Department of Agriculture

Volume 2—Final Environmental Impact Statement for the Land Management Plan

Flathead National Forest

Forest Service **Northern Region** **November 2018**

". . . for the greatest good of the greatest number for the longest time."—Gifford Pinchot, founding Chief of the Forest Service, 1905

Volume 2—Final Environmental Impact Statement for the Land Management Plan

Flathead National Forest

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Abstract: This is the second of four volumes of the final environmental impact statement (EIS) that documents the analysis of four alternatives developed for programmatic management of the 2.4 million acres administered by the Flathead National Forest. The Forest Service has identified alternative B modified as the preferred alternative. The Flathead National Forest encompasses 2.4 million acres in Flathead, Lake, Lewis and Clark, Lincoln, Missoula, and Powell Counties, Montana.

The Forest Service is concurrently amending the forest plans of the Helena-Lewis and Clark, Kootenai, and Lolo National Forests (referred to as the "amendment forests") to incorporate habitat management direction for the Northern Continental Divide Ecosystem (NCDE) grizzly bear population (refer to volume 3 of the final EIS for the evaluation of effects of the amendments).

Flathead National Forest cover photo captions (clockwise from upper left):

- South Fork of the Flathead River, Spotted Bear Ranger District
- Forwarder working on the Paint Emery Resource Management Project, Hungry Horse–Glacier View Ranger District
- Two hikers
- Snowmobiler
- View from trail to Pentagon Cabin in the Bob Marshall Wilderness (photo by Peter Borgesen)
- Fireweed
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Chapter 3. Affected Environment and Environmental Consequences (continued)

This volume of the EIS addresses the following topics:

- wildlife
- fire and fuels management
- air quality
- sustainable recreation and access
- scenery
- infrastructure
- lands and special uses
- designated and recommended wilderness
- inventoried roadless areas
- wild and scenic rivers
- national scenic trails
- special areas and research natural areas
- forest products
- mineral resources
- livestock grazing
- cultural resources
- American Indian rights and interests
- social and economic environment

Physical and biological (cont.)

This section, continued from volume 1) addresses the following resources:

- Wildlife
- Fire and Fuels Management
- Air Quality

3.7 Wildlife

3.7.1 Introduction

In 2006, a national study was completed that looked at the relationship between fish and wildlife conservation and economic prosperity in Montana. This study (sponsored by the U.S. Fish and Wildlife Service and the U.S. Census Bureau) highlighted the importance of wildlife-related activities to residents of Montana as well as those visiting the state. The percentage of Montana's population participating in wildlife-related activities (hunting, fishing, wildlife viewing) was substantially higher than that for the nation as a whole or for the Rocky Mountain region of the West. Wildlife viewing was one of the top four activities for Forest visitors in 2015, and in Montana the hunting, fishing, and wildlife-viewing economy is estimated to total over $1.2 billion in direct annual expenditures (see sections 3.10 and 3.27 for more details).

The wildlife sections of the final EIS address consequences of implementing alternative A (the 1986 forest plan, as amended) compared to three action alternatives. The forest plan must include plan components to maintain or restore (1) key characteristics associated with terrestrial and aquatic ecosystem types, (2) rare aquatic and terrestrial plant and animal communities, and (3) the diversity of native tree species similar to that existing in the plan area (36 CFR § 219.9(a)(2)). The forest plan must also address the 2012 planning rule requirements for ecosystem integrity by including management direction (plan components, including standards or guidelines) to maintain or restore the ecological integrity of terrestrial and aquatic ecosystems and watersheds in the plan area. Doing so includes plan components to maintain or restore the ecosystems' structure, function, composition, and connectivity (36 CFR § 219.9(a)(1)); Forest Service Handbook 1909.12 chap. 20 sec. 23.11-23.11d). The Flathead National Forest assessment (USDA, 2014a), the forest plan, the final EIS, and the planning record exhibits document how these requirements have been met. For a list of species known to occur on the Flathead National Forest and their association with key ecosystems and ecosystem characteristics, see appendix 6 (Coleman & Kuennen, 2013; MFWP, 2016b; MHP-MTFWP, 2013; MNHP, 2010, 2013a).

Organization of the wildlife analysis

Section 3.7.4 is organized by key ecosystems and ecosystem characteristics that provide habitat for associated animal species (see also appendix 6). Each individual section begins with an analysis of coarse-filter plan components and consequences to most species and is followed by sections on specific species. The species listed in table 45 are not federally listed by the USFWS but are included in section 3.7.4 to address public comments and to help display the effects of alternatives (USDA, 2011b). Section 3.7.5 addresses species that currently have threatened, endangered, proposed, or candidate status under the Endangered Species Act (USFWS, 2017e) and their designated critical habitat. This final EIS is also evaluating the effects of alternatives for other national forests in the Northern Continental Divide Ecosystem with respect to plan components for the grizzly bear (including cumulative consequences to the grizzly bear; see chapter 6). Plan components in the forest plan do not rely upon the particular status of a species.

Some species are species of conservation concern under the 2012 planning rule. This is a species, other than a federally listed threatened, endangered, proposed, or candidate species, that is known to occur in the plan area and for which the regional forester has determined that the best available scientific information indicates substantial concern about the species' capability to persist over the long term in the plan area (36 CFR § 219.9; 77 FR 21169). More information about the USDA Forest Service Northern Region (hereafter "Northern Region") species of conservation concern selection process and the rationale for selecting or not selecting species for the Flathead National Forest can be found on this Web site: http://bit.ly/NorthernRegion-SCC.

Table 45. Key wildlife species, not federally listed, included in the analysis and section containing the analysis.

Species' Common Name	Species' Scientific Name	Section
Bald eagle Beaver Black swift (2017 regional forester species of conservation concern) Boreal (Western) toad Common loon Harlequin duck Northern bog lemming	*Haliaeetus leucocephalus* *Castor canadensis* *Cypseloides niger* *Bufo boreas* *Gavia immer* *Histrionicus histrionicus* *Synaptomys borealis*	Wildlife Diversity—Aquatic, wetland, and riparian habitats
Mountain goat Peregrine falcon Townsend's big-eared bat	*Oreamnos americanus* *Falco peregrinus* *Corynorhinus townsendii*	Wildlife Diversity—Cliff, cave, scree, and rock habitats
Clark's nutcracker (2017 regional forester species of conservation concern) Elk Flammulated owl (2017 regional forester species of conservation concern) Gray wolf Marten Moose Mule deer Northern goshawk White-tailed deer	*Nucifrage Columbiana* *Cervus canadensis* *Psiloscops* [formerly *Otus*] *flammeolus* *Canis lupus* *Martes spp.* *Alces americanus* *Odocoileus hemionus* *Accipiter gentilis* *Odocoileus virginianus*	Wildlife Diversity—Coniferous forest habitats
Fisher Pileated woodpecker	*Pekania* [formerly *Martes*] *pennanti* *Drycopus pileatus*	Wildlife Diversity—Old-growth forest, very large live tree habitat, and very large dead tree habitat
Black-backed woodpecker Olive-sided flycatcher	*Picoides arcticus* *Contopus cooperi*	Wildlife Diversity—Burned forest and dead tree habitat

Table 46. Wildlife species on the Flathead National Forest that were federally listed as of August 04, 2017

Species Common Name	Species Scientific Name	Status
Grizzly bear	*Ursus arctos horribilis*	Threatened
Canada lynx	*Lynx canadensis*	Threatened; critical habitat designated
North American wolverine	*Gulo gulo luscus*	Proposed

Wildlife habitat connectivity is summarized in section 3.7.6 and is addressed throughout the wildlife sections of the final EIS. Section 3.7.7 provides a summary of key consequences to wildlife from forest plan components associated with other resource programs or management activities, section 3.7.8 addresses terrestrial invertebrates, and section 3.7.9 addresses pollinators (see section 3.2.9 for effects to aquatic species, including invertebrates).

The information in this document on species life history and habitat provides the context for key ecosystem characteristics, ecological conditions, the capability of lands on the Forest, plan components, and key indicators of the consequences of alternatives. The Forest's planning team biologist considered the many stressors that may affect species and their habitats on and off the plan area and assessed the key stressors most relevant to the Flathead National Forest. The indicators used to focus the analysis and disclose relevant environmental consequences were developed after considering key stressors, public comments, and issues identified during scoping.

Stressors can be activities that have occurred in the past; they may not be occurring presently, nor are they necessarily expected to occur in the future. Stressors may affect a species and/or its habitat if not managed or mitigated. Some activities or processes can function as both drivers and stressors of ecosystem change, depending upon their timing or magnitude. What is a driver for one species may be a stressor for another. Stressors that are not entirely within Forest Service control include those activities that occur on non-NFS lands or that are not within Forest Service authority or ability to manage. These stressors are considered in this final EIS's sections on cumulative consequences. Changing climate is addressed in the 'Affected environment" sections of the analysis because it is ongoing and is part of the baseline condition. The analysis of consequences of alternatives also considers anticipated effects of climate changes in the future, including potential cumulative effects.

3.7.2 Regulatory framework

The following is the key set of statutory authorities that affect wildlife management on NFS lands. They are briefly identified and described below to provide context to management and the final EIS evaluation of the wildlife resource. Many other laws, regulations, executive orders, and policies not described below also guide the management of this resource.

Hellgate Treaty of 1855: The Confederated Salish and Kootenai Tribes of Montana, which includes the Kootenai, the Bitterroot Salish, and the Pend d'Oreille Salish peoples, have reserved treaty rights in the plan area under the Hellgate Treaty of 1855. These treaty rights include hunting, gathering, and grazing rights on Federal lands within the plan area.

Migratory Bird Treaty Act of 1918: Prohibits unauthorized take of migratory birds, as defined through subsequent regulations. Executive Order 13186 (66 FR 3853) and memoranda of understanding (USDA-USFWS, 2008, 2016) outline the responsibilities of Federal agencies to protect migratory birds in furtherance of the purposes of the Migratory Bird Treaty Act.

Bald and Golden Eagle Protection Act of 1940: Prohibits unauthorized take of bald and golden eagles, as defined through subsequent regulations.

Use of Off-Road Vehicles, 1972 (Executive Order 11644, as amended by Executive Order 11989): This executive order addresses the use of off-road vehicles on public lands. It requires the Forest Service to "establish polices and provide for procedures that will ensure that the use of off-road vehicles on public lands will be controlled and directed so as to protect the resources of those lands, to promote the safety of all users of those lands, and to minimize conflicts among the various uses of those lands" (section 1). The executive order directs agencies to designate the "specific areas and trails on public lands on which the

use of off-road vehicles may be permitted, and areas in which the use of off-road vehicles may not be permitted" (section 3). The minimization criteria are identified in the final rule for Travel Management; Designated Routes and Areas for Motor Vehicle Use (commonly referred to as the 2005 Travel Management Rule), which implements provisions of Executive Orders 11644 and 11989 regarding off-road use of motor vehicles on Federal lands. Regulations implementing this rule are found at 36 CFR § 212. The portion of the rule pertaining to motor vehicle use is subpart B; the portion of the rule pertaining to motorized over-snow vehicle use is subpart C, which was updated in January 2015. The "minimization criteria" referenced in the 2015 circuit court opinion and district court order are in 36 CFR § 212.55(b), where specific criteria for designation of trails and areas relevant to wildlife specify that "in designating National Forest System trails and areas on National Forest System lands, the responsible official shall consider effects on the following with the objective of minimizing . . . (2) Harassment of wildlife and significant disruption of wildlife habitats." The Forest designates specific areas and trails for the use of motor vehicles (which includes off-road vehicles), which are displayed on the Forest's motor vehicle use maps as required by 36 CFR § 212 subpart B. The Forest also has completed subpart C through amendment 24 to the 1986 forest plan, and that is displayed in the motorized over-snow vehicle use map as required by 36 CFR § 212 subpart C.

Endangered Species Act of 1973, as amended: Provides requirements for Federal agencies with regard to species listed as threatened, endangered, or candidate under the act.

Sikes Act of 1974, as amended: The Sikes Act directs the Secretaries of Interior and Agriculture to cooperate with the States in developing comprehensive plans to plan, maintain, and coordinate the conservation and rehabilitation of wildlife, fish, and game, including but not limited to protection of species considered threatened or endangered pursuant to section 4 of the Endangered Species Act (16 USC 1533) or considered to be threatened, rare, or endangered by the State agency.

National Forest Management Act of 1976: This act states that the Secretary shall "promulgate regulations," under the principles of the Multiple-Use Sustained-Yield Act of 1960, to "provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives, and within the multiple-use objectives of a land management plan adopted pursuant to this section, provide, where appropriate to the degree practicable, for steps to be taken to preserve the diversity of tree species similar to that existing in the region controlled by the Plan" (Pub. L. 94-588, Sec. 5 (g)(3)(B)). The 2012 planning rule was determined to be consistent with this act (77 FR 21162).

2001 Roadless Area Conservation Rule: The 2001 Roadless Area Conservation Rule (36 CFR § 294 subpart B; 66 FR 3244-3273) includes a prohibition on road construction and road reconstruction in inventoried roadless areas and prohibits timber cutting, sale, or removal except in certain circumstances.

2012 planning rule: Relative to wildlife species, the rule directs the Forest to consider (1) habitat conditions, subject to the requirements of 36 CFR § 219.9, for at-risk species; (2) habitat conditions, subject to the requirements of § 219.9, for wildlife, fish, and plants commonly enjoyed and used by the public for hunting, fishing, trapping, gathering, observing, subsistence, and other activities in collaboration with federally recognized Tribes, Alaska Native Corporations, other Federal agencies, and State and local governments (§ 219.10 (a)(5)); (3) dominant ecological processes, disturbance regimes, and stressors such as natural succession, wildland fire, invasive species, and climate change; (4) the ability of the terrestrial and aquatic ecosystems on the plan area to adapt to change (§ 219.8)); (5) habitat/habitat connectivity; and (6) riparian areas (§ 219.10 (a)(1))

The 2012 planning rule requires that forest plans use a complementary ecosystem- and species-specific approach. The responsible official determines whether or not the plan components provide the ecological

conditions necessary to contribute to the recovery of federally listed threatened and endangered species; conserve proposed and candidate species; and provide ecological conditions to maintain a viable population of each species of conservation concern within the plan area. If the responsible official determines that the ecosystem plan components are insufficient to provide such ecological conditions, then additional species-specific plan components, including standards or guidelines, must be included in the plan to provide such ecological conditions in the plan area (36 CFR § 219.9 (b)(1)). If the responsible official finds that it is beyond the authority of the Forest Service or not within the inherent capability of the plan area to maintain or restore the ecological conditions to maintain a viable population of a species of conservation concern in the plan area, then the responsible official must show that the plan includes plan components, including standards or guidelines, to maintain or restore ecological conditions within the plan area to contribute to maintaining a viable population of the species within its range.

3.7.3 Methodology and analysis process

In developing the plan components and the EIS, the Forest sought information on local wildlife populations and habitat factors (including presence, abundance, distribution, stressors, trends in habitat, and responses to management) throughout the planning process. The process included

- identification of key ecosystems and their characteristics including composition, structure, function, and connectivity. As stated in the 2012 planning rule directives, key ecosystem characteristics may be added or modified during the planning phase (Forest Service Handbook 1909.12.13);
- an assessment of possible system drivers and stressors (36 CFR § 219.6(b)(3)) and their influences on key ecosystem characteristics ((USDA, 2014a);
- an assessment of the natural range of variation for selected key ecosystem characteristics (or a suitable alternative) for establishing a context for whether ecosystems on the Forest are functioning properly (Forest Service Handbook 1909.12.14a, 1909.12.14b); and
- an assessment of the status of the ecosystem based on projected trends of key ecosystem characteristics after considering the current plan and influence of climate changes (Forest Service Handbook 1909.12.14c).

See the final EIS and appendices for documentation of the process. During the planning process, ecosystems and key ecosystem characteristic were evaluated and determinations were made regarding whether associated wildlife species needs were met by the emerging plan components, considering known locations of species and their habitats, potential habitats, and key drivers and stressors. In addition to coarse-filter plan components, species-specific plan components were then considered. The alternatives are built on the principle that by restoring and maintaining the key characteristics, conditions, and functionality of native ecological systems and managing for additional needs of key species, the Forest will be able to

- maintain or improve ecosystem diversity and integrity,
- provide for the habitat needs of diverse plant and animal species on the Forest,
- provide for ecological conditions that maintain or contribute to the persistence of native species, and
- provide for the social and economic benefits derived from observing, hunting, and trapping wildlife.

The planning team biologist obtained species information from the Montana Natural Heritage Program and also obtained the most recent list of threatened, endangered, and candidate species from the USFWS (www.fws.gov/montanafieldoffice/Endangered_Species/Listed_Species/Forests/Flathead_sp_list.pdf). To evaluate ecological sustainability, the Forest identified key ecosystems and ecosystem characteristics (see sections 3.2, 3.3, 3.5, 3.6 for more details). The public, Montana Fish, Wildlife and Parks (MFWP), and members of the Confederated Salish and Kootenai Tribes participated in the planning process (Camel-Means, 2016). The planning team biologist also coordinated with adjacent national forests (Helena-Lewis and Clark, Kootenai, Lolo) and the regional ecologist (see 77 Federal Register 21175). Many of the individuals consulted have several decades of accumulated expertise on the species and habitats of all lands in northwest Montana (see 36 CFR § 219.9 (b)(2)(ii)). The Northern Region's regional forester provided an updated list of species of conservation concern in 2017. See the Northern Region's website for information regarding the process used to identify species of conservation concern (http://bit.ly/NorthernRegion-SCC).

Spatial and temporal analysis

In general, the analysis area for indirect effects to most wildlife species is NFS lands within the Flathead National Forest (see figure 1). The cumulative effects analysis area for most species is also the Forest, but this includes all lands within the geographic area boundaries (see figure 2). Because the grizzly bear and wolverine are particularly wide-ranging species, the cumulative effects analysis area for these species is the area identified as the Northern Continental Divide Ecosystem (see figure 1-70). The cumulative analysis area for Canada lynx is critical habitat unit 3 (see figure 1-51; biological assessment figure B-14), which encompasses the area delineated by Squires and others (2013) as the occupied range of lynx in the northern Rocky Mountains. Areas selected for analysis of cumulative effects are large enough to include the consequences of activities on all lands but not large enough to obscure effects.

The anticipated life of the forest plan is about 15 years. However, because management actions have the potential to affect wildlife species and their habitats for many decades, the temporal analysis for modeled vegetation change and cumulative effects discusses changes that may occur over the next 50 years as conditions change and vegetation moves from one successional stage to another.

Information sources

A thorough review of the scientific information was completed, and the best available scientific information was used to inform the planning process and develop plan components. Key information on the population, life history, and status of animal species on the Forest was obtained from the Montana Field Guide (http://fieldguide.mt.gov) as well as other sources listed in the references section of this document. Part 219.3 of the 2012 planning rule requires the responsible official to use the best available science and, in so doing, determine what is most accurate, reliable, and relevant. For the best available scientific information, the Forest used available peer-reviewed articles and data in which reliable statistical or other scientific methods were used to establish the accuracy or uncertainty of any findings (Forest Service Handbook 1909.12 Zero Code 07.12). For best relevance, the Forest used studies conducted in western Montana or western North America in habitat conditions similar to those that occur in the plan area, if available. If these were not available, we selected articles that considered ecological processes or conditions relevant to the analysis area. The Forest attempted to avoid professional opinion or publications that have not been peer-reviewed when peer-reviewed information was available. However, in accordance with section 07.13 of the 2012 planning rule directives on sources of scientific information, scientific information that may be considered the best available scientific information may include expert opinions, panel consensuses, inventories, or observational data prepared and managed by the Forest Service, other Federal agencies, universities, national research networks, other reputable scientific organizations, and data from public and governmental participation. This information may

include monitoring results, information in spatially referenced databases, data about the lands and resources of the planning unit, and various types of statistical or observational data. This final EIS provides extensive review of and references to peer-reviewed scientific literature that documents the status, habitat relationships, and responses to management activities of wildlife species and their habitats. In some cases, there is opposing, incomplete, or unavailable scientific information about a species or its habitat. This was also considered, in accordance with requirements of the National Environmental Policy Act. Data and information gaps exist, but the breadth and depth of the available scientific information are sufficient to determine the key stressors and plan components to address those key stressors.

Use of models, maps, and data

The Forest relied on a variety of databases (e.g., those from state agencies, Rocky Mountain Research Station, the agency's own internal databases) to support the development of plan components and assess the consequences of alternatives to wildlife. The Forest's map-based information is stored in a GIS database maintained by the Forest's GIS specialists.

Current technology, budgets, and the remoteness of much of the Forest may limit the ability to accurately detect or map all key ecosystem characteristics at the forestwide scale. For example, Forest Inventory and Analysis data sets are statistically accurate but were not intended to provide spatial information. As a result, Forest Inventory and Analysis data can be used to estimate the amount of old growth at a forestwide scale, but field inventories are necessary to accurately determine the location of old growth, its patch size, its connectivity, and other characteristics associated with its quality (see section 3.3 of the final EIS for more details). VMap data sets provide remotely sensed spatial information on vegetation, but the Forest's VMap database does not provide characteristics such as snag density or the density of shrubs and small trees in the understory that are important to some wildlife species. The available data is sufficient for programmatic planning and analysis of the forest plan, but more detailed information is gathered during field inventories conducted for implementation of projects.

Models were used to assess key ecosystems and key ecosystem characteristics and their natural range of variation, if available. The natural range of variation has been modeled at large scales, such as the Columbia River Basin, to smaller scales. For a discussion of the Columbia River Basin modeling, see the Forest assessment (USDA, 2014a). For the Forest's plan revision, the natural range of variation for vegetation composition, size class, canopy cover, density, pattern, patch size, and patch distribution were modeled for vegetation (see final EIS section 3.3 and appendix 2). Vegetation model outputs were then used to model habitat for key wildlife species (see final EIS appendix 3 and final EIS species sections for more details on habitat modeling).

The natural range of variation reflects the ecosystem conditions that have sustained the current complement of wildlife and plant species on the Forest and provides context for understanding the natural diversity of ecosystems and processes (such as wildfire, insects and disease, and plant succession). The natural range of variation, current condition, future trends, and effects of alternatives for vegetation were estimated using the SIMPPLE and Spectrum models, which use VMap and Forest Inventory and Analysis data sets for inputs and calibration of the models. Out of necessity, the models simplify a very complex and dynamic relationship between ecosystem processes and vegetation over time and space (see appendix 2 for more details). Ecosystem Research Group interpreted vegetation model outputs to estimate the natural range of variation and current and potential future habitat for a select set of wildlife species over the next 50 years. Although model outputs show future trends over the next 50 years, there is uncertainty regarding the timing and magnitude of trends due to the uncertainty associated with the models.

Due to the natural range of variation in the northern Rocky Mountains, fluctuations in wildlife populations and their distribution are normal. Fluctuations may occur due to changes in habitat, but

fluctuations may occur even when there has not been a noticeable change in habitat. These fluctuations may be due to factors such as interspecies competition, disease, hunter or trapper harvesting, effects of weather or climate, and other factors. In addition, for migratory species a change in population may not reflect a change in local habitat conditions. Many species found on the Forest migrate and are influenced by activities or conditions that occur elsewhere in the United States or even in other countries. For example, there are 71 species of neo-tropical migratory birds on the Forest (Dan Casey, Bissell, & Batts, 2016; Kuennen, 2016; C. M. White et al., 2015). Although it is possible to assess the effects of alternatives on the key ecosystems and ecosystem characteristics they are associated with during the breeding season, activities or conditions where they winter may not be known, which may affect biologists' ability to draw conclusions about population trends or cause-and-effect relationships.

Multiple connectivity models have been created for many different species, using a variety of methods. As noted by McClure and others (2016), "Additional comparative tests are needed to better understand how relative model performance may vary across species, movement processes, and landscapes, and what this means for effective connectivity conservation" (p. 1419). Ecosystem Research Group interpreted vegetation model outputs to estimate connectivity of vegetative cover for wildlife in key connectivity areas over the next 50 years (see appendix 3 for more details). This was one of many aspects of connectivity considered in the development of plan components and analysis of effects. For more details on wildlife connectivity and use of connectivity models, see section 3.7.6 and Kuennen (2017b).

Downscaled climate models are used to predict the effects of a changing climate. For this final EIS, the Forest used a compilation of climate change effects published for the Northern Region Adaptation Partnership (Halofsky et al., in press) that summarizes climate change projections by subregions (see final EIS figure 1-05 and section 3.1.1). McKelvey and Buotte (in press) provide a summary of modeled climate change effects on wildlife in the northern Rocky Mountains.

In summary, there is uncertainty with all models, including models of the natural range of variation that occurred in the past as well as the changes predicted to occur in the future. In addition, models, maps of habitat, and numeric estimates of habitat or species populations may change over time as technology changes or as on-the-ground inventories are conducted. Inventories, models, maps and data may be updated for the implementation of projects.

Assumptions

The forest plan provides a programmatic framework that guides site-specific actions but does not authorize, fund, or carry out a project or activity (including ground-disturbing actions). As a result, it does not result in direct effects to wildlife but may result in indirect or cumulative environmental consequences from managing the Forest under this programmatic framework; these consequences are assessed in this final EIS.

Before ground-disturbing actions take place, they must first be authorized in a site-specific environmental analysis. Therefore, none of the alternatives would cause unavoidable adverse impacts or an irreversible or irretrievable commitment of resources.

The forest plan's desired conditions, objectives, standards, guidelines, management area allocations, and suitability will be followed when planning or implementing new site-specific projects and activities.

Laws, regulations, and policy regulations will be followed when planning or implementing new site-specific projects and activities.

Terms and conditions and reasonable and prudent measures resulting from USFWS consultation on the programmatic framework of the forest plan will be followed when planning or implementing new site-specific projects and activities, unless modified by site-specific consultation.

Models of future conditions or consequences are probabilistic and show predicted changes given a particular set of assumptions, as discussed in detail in this final EIS.

Notable changes between the assessment, draft EIS, and final EIS

The analysis of species and their status, existing conditions, and trends contained in the assessment of the Flathead National Forest (USDA, 2014a) is updated in the "Affected environment" sections of this final EIS and in the planning record. In the Forest's assessment, the Terrestrial Ecosystem and Aquatic Ecosystem sections reported on conditions for specific wildlife species using the following three categories: (1) threatened, endangered, proposed, and candidate species; (2) potential species of conservation concern; and (3) key species of public interest. Because the planning process occurred over a time period of a few years, the status of species and use of these categories has evolved for a variety of reasons. The assessment was based upon draft planning rule directives and, since the assessment was published, the USFS has published final directives. Species of conservation concern and supporting information for their selection have been updated by the regional forester based upon the final directives (see http://bit.ly/NorthernRegion-SCC). The best available scientific information, models, and model outputs have been further evaluated and/or updated.

Because the Forest initiated its revision prior to the final planning rule directives, as set forth in Forest Service Manual 1920.3 policy paragraph 9b, the responsible official was not required to revise past steps, such as the assessment or its appendices, when the final direction of January 30, 2015, was approved by the deputy chief of the Forest Service.

Changes were made between the draft and the final EIS in order to respond to public comments, improve organization or clarity, and consider opposing science, updates in science, and/or information submitted as best available scientific information. Key changes for wildlife include:

- updating, clarifying, and reorganizing plan components and sections of text in the final EIS;
- updating existing or baseline conditions for data, such as motorized access density or acres burned by wildfires (if available);
- moving plan components for Canada lynx to appendix A of the forest plan, clarifying and expanding upon the Canada lynx critical habitat analysis, and refining forest-specific plan components and estimates of acres that may be treated using exceptions or exemptions to the vegetation standards for Canada lynx, based upon additional GIS analysis;
- clarifying plan components for the grizzly bear and expanding upon the grizzly bear analysis;
- adding section 3.7.6, which summarizes the effects of plan components on habitat connectivity (a detailed discussion of connectivity related to individual ecosystems or species is still included in sections 3.7.4 and 3.7.5);
- changing the subtitles of the native plant and animal species section of the forest plan and the wildlife plan components from "Wildlife currently designated as species of conservation concern" (plan component identifier: SCC) or "Species of interest" (SOI) to "wildlife diversity" (DIV);

- moving the wolverine analysis and its species-specific plan components to the threatened, endangered, proposed, and candidate species section (3.7.5) based upon its current status;
- consolidating elk, deer, and moose in one subsection of section 3.7.4 called “Forest ungulates”;
- including bats in the new section on caves in the forest plan and clarifying that plan components for bats apply to more than one species (see wildlife diversity section 3.7.4);
- creating an addendum to appendix 3, which is on wildlife modeling, based upon updated vegetation modeling (see additional discussion under section 3.3);
- moving the tables of species, key ecosystem characteristics, and plan component cross-references to EIS appendix 6;
- modifying the original drivers and stressors table so that there is now a table addressing the climate change strategies outlined by the Northern Region Adaptation Partnership (appendix 7); and
- clarifying and expanding upon potential strategies and management approaches in appendix C of the forest plan.

3.7.4 Wildlife diversity

Diverse ecosystems on the Flathead National Forest support close to 300 species of wildlife, including mammals, amphibians, reptiles, and birds as well as about 60 known invertebrate species (see appendix 6). Within the national forests, conservation of migratory birds focuses on providing a diversity of habitat conditions at multiple spatial scales and ensuring that bird conservation is addressed when planning for land management activities. Six of the neo-tropical migratory species found on the Forest are associated with old-growth, at least 13 are associated with dead tree habitats, and 43 are associated with riparian habitats.

This section is organized by key ecosystems and ecosystem characteristics that provide habitat for associated animal species. Each individual section begins with an analysis of coarse-filter plan components and consequences to most species and is followed by sections on specific species. The following key ecosystems or ecosystem characteristics are discussed:

- aquatic, wetland, and riparian habitats
- hardwood tree habitats
- cliff, cave, scree, and rock habitats
- persistent grass/forb/shrub habitat
- high-elevation habitat
- coniferous forest habitats
- old-growth forest, very large live tree habitat, and very large dead tree habitat
- burned forest and dead tree habitats

Refer to detailed discussion of these key ecosystems or ecosystem characteristics in sections 3.2 and 3.3, including the affected environment, environmental consequences, specific indicators used for analysis,

and consequences to these ecosystems from other resource programs or management direction. In addition to the indicators addressed in these sections that are referred to, additional indicators were developed or clarified after considering key stressors, public comments, and issues identified during scoping.

Aquatic, wetland, and riparian habitats

Introduction

The Forest has more abundant and diverse aquatic, riparian, and wetland habitats compared to many other national forests in Montana (see section 3.2 for more details). About 175 wildlife species on the Forest are specifically associated with aquatic, wetland, and riparian habitats for feeding, breeding, and or shelter (see appendix 6). The Confederated Salish and Kootenai Tribes expressed particular concern for wetland habitats and associated wildlife in their Climate Change Strategic Plan (CSKT, 2013). Montana Fish, Wildlife and Parks also expressed a particular concern for wetlands and associated wildlife in their State Wildlife Action Plan (MTFWP, 2015a). Montana Fish, Wildlife and Parks identified floodplain and riparian areas, wetlands, and open water as tier I community types of greatest conservation need in every ecoregion within the state because of (1) the biodiversity found in these landscapes and (2) the importance of water during the life cycles of wildlife species.

Riparian habitats provide large amounts of biomass, feeding and hiding sites, and overwintering and breeding sites that support a high diversity of plants and animals (Sanders & Edge, 1998). As noted by Knopf et al. in 1988, gravel bed river floodplains provide near-channel habitats as well as adjacent riparian forest habitats for diverse bird communities (Hauer et al., 2016). Riparian corridors "connect habitats providing additional life requisites (e.g., feeding, nesting, roosting, escape cover, etc.) as well as interaction among local populations for reproduction or other social behaviors" (USDA, 2010a, p. 1), making these areas important to many wildlife species.

Maintenance and restoration of processes that create a complex structural mosaic within riparian management zones is important. These processes include:

- flood events that change the channel, cut the channel, and leave behind the abandoned channel, creating a mosaic of cobble, gravel, and finer deposits that support a mosaic of floodplain vegetation;
- river water that flows in and out of the floodplain subsurface, providing an upwelling of cold groundwater that supports species on the surface as well as subsurface habitat for micro and macroinvertebrates and makes rivers more resilient to changes in climate;
- the presence of ponds, disconnected backwaters, and wetlands along the floodplain that provide an array of thermal conditions to support larval amphibians and help them avoid predation by fish; and
- periodic flood, fire, or other events that restore deciduous vegetation, including cottonwood trees in a variety of sizes, interspersed with shrubs. These deciduous tree and shrub communities provide key habitats for nesting, feeding, shelter, and seasonal or annual migration for highly diverse wildlife communities.

An assessment of bird biodiversity on all lands in the Flathead River Basin was completed based upon research conducted at the Landscape Biodiversity Lab at Montana State University (Mahr & Jones, 2005). The authors stated that the Flathead River Basin has higher bird richness than all but one other area within the Yellowstone to Yukon ecoregion. Examples of bird species associated with aquatic, riparian, and

wetland habitats include a variety of waterfowl and shorebirds: the American redstart, bald eagle, Wilson's warbler, northern water-thrush, catbird, winter wren, great blue heron, and long-billed marsh wren. Several species of mammals, such as beaver, river otter, moose, elk, and deer, and their predators as well as numerous species of bats (such as the long-eared and long-legged myotis) forage within or above aquatic, wetland, and riparian communities.

Some aquatic wildlife species are associated with fast-moving streams (e.g., deep pools for escape from predators, downed logs or large rocks used for nesting or loafing, and high water quality that supports abundant aquatic insects for food). Downed logs are provided when trees in riparian areas fall into the stream, which are in turn affected by processes such as wildfire, insect and disease, or timber harvest. Key ecosystem characteristics for other species are associated with conditions in larger lakes (e.g., deep water for diving to avoid predators or catch fish) and shoreline conditions that provide gentle terrain and vegetation for nesting. Key ecosystem characteristics for other species are associated with conditions in wetlands (e.g., a variety of submergent, emergent, or other low-growing plants that provide cover as well as high densities of invertebrates for food).

Affected environment

On wide, low-gradient rivers (e.g., the Swan River), periodic flooding maintains a very highly convoluted pattern of meanders, sloughs, and oxbow lakes. Because this pattern is changing constantly due to periodic flooding, early-successional vegetation, including shrubs, forbs, grasses, and young hardwood trees, are maintained by natural flood processes. Beaver activity also helps to maintain nonconiferous vegetation by raising the water table.

Numerous studies have been published on the use of riparian habitats by particular species, from invertebrates (F. L. Bunnell & Houde, 2010) to amphibians (D. H. Olson & Burton, 2014) and from mammals (McKelvey & Buotte, in press; Wilk, Raphael, Nations, & Ricklefs, 2010) to birds (Lehmkuhl et al., 2007; Marcot et al., in press). However, the width of riparian areas needed by most wildlife species in the northern Rocky Mountains is unknown. Although many studies have reported on the need for "riparian buffers," studies of the results of such buffers have reported inconsistent results. Additionally, most of the studies that have been done are in places other than the northern Rocky Mountains, where wildlife species are not the same as in northwest Montana or where stand-replacing wildfire is not a dominant factor in the natural range of variation. In a literature review considering appropriate widths for riparian management zones, Lee and others (2004) surveyed management prescriptions next to waterbodies in both Canada and the United States. They found that although prescriptions for buffer widths varied by waterbody type such as wetlands, intermittent streams, and fish-bearing streams, they were generally wide enough to protect many of the important riparian processes that support aquatic biota. However, the buffers were generally less than the widths that are recommended to protect terrestrial fauna.

Marczak et al. (2010) found that where the total width of a stream buffer was less than 164 feet, responses by different species were more variable compared to untreated riparian areas. They also found that species did not respond similarly to riparian treatments. Some edge-related species increased in abundance or diversity, some interior-associated species declined, and for some species, presence and abundance remained unchanged. They concluded that increases in protections in some locations should be balanced with riparian areas that allow partial resource extraction in other locations (Marczak et al., 2010; Reeves, Pickard, & Johnson, 2016; Spies et al., 2007).

To maintain the entire breeding bird community associated with forested riparian habitats in the Pacific Northwest, Pearson and Manuwal (2001) recommend a minimum buffer of 150 feet along each side of second- and third-order streams. They stated that habitat features such as deciduous trees and berry-

producing shrubs appear to be important and should be maintained within forested riparian areas. Wenger (1999) recommended a distance of 300 feet for most wildlife, acknowledging that the distance might be difficult to implement in all management applications. Semlitsch and Bodie (2003) suggested that upland terrestrial vegetation might need to be combined with the protections that come with riparian management zones for some sensitive terrestrial species. Braithwaite and Mallik (2012) recommended producing a wider edge structure when harvesting green trees or salvaging dead trees to better emulate the natural disturbance of wildfire (see Kuennen, 2017c for more details).

Wetlands with diverse vegetation typically contain a range of microhabitats which supports high species diversity. It is important to maintain the structure, function, and diversity of wetland pools, their spatial arrangement and connectivity, and the surrounding terrestrial habitat for pool-breeding amphibians. Terrestrial habitat supports adult populations and enables them to move as habitat conditions change. Forest canopy conditions over ephemeral pools can have strong effects on amphibian species composition because many species are found in cool, shaded pools and some are specialized breeders (e.g., wood frog, long-toed salamander, tiger salamander). Studies by Semlitsch and others (2009) demonstrate that the egg-laying and aquatic larval life stages are sometimes affected positively by clearcutting, whereas effects on juvenile and adult terrestrial stages are mostly negative. Partial-harvest treatments produced both positive and weaker negative responses compared to clearcut treatments. Mitigating the detrimental effects of canopy removal, higher surface temperature, and loss of soil-litter moisture in terrestrial habitats surrounding breeding ponds is important for maintaining amphibian populations in managed forested landscapes. Seasonal or temporary pools are considered a distinctive type of wetland that is usually devoid of fish and, as a result, allows the safe development of young amphibian and insect species unable to withstand competition or predation by fish. Maintaining disturbance processes is important to balance the loss of seasonal pools through succession. Without disturbance processes, amphibian species that favor early-successional habitats (chorus frogs, toads, tiger salamanders) would decline or disappear, favoring species only associated with later successional stages (Skelly, Werner, & Cortwright, 1999, table 7.1). Local populations are adapted to natural variability in pool flooding and drying due to events such as drought.

On the Forest, many upland riparian areas are dominated by coniferous forests, although early-successional plants are maintained by high water tables in some areas. On streams with a higher gradient, early-successional stages including shrubs, forbs, grasses, and young hardwood trees have historically been promoted by wildfire, insects, and disease. Early-successional openings in riparian areas are required by some wildlife species; late-successional stages and forest cover are required by some wildlife species, and others require a mosaic of different successional stages.

For additional discussion of the best available science related to riparian areas, see section 3.2.6, the introduction to the "Environmental consequences" section for aquatic resources. Also refer to section 3.2.5 in the aquatics section of the final EIS for additional information on affected environment for riparian areas and wetlands.

This section assesses effects to most species associated with aquatic, riparian, and wetland ecosystems. Following the general discussion, six species are discussed as examples in order to help display differences in the effects of the alternatives. The six species are the black swift, harlequin duck, beaver, northern bog lemming, boreal (western) toad, and bald eagle.

Key stressors

Land management

Land management actions on all lands, including vegetation, fire and fuels management, roads, energy and minerals, livestock grazing, invasive species, and recreation, can affect species associated with these habitats. Activities on other land ownerships or controlled by other management agencies that may affect aquatic, wetland, and riparian wildlife habitats include water diversion, flood control, stream channel manipulation, hydropower management, farming, construction of housing subdivisions, and commercial development (see section of 3.2 for more details).

Changing climate

Climate models show that future changes in climate are anticipated to decrease runoff, groundwater infiltration, and availability of wetland habitats. Water temperatures are likely to increase with increasing summer air temperature and decreased late summer stream flows. In the central Rocky Mountains, snowpack, rate of spring warming, and spring precipitation are the primary drivers of spring runoff severity (I. T. Stewart, Cayan, & Dettinger, 2004). Changes in the timing or amount of runoff have occurred in the past and are likely to occur in the future. Effects on aquatic, wetland, and riparian species are likely to be variable. The ability of most species to adapt to higher variability or more prolonged periods of variability cannot be predicted with certainty.

Key indicator for analysis of most wildlife associated with aquatic, wetland, and riparian habitats

The following indicator is important for the wide variety of wildlife species associated with aquatic, wetland, and riparian habitats:

- Diversity of successional stages in riparian areas

Also refer to indicators and effects addressed in sections 3.2.3 through 3.2.13, and 3.3.1 through 3.3.11.

Environmental consequences

Effects common to all alternatives

Riparian areas with special management direction are called riparian habitat conservation areas under alternative A and riparian management zones under alternatives B modified, C, and D (see figures 1-07, 1-08) Differences in their delineation are discussed in the following sections. Under all alternatives, plan components for aquatic ecosystems help to provide high-quality habitat benefiting wildlife associated with aquatic, wetland, and riparian habitats (see section 3.2 of the final EIS and the Aquatic Species, Watersheds, Riparian Management Zones, and Soils sections of the forest plan for more details). All alternatives would promote connectivity in riparian habitat conservation areas/riparian management zones to varying degrees. For wildlife, the differences in alternatives are primarily related to riparian habitat conservation area/riparian management zone widths and plan components that affect riparian habitat diversity (Kuennen, 2017c).

Alternative A

The Inland Native Fish Strategy (INFISH) (USDA, 1995c), as it was amended to the Flathead National Forest plan in 1995, is unchanged from its original wording in alternative A. INFISH reduces the risk to watersheds and riparian and aquatic resources by improving riparian zone protections. INFISH has standards and guidelines for timber, roads, grazing, recreation, minerals, and fire management that have improved water quality and stream habitat on the forest (see section 3.2.8 for more details). Under alternative A, riparian habitat conservation areas (see figure 1-08) are established and are areas where

riparian-dependent resources receive primary emphasis. Riparian habitat conservation areas for fish-bearing streams are generally a minimum 300 feet slope distance on each side, whereas for permanently flowing non-fish-bearing streams the riparian habitat conservation area are generally a minimum 150 feet slope distance for each side. Seasonally flowing or intermittent streams, wetlands less than 1 acre, landslides, and landslide-prone areas in priority watersheds for bull trout are generally a minimum100 feet slope distance, and, if not in a priority watershed, are generally a minimum 50 feet slope distance. For ponds, lakes, reservoirs and wetlands greater than 1 acre, riparian habitat conservation area widths are generally a minimum 150 feet. There is an estimated 313,922 total acres of mapped riparian habitat conservation areas on the Forest, which is approximately 13 percent of NFS lands on the Forest (see figure 1-08). Riparian habitat conservation areas are not suitable for timber production, but timber harvest is allowable if consistent with forest plan direction.

Plan direction associated with the INFISH amendment benefits many, but not all, wildlife species associated with aquatic, riparian, and wetland habitats. Under alternative A, plan standards direct the USFS to minimize the disturbance of riparian ground cover and vegetation in riparian habitat conservation areas. Because of this emphasis, riparian habitat conservation areas have been treated as buffers in many areas of the Forest. The lack of timber harvest and prescribed fire in some riparian habitat conservation areas has reduced the habitat for species associated with riparian shrubs, deciduous trees, grasses, and forbs but has benefited species associated with later successional stages. Wildlife connectivity and habitat for forest-interior species are supported by the emphasis on forest cover. For more details, see individual species sections below.

Alternatives B modified, C, and D

Forestwide standard FW-STD-RMZ-01 would establish riparian management zones (see figure 1-07), which are the same for all action alternatives (B modified, C, and D). Compared to alternative A, riparian management zone widths would be different for category 3 (seasonally flowing streams, intermittent streams, and lands identified as potentially unstable or landslide prone) and category 4 (ponds, lakes, reservoirs, and wetlands). Under alternatives B modified, C, and D, seasonally flowing or intermittent streams (not just streams in priority watersheds for bull trout), landslides, and landslide-prone areas would have a minimum riparian management zone width of 100 feet slope distance on each side of the stream or edge of the landslide-prone terrain. Under alternatives B modified, C, and D, FW-STD-RMZ-01 would increase the minimum riparian management zone width to 300 feet slope distance (with qualifiers, to be identified in the field at the project level) for ponds, lakes, reservoirs, and wetlands *greater than* 0.5 acre and for all sizes of Howellia ponds and for fens and peatlands. For ponds, lakes, reservoirs, and wetlands *less than* 0.5 acre (except for Howellia ponds and fens and peatlands), the minimum riparian management zone width would be 100 feet slope distance (with qualifiers), similar to alternative A. Based on these definitions, there are an estimated 410,863 acres of mapped riparian management zones on Forest lands, comprising approximately 17 percent of the NFS lands on the Forest (see figure 1-07). This is an increase of an estimated 96,941 acres forestwide compared to the area within riparian habitat conservation areas on NFS lands in the existing 1986 forest plan. This expansion is the result of increasing the size and distance of riparian management zone areas around wetlands, lakes, ponds, landslide-prone areas, and some intermittent streams. Riparian management zones are not suitable for timber production under any of the action alternatives, but timber harvest is allowable to contribute to desired conditions, as consistent with standards and guidelines.

Desired conditions FW-DC-RMZ-01 through 06 provide ecological conditions for diverse vegetation structure, composition, pattern, and connectivity, consistent with natural disturbance regimes and processes. Desired conditions for riparian areas contribute to maintaining vegetation conditions at the stand and landscape scale that are resilient and resistant to potential future stressors or threats (see section 3.3 and appendix 7 of the final EIS). Standards and guidelines for riparian management zones help to

achieve or maintain desired conditions and address timber, roads, grazing, recreation, minerals, and fire management in order to maintain or restore water quality and stream and wetland habitat on the Forest (see sections 3.2.10 and 3.2.11 for more details). The standards and guidelines for riparian management zones benefit wildlife and habitat diversity because they emphasize a wider riparian management zone for wetlands, successional stage diversity, retention of downed trees, retention of live trees, and snags. Additionally, standards and guidelines benefit wildlife because they state that vegetation management activities must comply with streamside management zone law and because the use of chemicals that may affect aquatic food chains is restricted.

Riparian management zones on the Forest are abundant and interconnected (see figure 1-07). Some standards and guidelines would apply to the entire riparian management zone and others would apply only to the inner riparian management zone, as defined in FW-STD-RMZ-01. Forestwide standards FW-STD-RMZ-02 through 05 and forestwide guidelines FW-GDL-RMZ-01 through 13 apply to the entire riparian management zone of their respective category. Standard FW-STD-RMZ-05 states that within 300 feet of peatlands, fens, and bogs (i.e., the entire riparian management zone), ground-disturbing vegetation treatments shall only occur to restore or enhance riparian-associated resources. Because fens and peatlands are types of wetlands that have a unique hydrology, chemistry, and plant and animal communities, this standard provides the needed protection.

Standard FW-STD-RMZ-06 applies to the inner management zone for all categories except peatlands, fens, and bogs. This standard states that vegetation management shall only occur in the *inner* riparian management zone in order to restore or enhance aquatic and riparian-associated resources. Exceptions may occur as long as aquatic and riparian-associated resources are maintained. The exceptions are for (1) nonmechanical treatments, e.g., prescribed fire, sapling thinning, or hand fuels reduction treatments; (2) mechanical fuel-reduction treatments in the wildland-urban interface within 300 feet of private property boundaries; and (3) treatments that address human safety hazards adjacent to infrastructure or within administrative or developed recreation sites. This standard provides protection to the portion of the riparian management zones that most influences the condition of the water features and preserve the functional attributes for riparian and aquatic resources and water quality.

Forestwide guideline FW-GDL-RMZ-09, which applies to the entire riparian management zone defined in FW-STD-RMZ-01, provides for habitat connectivity by stating that the distance to cover for created openings should not exceed 350 feet. Guideline FW-RMZ-12-15 benefits wildlife habitat connectivity by limiting new landings and roads and retaining understory vegetation.

In summary, under alternatives B modified, C, and D, aquatic ecosystem plan components would meet the needs of most species associated with aquatic, riparian, and wetland habitats. Refer to sections 3.2.10 and 3.2.11 in the aquatics sections of the final EIS for a detailed discussion on the effects of the alternatives on riparian areas and wetlands.

Summary of modeled alternative consequences

To look at riparian habitat diversity, Ecosystem Research Group modeled consequences of alternatives, differentiating between low-gradient riparian habitats along rivers and streams that are maintained by flooding vs. those in upland areas that are controlled by bedrock and affected primarily by forest succession, fire suppression, wildfire, insects and disease, and vegetation management activities. Ecosystem Research Group modeled the amount of early-successional habitat in upland riparian habitat conservation areas based on a warmer and drier climate over the next five decades.

The natural range of variation was modeled going back about 1,000 years, and the effects of the alternatives were projected for the next 50 years, incorporating anticipated changes in climate, using the

fire suppression logic of the model. Disturbances, such as fire or insect activities, have historically had major influences on vegetation conditions within riparian areas, just as they have on the conditions of vegetation across the entire Forest. For further information, refer to section 3.2.5 in the aquatics section and to section 3.3.1 in the vegetation section of the final EIS for discussion of ecosystem processes and disturbances forestwide and in riparian areas. Some disturbances are severe enough to convert forest stands to an early-successional stage of development, creating openings for a period of time that are dominated by grasses, forbs, shrubs, and seedling trees (conifers and hardwoods). Based upon vegetation modeling, the natural range of variation for early-successional openings in riparian habitat areas used for modeling ranges from about 2.4 to 8 percent (8,000-33,000 acres) of the total acres of NFS lands, with variation due to processes such as wildfire, insects, and disease. Current levels are estimated to be near the middle of the range (about 24,000 acres) (see appendix 3).The model predicts all alternatives would stay within the minimum and maximum natural range of variation over the five-decade time period. Acres of riparian habitat in an early-successional stage would decline the most (from about 24,000 acres to about 10,000 acres) from current levels under alternative A over the five-decade period. Under alternative A, the quantity of habitat for riparian wildlife species associated with dense shrubs, grasses, forbs, and young hardwood trees would decrease, but it would increase for species associated with coniferous forest in later successional stages. Under alternative C, the amount of early-successional forest would increase above current levels by the end of decade 5. Alternative C has more management area 1b (recommended wilderness) and lower levels of fire suppression. Alternative C would provide the most habitat for wildlife species associated with riparian areas in the early-successional stage but the least habitat for species associated with coniferous forest in later successional stages. Under alternatives B modified and D, levels would fluctuate but would remain near current levels by the end of decade 5. (The results of vegetation modeling for alternative B modified are similar to the results for alternative B; see appendices 2 and 3 for more details.)

Cumulative effects

This section summarizes the activities and effects that are common to most wildlife species associated with aquatic, wetland, and riparian habitats. See also the individual cumulative effects section specific to aquatic species in section 3.2.12 and the species discussions in sections 3.7.4 and 3.7.5.

Historically, much of the private land in the valley bottom of the Flathead Valley was cleared for grazing and farming, reducing native riparian vegetation but maintaining open space used by wildlife. Private land in the Flathead Valley then became more valuable for residential and commercial development, resulting in less open space and less wildlife habitat for many species, especially on the shores of large lakes and streams. This reduces the connectivity in and between riparian areas and upland areas. Developments may also increase human disturbance or loss of wildlife due to vehicle collision as animals move from aquatic and riparian habitats to upland areas.

Many land managers now work together to protect and restore the high quality of the aquatic, wetland, and riparian habitats of the Flathead River Basin. Numerous acquisitions and conservation easements have been completed along lakes, rivers, and streams by groups and individuals such as MFWP, F. H. Stoltze Land & Lumber Company, and The Nature Conservancy, including the Montana Legacy Project, under which lands formerly owned by Plum Creek Timber Company in the Swan Valley were conveyed to the Forest. All of these provide for conservation of wildlife habitat. Montana Fish, Wildlife and Parks is continuing to actively pursue conservation easements on private lands to limit the loss of riparian habitats (G. Bissell, MFWP, personal communication to R. Kuennen, 2014).

In the future, loss of habitat associated with human developments on some private lands is likely to continue and may increase as the human population in the Flathead Valley grows. Newlon and Burns (2010), with the Montana Natural Heritage Program , completed an analysis of wetlands in the Flathead

Valley using remote sensing and photo interpretation techniques. Their study area encompassed private lands and former Plum Creek Timber Company lands as well as lands managed by the Montana Department of Natural Resources and Conservation, MFWP, the Flathead National Forest, and USFWS. About 24,255 acres of wetland and riparian habitats were mapped on private lands and about 8,129 acres were mapped on public lands (including wildlife refuges managed by USFWS). The authors' preliminary analysis showed relatively little overall change in wetland area between 1981 and 2005, but they found changes in wetland functional capacity and land cover types around wetlands. These changes included relatively large areas of forest and grassland/shrub cover types that had been converted to agricultural and/or urban land cover types on private lands.

Laws governing the protection of lakes, streams, and wetlands apply to all land ownerships. In addition, the Flathead County Growth Policy (adopted March 19, 2007) includes lake and lakeshore protection regulations as an implementation tool. These are designed to promote public health and safety, maintain water quality, and preserve public waterbodies and natural resources available to the citizens of Flathead County. County policy P10.5 protects wetlands and riparian areas. County policy P5.5 restricts industrial uses that cannot be mitigated near incompatible uses such as residences and schools and environmentally sensitive areas such as wetlands, floodplains, riparian areas, and areas of shallow groundwater. County policy P19.4 recognizes riparian buffers for their recreational value and their ability to protect the quality of water along major streams and rivers in the county, which enhances recreational opportunities, protects the quality of water (e.g., by reducing erosion, surface runoff containing pesticides or fertilizers, and streambank depredation or defoliation), and protects the natural aesthetics of waterways. Portions of the Swan Valley geographic area are in Missoula County, where a May 2016 growth policy includes direction to prioritize and provide protection strategies for key resources and resource-rich areas and/or demonstrate that the plan does not unduly compromise critical natural resources or natural functions. For example, guidance for rural residential cluster development benefits riparian habitats by discouraging development on lands that have been identified as conservation resource lands and stating that development should be located far enough away from areas of riparian habitat and community types to protect the resource, thus benefiting wildlife.

State streamside management zone law and policy benefits wildlife on all lands. Many landowners implement best management practices and other watershed conservation practices. Lands managed by the Montana Department of Natural Resources and Conservation (e.g., Swan State Forest, Coal Creek State Forest, and Stillwater State Forest) are addressed by that agency's Habitat Conservation Plan. On Montana Department of Natural Resources and Conservation lands, riparian habitats are protected during riparian timber harvest by the establishment of a riparian buffer equal to the 100-year site index tree height along Class 1 streams (MTDNRC, 2011). Streamside management zones on private timber lands are managed to protect water quality and reduce cumulative effects on streams, but the width of these areas is smaller and some activities do not have as many restrictions as on NFS lands.

The Confederated Salish and Kootenai Tribes developed a comprehensive wetlands conservation plan for the Flathead Reservation, adjacent to the Forest, adopted by the tribal council in 1999. The interim and long-terms goals of the plan are a synthesis of tribal goals for wetlands and riparian lands articulated in prior plans, strategies, ordinances, consent decrees, environmental standards, and best management practices, including shoreline protection, aquatic and wetlands conservation, noxious weed management, water quality standards, Kerr Dam mitigation and management, lower Flathead River corridor management, non-point source assessments, and watershed plans.

Timber harvest does not occur in riparian areas in Glacier National Park, but trees may be removed to provide for human safety. Glacier National Park's general management plan (1999) addresses aquatic habitats. Research projects, as well as restoration projects, are ongoing. Cumulatively, vegetation

management on NFS, State, Tribal, Glacier National Park, and some private lands contributes to aquatic, wetland, and riparian habitats and their connectivity.

Historically, wildfires were instrumental in creating dense riparian shrub and deciduous tree communities, but the development of river valleys and adjacent private uplands has placed a high level of emphasis on fire suppression (see section 3.8 for more details). As more people inhabit areas in and adjacent to riparian areas, there may be more clearing of fuels for fire protection on private or State lands. Drought, disease, insects, and/or wildfires may continue to have effects on riparian wildlife habitat on all lands.

Mining is expected to continue to be a minor land use on Forest lands, and the potential for mining on State and private lands is also expected to be low to moderate (see section 3.23 for more details).

In the West, impoundments have interrupted the natural flood cycle of rivers to the detriment of cottonwood/shrub communities in some areas. The only large impoundment affecting Forest lands is the Hungry Horse Dam and Reservoir, completed in 1953, which provides hydropower and flood control. The Hungry Horse Dam inundated a segment of the South Fork of the Flathead River and flooded an estimated 6,867 acres of riparian/wetland wildlife habitats, according to MFWP. Montana Fish, Wildlife and Parks has a mitigation program for this loss of habitat that is beneficial for wildlife (see USDA, 2014a for more details).

Introduction of aquatic invasive species or contaminants in waterbodies resulting from recreational, agricultural, or industrial activities may have negative impacts on species associated with aquatic, wetland, and/or riparian habitats. The potential for introduction of disease and aquatic nuisance species exists on all lands within the cumulative effects analysis area, often as an indirect result of water-based recreation. Many management agencies have increased inspections and public education efforts in recent years in order to reduce these risks.

In summary, proposed management direction on the Forest, in the context of all lands of the larger landscape, contribute to the quality of aquatic, wetland, and riparian habitats (see section 3.2 for more details). This would be accomplished by providing plan components to protect water quality and quantity; establishing aquatic sites, wetlands, and riparian management zones; applying best management practices; providing connectivity; providing for diversity of vegetation structure, species, and forest densities; protecting habitats from development; providing for natural flood and groundwater infiltration processes; and restoring areas impacted by invasive species or other past management. Although the Forest does not have authority over all the stressors, the ecological conditions of aquatic, wetland, and riparian communities and the processes that maintain them would be provided on NFS lands. Coarse-filter plan components provide for biodiversity and ecological conditions that support the long-term persistence of the majority of species associated with these habitats. Aquatic, wetland, and riparian habitat is distributed across all Forest geographic areas.

Black swift (species of conservation concern)

Affected environment

The black swift is identified as a species of conservation concern by the regional forester (see http://bit.ly/NorthernRegion-SCC). This species is a neotropical migratory bird that winters in Central and South America. During the breeding season, black swift distribution is most widespread in British Columbia and western Alberta, with spotty distribution in western states from Alaska to southern California and east to Colorado. The black swift is present on the Forest only during the breeding season.

Aquatic ecosystems, including rock cliffs near waterfalls, provide key habitat for black swifts in Montana (J. S. Marks, Hendricks, & Casey, 2016). A total of almost 50 sites in Montana were surveyed by MFWP

in 2015. As of 2015, there was a total of seven known nest sites in northwest Montana outside Glacier National Park on national forest or Confederated Salish and Kootenai Tribes lands (C. Hammond, personal communication, 2015; C. Hammond, 2016) and six known nest sites in Glacier National Park (Glacier National Park, 2013). On the Forest, there is one known nesting site, which is at Lower Holland Falls in the Swan Valley geographic area (A. Anderson & Turnock, 2012).

Many potential nest sites in northwest Montana have not been surveyed (C. Hammond, personal communication, 2016). Swifts are hard to detect because of their fast erratic flight and little to no vocalization. This makes point counts and other standard bird monitoring techniques ineffective (Daniel Casey, 2004). In addition, monitoring breeding sites is generally difficult because of dangerous access and the cryptic nature of colony sites (Daniel Casey, 2004; Marin, 1997). Colonies typically consist of only one or two nests, making observation of many breeding swifts logistically challenging (Hirshman, Gunn, & Levad, 2007). Colonies are also difficult to document because adult birds visit the nest only infrequently (A. Anderson & Turnock, 2012).

The closest study of black swifts is in Glacier National Park, adjacent to the Forest, where the species had fairly high nest failure rates, with no evidence of renesting after nest failure (Hunter & Baldwin, 1962, 1972). Adults show strong nest site fidelity, using the same nest for a decade or more (Levad, Potter, Shultz, Gunn, & Doerr, 2008). The black swift has a low reproductive rate and is relatively long lived, and the survival of adults is likely the most important factor in regulating black swift population growth (Wiggins, 2004). The black swift is unique among swifts in that they incubate only one egg per clutch (Hirshman et al., 2007). There is no population estimate, trend, or density available for Montana.

Black swifts nest on ledges or in shallow caves on steep rock faces behind tall waterfalls (Hirshman et al., 2007)—a very limited and specialized habitat. Known nesting locations have high topographic relief, inaccessibility to predators, unobstructed flyways to and from the nest, and darkness for most of the day (Hunter & Baldwin, 1962). Increasing stream flow, number of potential nest platforms, amount of available moss, shading of potential nest niches, topographic relief of surrounding terrain, and ease of aerial access to potential nest niches contributed to a higher probability that the site would be occupied by black swifts (Levad et al., 2008). Most characteristics of black swift nesting habitat are a function of inherent geologic and topographic conditions and are not affected by NFS management. On the Forest, the 100-foot waterfall that provides known nesting habitat has abundant waterflow, which is dependent upon high-elevation snowmelt from lands that are in wilderness and inventoried roadless areas, so waterflow would not be affected by human activities.

Marks and Casey surveyed waterfalls for black swift nests in 2004 (Hendricks, 2005; J. Marks & Casey, 2005), visiting 32 potential nesting sites on the Flathead National Forest and adjacent areas of western Montana. They listed nine potential nesting waterfalls on the Forest (Dan Casey, 2004) (using the criterion that waterfalls had to be at least 20 feet tall), in all geographic areas except the North Fork geographic area or the Hungry Horse geographic area (Hendricks, 2005). All identified potential black swift nest sites on the Forest are in Class 1 watersheds. Class 1 watersheds are those that exhibit high geomorphic, hydrologic, and biotic integrity relative to their natural potential condition (see also section 3.2).

Black swifts forage on flying insects over wide areas in the mountains and descend to valleys to feed over rivers, lakes, and meadows, sometimes long distances from the nest (Marin, 1997), and most observations on the Forest are of feeding birds. Feeding habitat is distributed across the Forest along the North Fork and Middle Fork of the Flathead River adjacent to Glacier National Park as well as in the main Flathead Valley, Swan Valley, and Stillwater Valley (Kuennen, 2013c). The nesting locations of these birds are unknown, but based upon the number of black swift feeding observations, there are likely black swift colonies in Montana that are as yet unidentified (A. Anderson & Turnock, 2012).

Key stressors

Human disturbance

Black swifts generally nest in inaccessible areas where human disturbance is low. There have been no studies of the effects of human recreational activities on black swifts. Incidental observations at a swift nesting colony in a cave in southern California and at Box Canyon Falls in Colorado (Wiggins, 2004) suggest that humans occasionally disturb black swift nesting attempts. However, both of these situations were somewhat unusual in that the nests were readily accessible to human visitors.

Changing climate

There is currently little direct information on the factors affecting black swift populations, but the main threat is hypothesized to be the lack of late summer water runoff, which affects the suitability of nest and colony sites and may decrease local food supplies in some areas (Wiggins, 2004).

Key indicators for analysis

The following species-specific indicator applies to black swifts:

- Provide key ecosystem characteristics for black swift nesting habitat and reduce the risk of disturbance near active nesting colonies.

In addition, refer to the effects of alternatives described under section 3.7.4, subsection "Aquatic, wetland, and riparian habitats," and sections 3.2.3 through 3.2.13.

Environmental consequences

Effects common to all alternatives

Under all the alternatives, management area allocations would support ecological conditions for nesting by black swifts at the known nesting site on the Forest. Alternatives differ with respect to management areas on lands adjacent to the known nest site, but these differences are expected to have minor effects because both management areas have a very low potential for human activities that could cause disturbance to nesting black swifts. In alternatives B modified and C, the nest area is in an inventoried roadless area with a management area 1b allocation (recommended wilderness). Under alternatives A and D, the management allocation is management area 5a (nonmotorized year-round). All of these management areas have a low risk of disturbance due to most human activities.

Under all alternatives, riparian habitat conservation area or riparian management zone direction supports most key ecosystem characteristics for black swifts. Plan components provide protection for riparian habitat within 300 feet of perennial streams that flow into the nine waterfalls listed as having the potential to provide black swift nesting habitat. This management direction also supports ecological conditions that provide feeding habitat.

Alternative A

The 1986 forest plan does not specifically address human disturbance of black swift nesting colonies.

Alternatives B modified, C, and D

Guideline FW-GDL-WL-DIV-05 reduces the risk of human disturbance because it specifies that new projects or authorizations of activities known to disturb black swifts should not occur within 500 feet of active black swift nest sites from April 15 to August 15 unless project design features mitigate new disturbance to nesting black swifts. The type of design features would vary depending upon site-specific

characteristics and the nature of the activity and so would be assessed at the project level. Forestwide desired conditions FW-DC-WTR-07 through 14 and FW-DC-CWN-01 support ecological conditions that provide for wildlife biodiversity and habitat integrity at the watershed scale, benefiting feeding habitat and potential nesting habitat for black swifts.

The 2012 planning rule requires the Forest to determine whether the plan components provide the ecological conditions necessary to maintain or restore a viable population of a species of conservation concern in the planning area (36 CFR 219.9(b)(1)). Key ecosystem characteristics for the black swift are cliffs with shading and cover provided by waterfalls suitable for nesting colonies. Black swifts forage on flying insects and descend to valleys to feed over rivers, lakes, and meadows, sometimes traveling long distances from the nest.

It is likely beyond the authority of the Forest Service or not within the capability of the plan area to maintain long-term persistence of the black swift in the plan area. However, the forest plan has plan components, including standards and guidelines, to maintain, improve, and restore ecological conditions within the plan area to contribute to maintaining a viable population of the species within its range, considering that

- this species migrates to and winters in the tropics, demographically operating at a larger scale than the plan area;
- this species persists in the plan area even though the geologic and topographic conditions that create rock cliff, waterfall nesting sites are limited in number and distribution, thus limiting the ecological capacity of the Forest to provide nesting habitat;
- nine potential nesting waterfalls have been identified on the Forest, but occupancy by nesting birds has not been documented;
- the known nesting site on the Forest is in an area to be allocated as recommended wilderness (management area 1a), where natural processes will prevail and threats are few;
- the known nesting site on the Forest has high waterflow throughout the nesting season and is close to 100 feet tall, so suitable conditions are likely to be present in the future;
- most observations of feeding black swifts are on sections of the Flathead River between Glacier National Park and the Forest, where the majority of nesting birds are known to occur;
- plan components contribute to high water quality and quantity in the plan area; and
- threats or stressors that can be influenced by management are low because the known nesting site is generally difficult to access. A species-specific plan component would limit the risk of nest site disturbance, and black swifts are not known to be sensitive to human disturbance while feeding.

Although the Forest does not have authority over all the stressors that may affect black swifts, the forest plan includes plan components that would maintain, improve, and restore the ecological conditions of key nesting and foraging habitats.

Cumulative effects

Waterfalls providing potential nesting habitat occur on NFS lands as well as Confederated Salish and Kootenai Tribes lands and Glacier National Park lands adjacent to the Forest. There are no known waterfalls suitable for nesting on State or private lands.

A nonmotorized recreation trail has accessed the base of Holland Falls in the Swan Valley below the known nest for decades. According to Anderson and Turnock, it is probable that the colony has been there for some time and gone unnoticed by casual visitors (A. Anderson & Turnock, 2012). Despite the existence of the trail, the black swift nesting colony has not abandoned this nesting site; therefore, black swifts appear to be tolerant of existing use and the pattern of recreationists moving along the trail. The rock at Holland Falls is fractured and not suitable for rock climbing (J. Dunham, Swan Lake Ranger District Recreation Specialist, personal communication, 2016).

There are several potential nest sites and one known nest site on Confederated Salish and Kootenai Tribes lands (adjacent to the Forest) in the Mission Mountains Tribal Wilderness. In Glacier National Park and the Mission Mountains Tribal Wilderness, many waterfalls are difficult to access, so risks of disturbance to nesting black swifts are very low. In a 2012 survey of previously known nesting sites in Montana, one previously occupied site was believed to be unoccupied. One colony at Haystack Creek in Glacier National Park is monitored frequently and has supported three active nests in the past. In 2013 only two nests were active, and in 2014 only one nest was active (L. J. Bate, 2015). Whether this is due to natural changes in waterflow or human disturbance is unknown. Continued monitoring is needed to determine whether this change in active nesting is a long-term trend or whether it represents a normal level of variation.

There is no information on the natural range of variation for black swift nesting habitat in Montana, so the risk of consequences from changing future climate is uncertain. Droughts undoubtedly affect habitat on a periodic basis, but nesting birds have persisted. In the future, the potential combination of less snowpack and earlier spring snowmelt could cause lower late-summer flows. Changes in climate could cause some waterfalls to dry up before black swift young have fledged from the nest. Data from four snow telemetry (SNOTEL) sites on the Forest present a flat to slightly decreasing trend in the April 1 peak snowpack from 1983-2012 (see USDA, 2014a, figure 14). The four sites show varying trends in total water year precipitation, with the high-elevation site (Noisy Basin at 6,040 feet) exhibiting an upward trend whereas the three sites at lower elevations (4,350 to 5,035 feet) appear flat to downward (see USDA, 2014a, section 3.2.10 for more details). Past actions on the Forest have maintained Class 1 watershed condition for all areas with waterfalls believed to be suitable for nesting, and this condition is likely to be maintained in the future.

Harlequin duck

Affected environment

The breeding season range of the Pacific population of harlequin ducks occurs across most of Alaska and British Columbia as well as portions of the Yukon, Washington, Oregon, Idaho, Colorado, and Montana. Aquatic ecosystems, including fast-moving streams, provide key breeding habitat for harlequin ducks in Montana (J. S. Marks et al., 2016). Montana is at the eastern edge of the range of the Pacific population, which extends south to northwest Wyoming. Harlequin ducks are small sea ducks that spend most of the year in near-shore sea environments but move inland to fast-moving streams to breed. They form lifelong pair bonds on the coastal wintering grounds, and then the pairs migrate to the stream where the female was born (W. K. Hansen, 2014a).

During the breeding season, harlequin ducks use clear, low-gradient, fast-moving mountain streams with abundant aquatic insects. Females are known to lay eggs in a wide variety of microsites including cliffs, under downed logs in burned areas, on instream logjams, or on streambanks with thick shrub and/or tree cover (L. Bate, 2014a; Cassirer & Groves, 1994). Key habitat characteristics are high water quality, a complex stream structure (including fast water to support aquatic prey, deep pools for escape, and rocks or large downed logs for loafing), as well as dense vegetative or log cover on the shoreline to reduce

disturbance and protect birds for from avian predators during incubation (L. Bate, 2015). Cover also provides stream shading that promotes cool water temperatures and associated higher oxygen levels important to the aquatic invertebrates that harlequins feed upon. On the west side of the Continental Divide, calm backwaters along rivers or beaver ponds may be important for brood rearing (L. Bate, 2015; Kuchel, 1977). Harlequin broods may move downstream from the fast-moving streams where they are born to larger streams and rivers as the summer season progresses (Cassirer & Groves, 1994; Kuchel, 1977), and they are often easier to observe at this time. A strong stream selection factor in Montana appears to be stream reaches with at least two loafing sites per 33 feet (Kuchel, 1977).

About 25 percent of known breeding harlequins in northwest Montana nest along a 10-mile reach of McDonald Creek in Glacier National Park (Reichel & Genter, 1996), adjacent to the Forest. There is little to no information about harlequins in Montana prior to the late 1980s, and the currently available information is not sufficient to detect a population trend (C. Hammond, 2016). In 1996, Reichel estimated that the statewide population of harlequin ducks in Montana ranged from 150-200 pairs. There has been no subsequent population estimate, and the population trend in Montana is unknown. The Glacier National Park population appears to be stable, but the population trend in other parts of Montana is unknown. In some areas of the West, harlequin duck populations appear to be in decline (C. Hammond, 2016). In 2014, the Montana Natural Heritage Program and other cooperators carried out a systematic survey of harlequin ducks on streams in Montana where they have been known to breed historically. This effort detected a total of 31 broods with 126 chicks on 17 of the 49 streams that were surveyed (B. Maxell, 2014).

On the Forest, harlequin duck brood monitoring data for nine streams with historical evidence of broods suggests relative stability. From 1990-2017, nine streams have had verified broods in about 69 percent of the survey years. Trail Creek and Spotted Bear River are the two streams that have been most consistently monitored and have also consistently produced young. Other streams have not been monitored as frequently, but about 78 percent of streams had verified brood production in at least 50 percent (proportionally) of all years monitored. Only two streams have not had verified brood detections since 2010, but these are in remote wilderness areas and have been surveyed only once or twice since then, which is not likely sufficient to conclude a loss of breeding areas. Across all nine streams and the 27-year monitoring period, broods have been detected in 69 percent of survey years (W. K. Hansen, 2014b; Staab, 2017).

Historically, harlequin duck nesting was known to occur in five of the seven Forest geographic areas (Reichel & Genter, 1996). Numerous broods have been consistently detected in Trail Creek in the North Fork geographic area and in Spotted Bear River in the South Fork geographic area. Other geographic areas have not been surveyed as consistently, but broods have also been observed in the Middle Fork and Hungry Horse geographic areas. There are no records of harlequin ducks nesting in the Salish Mountains or Swan Valley geographic areas, and these geographic areas are not believed to contain potential nesting habitat. Nesting stream reaches are more reliably detected than the nest sites themselves. Nest sites are often difficult to locate because of very dense trees, shrubs, and downed logs that occur near nest sites on the Forest.

Like many other sea ducks, male harlequins depart the breeding grounds immediately after females begin incubation, so females do not frequently renest in the event of a nest failure (Lisa J. Bate, 2013). Relative to many other species of ducks, harlequins occur at very low population densities on their breeding grounds and exhibit high breeding site fidelity, low reproductive rates, and delayed reproduction (Wiggins, 2005), and thus they may be susceptible to local extirpations (NatureServe, 2015c). Bond and others (2009) estimated survival probability for 144 adult female harlequin ducks at four breeding areas in western North America. They found that survival was lowest during incubation, with the highest number

of mortalities attributed to predation. Adult survival likely drives population dynamics. If a nesting pair is lost, the habitat may not be occupied by another pair in that or subsequent seasons.

Because harlequins are on their nesting streams early in the season, nesting success may be affected by changes in waterflow. In Glacier National Park, breeding pairs inhabit Upper McDonald Creek from late April through mid-June, and females with broods are on the creek during July, August, and early September. Late spring high waterflows in 2014 may have caused reduced detectability or failed reproduction on some streams where breeding had been observed in the past (L. Bate, personal communication, 2014) (L. Bate, 2014a, 2014b, 2015). In Montana, nesting has not been monitored long enough or consistently enough in some areas to know whether climatic variation causes harlequins to move or causes nest failure, and, if so, how many years of nest failure they may be able to tolerate before a female will no longer return to a stream reach (W. K. Hansen, 2014b).

There are somewhat conflicting scientific findings regarding the effects of instream recreation and road-related disturbance on harlequin ducks. Although harlequins are generally tolerant of people, they may be sensitive to particular types of disturbance at certain times of year. Hansen's analysis in Glacier National Park (W. K. Hansen, 2014a) showed that harlequin ducks did not avoid high-quality habitats adjacent to roads and other sites with high recreational use. But harlequin ducks have been observed avoiding boats (e.g., rafts, packrafts, kayaks) in breeding stream reaches during incubation and the first four weeks after hatching (Clarkson, 1992; Kuchel, 1977; Reichel & Genter, 1996).

In all monitored watershed subbasins on the Forest that have known harlequin duck nesting, the overall watershed condition is high, indicating that habitat diversity and quality for harlequin ducks on the Forest is high at the watershed scale. According to PIBO data monitoring, there is an improved trend in aquatic habitat in reference and managed watersheds (C. N. Kendall, 2014). Habitat conditions such as large wood, pool fines, percent pools, and residual pool depth have trended upwards since sampling began in 2001 (see section 3.2 for more details). Some stream reaches that appear to provide suitable habitat characteristics in terms of stream characteristics and water quality are not known to be used by harlequin ducks, but only two breeding streams have been consistently surveyed and harlequin ducks can be very difficult to detect while on the nest.

Key stressors

Land management

Some activities can reduce the quantity or quality of nesting habitat by removing vegetation that provides cover for nesting or avoiding predation. Activities that produce sediment can affect the aquatic organisms that harlequins feed upon. Activities on all lands where harlequin ducks nest may affect instream and streamside conditions on breeding stream reaches and may risk disturbance or displacement of harlequin ducks.

Recreation

Recreational floating, boating, and fishing may disturb or displace nesting harlequin ducks in their nesting stream reaches on all lands, but anecdotal observations suggest broods may be more tolerant of people once they move to larger rivers. They often remain on loafing rocks as floaters drift by but dive underwater if approached. The Forest Service does not have authority over some types of stream-related recreation.

Changing climate

The effects of changing climate on water flows could have a negative impact harlequin duck habitat. Changing water levels could make nesting and foraging habitat unsuitable at key times when they

historically would have been suitable. There is no information on the natural range of variation for harlequin duck nesting habitat.

Forest insects and disease are expected to increase with climate change and may be beneficial by creating downed woody material, which provides nesting cover and instream nesting or loafing sites. However, large, stand-replacing fires (also expected to increase with the changing climate) may be detrimental by causing temporary increases in runoff or by temporarily removing dense shrub and tree cover along stream banks (see section 3.2.10 for more details).

Competition and predation

Numerous theories have been proposed as to why Upper McDonald Creek has such a high density of nesting harlequin ducks. One is that natural fish barriers low in the watershed limit fish density and fish size. Some species of fish may prey on harlequin ducks or compete with them for food resources. Strong correlations have been shown between harlequin duck density and fishless stream reaches (W. K. Hansen, 2014a). During incubation, females and their eggs are highly susceptible to predation by avian predators as well as marten, mink, red squirrel, and wolf (W. K. Hansen, 2014a). Predation by species such as bald eagles may also affect harlequins on their wintering grounds.

Hunting

Harlequin ducks are classified as waterfowl in Montana and can be legally hunted. However, most harlequins have left Montana by the time the waterfowl hunting season in Montana begins (C. Hammond personal communication, 2014). Hunting may occur in wintering areas.

Other causes of mortality on Pacific Ocean wintering grounds

Oil spills and other toxic pollutants on the ocean wintering grounds of harlequin ducks can kill large numbers of harlequins (Reichel & Genter, 1996). Immediate bird mortality from the *Exxon Valdez* oil spill was high; more than 1,000 harlequin ducks were estimated to have died as a direct result of the spill (Esler et al., 2002). It took the harlequin population about 25 years to recover from the *Exxon Valdez* oil spill (C. Hammond, 2016).

Habitat Inundation

Construction of dams can flood the fast-moving streams used by harlequin ducks during the breeding season.

Key indicators for analysis

Cassirer and others (1996) prepared a conservation assessment and strategy that addresses the status and conservation of harlequin ducks in the Rocky Mountains of Idaho, Montana, and Wyoming based on inventory, monitoring, and research data collected in the Rocky Mountains. Wiggins prepared a conservation assessment for the Rocky Mountain region in Colorado (Wiggins, 2005). These authors emphasize measures to sustain harlequin duck populations and an adaptive approach for maintaining riparian and instream harlequin duck habitat. Guidelines include maintaining streamside vegetation for nesting cover, maintaining instream flows and water quality, and reducing or not increasing human disturbance. The authors also identify areas where additional information is needed regarding basic ecology and management for harlequin duck conservation.

The following species-specific indicator applies to harlequin ducks:

- Provide key ecosystem characteristics of potential nesting stream reaches and reduce the risk of human disturbance of harlequin ducks on known nesting stream reaches

In addition, refer to effects of alternatives described in section 3.7.4, subsection “Aquatic, wetland, and riparian habitat” and sections 3.2.3 through 3.2.13, which address instream flows and water quality.

Environmental consequences

Effects common to all alternatives

All alternatives have plan components to maintain or restore high water quality, which would provide for the aquatic insects harlequin ducks feed upon.

Alternative A

The 1986 forest plan does not specifically address human disturbance on harlequin duck nesting stream reaches.

Alternatives B modified, C, and D

Species-specific desired condition FW-DC-WL DIV-01 supports ecological conditions that provide nesting sites for harlequin ducks, aquatic insects for feeding, and low levels of human disturbance during key time periods. Forestwide standards FW-STD-RMZ-01 and 06 protect harlequin duck nest sites because they are generally within the inner riparian management zone of permanently flowing streams, where cover would be protected.

Harlequin ducks may be disturbed by activities such as road building, trail use, camping, fishing, boating, timber harvest, prescribed burning, or thinning near their nest sites. The action alternatives have plan components to reduce the risk of human disturbance on nesting stream reaches during key time periods. Guideline FW-GDL-WL-05 specifies that new projects or authorizations for activities known to disturb harlequin ducks should not occur along active nesting stream reaches from April 15 to August 15 unless project design features mitigate new disturbance to nesting harlequin ducks. The type of design features and distance would vary depending upon site-specific characteristics and nature of the activity and so would be assessed at the project level. Plan components for the Forest are consistent with the recommendations of Wiggins (2005) and Cassirer and others (1996), as applicable to NFS lands.

Cumulative effects

In the past, the construction of Hungry Horse Dam may have affected harlequin ducks on the Forest by flooding nesting stream reaches, but the magnitude of this effect is unknown. Existing designation of rivers as wild and scenic or future designation of eligible rivers into the National Wild and Scenic River System would prevent impoundments in the future, benefiting harlequin ducks. Natural stream barriers may help reduce competition between harlequin ducks and some fish species, but this is still speculative.

Under all action alternatives, several streams, including the two known nesting streams with the most abundant, consistent production of harlequin ducks, are listed as eligible wild and scenic rivers (see appendix 5). Wild and scenic river designation into the National Wild and Scenic River System could indirectly increase the level of human disturbance on harlequin nesting stream reaches by making these streams more widely known, increasing the risk of disturbance and lowering nesting success (especially if the stream reaches are near boaters or floaters). However, this designation could be beneficial to harlequin ducks by protecting the stream’s outstandingly remarkable values, including the habitat characteristics that are associated with harlequin duck nesting habitat. The harlequin duck would be protected under forest plan components regardless of the stream’s wild and scenic river eligibility (Forest Service Handbook 1909.12 chap. 80 secs. 83.1 and 84.3).

Streams with the potential to provide harlequin duck nesting occur in adjacent national forests and Glacier National Park, where management supports their habitat. Recreation is likely to increase in the future on

all land ownerships due to human population growth. Some studies indicate that harlequin ducks may be sensitive to some types of human disturbance until after the first four weeks after hatching. Rafting and kayaking have been banned on Upper McDonald Creek in Glacier National Park since the early 1990s. Montana Fish, Wildlife and Parks has closed fishing in Trail Creek (a consistent nesting stream), Whale Creek, Red Meadow Creek, Coal Creek, and Big Creek, which may indirectly reduce disturbance on potential and known nesting stream reaches. The larger rivers on the Forest where harlequins are known to rear their broods (e.g., the North and South Forks of the Flathead River) are wild and scenic rivers where outstandingly remarkable values must be maintained (USDA, 2013b). River outfitter and guide service days on the larger rivers are limited by permits subject to an environmental analysis that includes effects on wildlife.

Maintaining dense cover on nesting stream reaches helps to reduce the risk of human disturbance and predation. Stand-replacing wildfires may temporarily reduce cover on all land ownerships, but cover may increase in 10-20 years following fire as shrubs regrow and standing trees become downed wood.

In Glacier National Park, adjacent to the Forest, there is natural variability in amount and timing of stream flows, and harlequin duck nesting success is also known to be variable. Future changes in climate may magnify this effect on all lands. There has likely always been stream flow variability, but the intensity and timing of future climate effects on harlequin ducks are uncertain. Hansen (2014a) speculated that climate changes will likely enhance the prevalence of severe streamflow factors that limit harlequin reproductive success. Peak runoff is expected to occur earlier in the spring, potentially reducing the foraging efficiency of females preparing to lay eggs and delaying egg laying until nest sites become available. In addition, the timing of spikes in streamflow may cause flooding of established nests. The potential combination of earlier spring snowmelt, less snowpack (at least at lower elevations), and lower late-summer flows associated with more frequent or extreme summer drought could reduce water quality and quantity in the late nesting season. This could also affect harlequins because backwaters important for brood rearing may be dried up by August, although known brood-rearing streams on the Forest are on the larger rivers (e.g., the North and South Forks of the Flathead River), where this effect is less likely. Climate changes could also have negative effects on the aquatic insects that harlequin ducks feed upon since these insects require cold water with high levels of oxygen (W. K. Hansen, 2014a). Multiple agencies monitor stream conditions and harlequin ducks, contributing to the Forest's ability to manage adaptively.

The effects of hunting and environmental contamination on the Pacific Coast waters where harlequin ducks winter are uncertain, but this is being studied.

Northern bog lemming

Affected environment

Northern bog lemming population, life history, habitat, and distribution

The northern bog lemming is known to occur in much of Canada, Alaska, and northwest Montana, with a Montana range that extends east to the Rocky Mountain Front and south through the Lost Trail Pass to the Continental Divide (Reichel & Corn, 1997). The total number of known bog lemming sites in Montana was listed as 18 in 1997 (Reichel & Corn, 1997). There are currently 22 locations where northern bog lemmings have been documented (Kuennen, 2013f; Turnock & Anderson, 2012). The majority of sites are in Glacier National Park, with additional sites on six national forests in northwest Montana (including two national forests adjacent to the Flathead National Forest). Northern bog lemmings are a mouse-sized small mammal with a high reproductive rate. The population, distribution, and trend of bog lemmings is unknown because they are very difficult to detect, even with a trapping effort, and many potential sites have not had a trapping effort (Turnock & Anderson, 2012).

Bog lemmings are found in diverse wetland and riparian habitats, but large mats of sphagnum moss (associated with peatlands) have been found to be the best indicator that northern bog lemmings are present (Reichel & Beckstrom, 1994), and these are the most likely sites to find new populations (Reichel & Corn, 1997). Known bog lemming habitat patches across Montana range from 1-340 acres in size and from 3,340 feet in elevation at McDonald Creek in Glacier National Park to 6,520 feet at Maybee Meadows on the Beaverhead-Deerlodge National Forest. In low-gradient landscapes, beavers may increase potential bog lemming habitat by creating ponds that go through succession to become dominated by sedges and peat (Chadde et al., 1998).

Although key characteristics of habitat for bog lemmings in Montana are associated with bogs, peatlands, and a subset of peatlands known as fens, they have been detected in at least nine other habitat types, including riparian habitats with Engelmann spruce, subalpine fir, birch, willow, sedge (*Carex* spp.), spike rush (*Eleocharis* spp.), or combinations of the above. Wetlands that may contain peat total about 700 acres in about 290 different sites on the Forest, ranging in size from < 1 to 84 acres. They occur in all geographic areas, with the highest number of acres in the South Fork geographic area (including wilderness) and the lowest number of acres in the Middle Fork geographic area. Very few of the peatlands have ever had bog lemming surveys. There are numerous other riparian habitats with spruce, subalpine fir, birch, willow, sedge (*Carex* spp.), spike rush (*Eleocharis* spp.), or combinations of the above on the Forest that have never had bog lemming surveys (Reichel & Corn, 1997; Turnock & Anderson, 2012). Bog lemmings have been confirmed by trapping at two sites on the Forest, one in the Bowen Creek area of the Salish Mountains geographic area and one in the Lindbergh Lake area of the Swan Valley geographic area. Northern bog lemming observations have also been reported at the Sanko Creek Fen in the Salish Mountains geographic area and in the Meadow Creek Fen in the Swan Valley geographic area, but these observations have not been confirmed. New, non-invasive sampling techniques such as eDNA are being tested that may make it easier to detect bog lemmings in the future.

Key stressors

Land management

Activities that can affect fens and peatlands on all lands include nearby activities that change peatland hydrology (such as clearcutting, cattle grazing, or road building). Clearcutting and stand-replacing wildfire in areas next to peatlands may increase populations of species that compete with northern bog lemmings, at least temporarily (MNHP-MTFWP, 2015a).

Changing climate

The effects of changing climate on peatlands are unknown, but climate has varied widely over the past 1,000 years during which current peatlands were forming. Peatlands have a high water-holding capacity, which helps their resilience in periods of drought (Chadde et al., 1998).

Modification of wetlands, including peatland mining, dredging, or filling

Peatlands are classified as wetlands, so on all lands these activities require permits under the authority of other agencies (e.g., U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, Montana Department of Fish, Wildlife and Parks).

Key indicators for analysis

The following species-specific indicator applies to northern bog lemmings:

- Support key ecosystem characteristics of peatlands

In addition refer to the effects of alternatives described in section 3.7.4., subsection “Aquatic, wetland, and riparian habitats.”

Environmental consequences

Effects common to all alternatives

Key ecosystem characteristics described in the “Affected environment” section would be provided for by plan components for watersheds, peatlands and fens, and riparian areas (see also subsection “Aquatic, wetland, and riparian habitats,” sections 3.2.3 through 3.2.13, section 3.2.10 and section 3.5). Under all alternatives, vegetation management and road access requirements would help to reduce the risks to northern bog lemming habitat that could occur due to changes in the hydrology of peatlands and other wetlands.

Alternative A

Under alternative A, riparian habitat conservation areas are defined as areas where riparian-dependent resources receive primary emphasis (see figure 1-08). Riparian habitat conservation areas for wetlands less than 1 acre have an interim riparian habitat conservation area width that is generally 100 feet slope distance and, if not in a priority watershed, the width is generally 50 feet. For wetlands greater than 1 acre, the riparian habitat conservation area width is generally 150feet. The 1986 forest plan has standards and guidelines that promote northern bog lemming habitat in riparian habitat conservation areas. Although livestock grazing may affect peatlands in some areas, it is not widespread across the Forest; localized impacts to potential bog lemming habitat may occur unless peatland areas are fenced, as would be specified in a site-specific allotment management plan.

Alternatives B modified, C, and D

Desired conditions, standards, guidelines, and suitability related to northern bog lemming habitat do not differ between alternatives B modified, C, and D; therefore, the effects would be the same. Forestwide standard FW-STD-RMZ-01 would establish riparian management zones (see figure-1-07). Under the action alternatives (B modified, C, and D), riparian management zone widths would be greater around peatlands, fens, and bogs than under alternative A. Standard FW-STD-RMZ-01 would increase the riparian management zone width to 300 feet slope distance (with qualifiers) for all sizes of howellia ponds and fens or peatlands, with standards and guidelines that apply to the entire area. This increased distance for fens and peatlands, the primary habitat of bog lemmings, is beneficial for this species. In addition to consequences discussed in section 3.7.4., subsection “Aquatic, wetland, and riparian habitats,” desired condition FW-DC-WL DIV-01 addresses bog lemming habitat and its connectivity. Plan components for riparian management zones and bog lemmings incorporate conservation recommendations in the statewide action plan published by MFWP (MFWP, 2015b).

Compared to the no-action alternative, the action alternatives designate eight more peatlands and fens as management area 3b (see figures 1-01 through 1-04), where peatland protections would be even more extensive. MA3b-Special area-SUIT-01 and 02 state that special areas are not suitable for timber production or commercial use of non-timber forest products. Vegetation management activities (such as prescribed fire) may be allowed if specifically designed to maintain the values and desired conditions associated with the special area. MA3b-Special area-SUIT-03 states that special areas are not suitable for construction of new wheeled motorized trails and areas or associated structures. Existing trails that access these areas are suitable (see also section 3.5).

Cumulative effects

In the past, peatland hydrology may have been affected on all lands by cattle grazing, adjacent road building, dredging, filling, timber harvest, or fire suppression, but regulations for wetlands (e.g., by U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, Montana Department of Fish, Wildlife and Parks, Montana Department of Natural Resources and Conservation) now protect wetlands on all lands.

How the natural range of variation in the past has affected peatlands and fens is unknown. Fire suppression may increase cover, but it can also increase the risk of high-severity fires near peatland habitat, especially if summers become hotter and drier in the future. Small peatlands may occur in naturally small and isolated patches, making them vulnerable to extended periods without water due to changes in groundwater. Larger peatlands with deeper water are not as vulnerable. Peat accumulates very slowly, typically increasing at a rate of 8-11 inches over a period of 1,000 years. Constant high water levels lead to accumulation of organic matter, which is usually greater than 15 inches deep. As summarized by Gage and Cooper (2013),

> Stable hydrologic regimes are necessary for peat accumulation, and a water table decline will, over time, result in peat oxidization. Because fens vary widely in geomorphic setting and hydrologic functioning, and few long-term hydrologic data are available for different fen types, it is difficult to generalize about the likely response of fens to past climatic fluctuations. The HRV [historical range of variation] for key climatic factors important to fen hydrologic regimes and carbon accumulation dynamics such as the amount and seasonality of precipitation, timing of spring snowmelt, and temperature is broad and includes extended periods of both wet and cool conditions and extended dry periods. (p. 159)

Existing peatlands are believed to have been formed over a period of about 1,000 years, with extended dry periods and other climatic fluctuations in the past, and they have persisted. It is likely that they will persist in the future.

Common loon

Affected environment

The breeding range of the common loon is distributed across most of Canada and Alaska. Northwest Montana is at the southern edge of the common loon breeding range, and the Montana population migrates primarily to the West Coast for winter. Common loons are vulnerable to predation and to chemical contamination of their coastal wintering habitat (e.g., oil spills, lead or mercury contamination) (Evers, 2014).

Northwest Montana has a 10-year average summer count of 230 individuals at most, including about 60-70 territorial pairs, 50-60 non-breeding “single” adults, and about 35-55 chicks. The number of territorial pairs in Montana has increased by 44 percent from 2006-2014, and chick production has also increased (Byrd, Kneeland, Persico, & Evers, 2015). Hammond and others suggest that Montana’s population may be stable (C. A. M. Hammond, Mitchell, & Bissell, 2012; MT-CLWG, 2013).

Three of Montana’s four areas of highest loon-breeding densities are within the Forest analysis area (this also includes other land ownerships). On the Forest, there are about 25 known breeding pairs on nesting lakes distributed across the Hungry Horse, Middle Fork, North Fork, Salish Mountains, and Swan Valley geographic areas (Kuennen, 2013i; Kuennen, 2013a). About half of the lakes with breeding pairs have shoreline on NFS lands. In addition to the approximately 50 lakes with known or potential nesting habitat, many more lakes are used by loons for feeding within the Forest.

Availability of nesting lakes in a complex with additional feeding habitat is a key ecosystem characteristic. Common loons nest and feed on lakes of suitable size and elevation. In northwest Montana, the highest common loon nest success was observed on lakes greater than 13 but less than 60 acres in size (C. A. M. Hammond, 2009). In northwest Montana, lakes less than 5,000 feet in elevation generally have a long enough ice-free season to accommodate loon nesting (C. A. M. Hammond, 2009). Not only are lake-scale habitat factors important to loon management, but landscape-scale factors are important as well, especially complexes of lakes that provide for feeding near nesting lakes. Hammond and others (2012) expressed a need to protect occupied territories and prioritize conservation efforts for lake complexes that have high numbers of territorial pairs. These territories are likely to remain occupied over time and to provide the population growth necessary for the occupancy of surrounding unoccupied habitat.

Nest success may decrease when loons are exposed to disturbance, based on work by Kelly in 1992 and Vermeer in 1973 (C. A. M. Hammond et al., 2012), but some loons appear to tolerate disturbance, according to a 1982 report by Titus and VanDruff (C. A. M. Hammond et al., 2012). In 1981, Christenson reported that because loons may spend more time off their shoreline nests if disturbed, their eggs are more vulnerable to predators (C. A. M. Hammond et al., 2012). In addition, Vermeer reported in 1973 that recruitment may decline over time as loons are less likely to return to territories experiencing excessive disturbance and therefore must either compete for territories occupied by other pairs or establish new ones on unoccupied lakes (C. A. M. Hammond et al., 2012).

High lead and/or mercury levels in feeding lakes or lake sediments can negatively affect loons (Savoy, 2004). Chemicals used to kill undesirable fish species may indirectly affect loons by reducing food availability, at least in the short term. Chemicals in State waterbodies are monitored by agencies other than the Forest Service.

Key stressors

Land management

On all lands, stressors include disturbance near lake shorelines with loon nesting resulting from recreational use, disturbance from vegetation management or road construction, or loss of protective vegetation (at the nest site or between sources of shoreline disturbance and nursery areas).

Water-based recreation on nesting lakes

People approaching too close to loon nests in boats, in float tubes, or on paddleboards can flush nesting loons from the nest for prolonged periods of time, leading to loss of eggs due to cooling or predation. Boat wakes can flood and flush eggs from nests. The Forest Service does not have authority over recreational use on lakes or on other land ownerships. The State regulates recreational activities such as fishing, boating, and wake limits on recreational lakes.

Changing climate and weather

Evers (2014) hypothesized that potential climate changes can affect loons by (1) changes in air and water temperature that can affect the production, abundance, and distribution of aquatic organisms that provide food for the common loon, either directly or indirectly; (2) prolonged drought that could alter the depth of water, flow of water, and water-borne nutrients in a lake; and (3) changes in water chemistry. The historical range of variation for these factors is unknown, but common loons nest on large lakes, which tend to be relatively stable in changing climatic conditions.

Key indicator for analysis

The following species-specific indicator applies to common loons:

- Key ecosystem characteristics of loon territorial nesting lakes, including minimizing the risk of human disturbance to nesting loons

In addition, refer to effects of alternatives described in section 3.7.4., subsection “Aquatic, wetland and riparian habitats” and sections 3.2.3 through 3.2.13.

Environmental consequences

Effects common to all alternatives

Plan components would support key ecosystem characteristics described in the “Affected environment” section. Hammond et al. (2012) stated that Montana’s loon population was in a state of equilibrium and that management for stable or growing loon populations could be achieved using long-term monitoring and protection of loons on occupied territorial nesting lakes and nearby feeding lakes. The Forest has been helping to protect nesting loons for decades and would continue to do so under the plan direction for all alternatives.

Alternative A

Riparian habitat conservation area management direction provides for most key ecosystem characteristics for common loons because it provides protection for riparian habitat areas within 150 feet of lakes where loons nest and feed. However, riparian habitat conservation area direction does not address human disturbance at loon nesting lakes.

Alternatives B modified, C, and D

Key ecosystem characteristics described in the “Affected environment” section would be supported by the implementation of the coarse-filter plan components for watersheds and riparian management zones included in all action alternatives that would reduce the risk of cover loss and manage road access near nesting lakes, described in section 3.2.10. In addition, species-specific plan components included in all action alternatives would reduce the risk of human disturbance to nesting loons. Desired conditions FW-DC-WL DIV-01 and 02 and guideline FW-GDL-WL DIV-05 would reduce the disturbance of loons at code A territorial nesting lakes (those with current or recent nesting) (C. A. M. Hammond, 2009, appendix A or subsequent MFWP updates). Objective FW-OBJ-WL DIV-01 specifies that the Forest Service would install structures such as floating signs or nesting platforms to promote successful common loon reproduction on three to ten lakes annually, as needed.

Cumulative effects

Past disturbance is thought to have depressed loon populations. Common loon populations on the Forest and adjacent lands managed by other landowners have rebounded from the lows of the 1980s due to more than three decades of coordinated effort by multiple agencies, private organizations, and private landowners. These efforts have included educating recreationists about the sensitivity of loons to disturbance while loons are nesting and raising young chicks, the negative effects of contaminants such as lead, and the importance of maintaining diverse, abundant populations of fish in nesting lakes. Efforts have also included placing floating signs around active nests and/or placing floating nesting platforms on lakes with high levels of water fluctuation or strong boat wakes. In the future, given expected increases in the number of recreational users and the development of private shorelines, these efforts are anticipated to continue. Campgrounds and boat ramps that facilitate access to lakes can indirectly contribute to human disturbance of nesting loons on some lakes. Grizzly bear standard FW-STD-REC-01 limits increases in

the number and capacity of developed recreation sites in the recovery zone/primary conservation area, which could also reduce the risk of disturbance of nesting loons on some lakes in the future.

Habitats preferred by the common loon in northwest Montana are also expected to continue to change as a result of human land uses on all lands, particularly in the developed valley bottoms where many nesting lakes are located. Private land development on shorelines and increasing recreational use on some lakes may limit nesting habitat or increase disturbance. Lakes tend to be popular recreation destinations, so on lakes with mixed ownerships, disturbance to nesting loons by people who approach too close is likely. Some lakes that have nesting loons are adjacent to private lands, and most disturbances are likely to come from private lands and residences. Continued coordination and mitigation of these effects will be necessary.

The effects of environmental contaminants (e.g., mercury) on loons associated with the Pacific Coast environment where loons winter is being monitored (Byrd et al., 2015).

Some climate change predictions include more frequent storms and greater fluctuations in water levels (see the climate discussion in USDA, 2014a). Because loons have difficulty walking on land, their nests are often very close to lake or island shorelines. Increasing water levels, more frequent storms, or more wave action may destroy nests during the time period when adults are incubating. Some, but not all, loons may renest. Because the probability of these risks actually occurring is based upon a variety of factors (e.g., lake-basin configuration), the level of risk is not currently known, but loon nesting success is monitored by multiple partners, which will help support adaptive management.

Beaver

Affected environment

Beavers are distributed across most of North America and are year-round residents across Montana. Beavers are considered to be ecological engineers that create habitat for many other species, so they play an important role in helping to sustain biodiversity. Beavers use much of the woody vegetation they cut in building dams and lodges. Beavers eat a variety of shrubs and hardwood trees, including willows, mountain alder, aspen, and cottonwood, which they cache near shore for winter food. They also eat herbaceous vegetation during summer.

The number of beaver dams on NFS lands is unknown, but they are widespread across the Flathead Valley (Newlon & Burns, 2010). Beaver prefer to build dams on small- to medium-sized, low-gradient streams (< 6 percent slope) that flow through unconfined valleys and generally populate the lowest-gradient (slope < 1-2 percent) sites first (Pollock, Lewallen, Woodruff, Jordan, & Castro, 2015). Beaver also build dams on lakes, wetlands, culverts, or just about any place where additional water can be retained. They generally avoid constrained valleys with high-gradient streams but will colonize this less-preferred habitat if their population densities are high. Water impoundments built by beavers elevate the water table and expand the saturated surface area of riparian zones; they can also convert upland plant communities into wetland plant communities or expand the area of wetlands. Beaver ponds can also trap sediment and increase productivity of streams by increasing the availability of organic nutrients (Pollock et al., 2015) and by allowing sunlight to reach more water surface for photosynthesis. Because beaver impoundments can slow the flow of a stream, they hold the water within the stream reach for longer periods and can increase base flows as well as warming the temperature. Warmer temperatures are beneficial to some species but detrimental to others.

Key stressors

Human activities

Beaver dams have been removed when they create conflicts with human infrastructure or cold-water fish species, but this tends to be a short-term solution as new beavers will often reoccupy a site within one or two years. Alternative methods can be used to reduce the impacts of dams without removing them (Pollock et al., 2015). When beavers threaten infrastructure on private lands, they are often trapped and removed. Montana Fish, Wildlife and Parks regulates trapping.

Changing climate

A changing climate is not believed to be a substantial stressor for beavers in northwest Montana; instead, beavers may increase habitat resilience to changes in climate.

Key indicator for analysis

The Forest can provide habitat for beavers by providing for biodiversity, which includes the deciduous trees and shrubs they feed upon and use for dam building. The following species-specific indicator applies to beavers:

- Habitat to facilitate construction of and reduce the risk of loss of beaver dams

In addition, refer to the effects of alternatives described under section 3.2 and section 3.7.4., subsection "Aquatic, wetland and riparian habitats" and "Hardwood tree habitats."

Environmental consequences

Effects common to all alternatives

Under all alternatives, plan components for riparian habitat conservation areas or riparian management zones would support key ecosystem characteristics for beavers and the wetland habitats they create for many other animal and plant species.

Alternative A

Alternative A does not have plan components that support the presence of beaver dams.

Alternatives B modified, C, and D

Plan components for aquatic, wetland, and riparian ecosystems and key ecosystem characteristics would improve habitat diversity for beavers and for the other species associated with the wetlands created by beaver dams. In addition, species-specific desired condition FW-DC-WTR-14 would promote the ecological role of beaver. When managing beaver dams that are threatening infrastructure or impairing bull trout spawning, guideline FW-GDL-WTR-04 limits activities to those preferred techniques that sustain beavers.

Cumulative effects

Private landowners are likely to continue to remove beaver dams and/or trap beavers if they flood roads or property. Beaver pelt prices determine their popularity for recreational trapping, and MFWP regulates trapping to sustain beaver populations. Glacier National Park, encompassing about a million acres adjacent to the Forest, is closed to trapping. Beavers play a role in creating wetlands in Glacier National Park and the Flathead Indian Reservation adjacent to the Forest.

Maintaining beaver across the landscape may help the resilience of aquatic ecosystems in the face of anticipated future climates, benefiting many other aquatic, wetland, and riparian wildlife species in the future. Water storage from beaver impoundments may support the sustainability of wetlands and riparian habitats by capturing runoff for slow release downstream. As water storage in the form of glaciers and snow decreases, surface and groundwater storage behind beaver dams may provide a buffer for base flows (Beechie et al., 2013).

Larger and higher-severity wildfires associated with changing climate may initially reduce availability of food and dam-building materials for beavers, impairing their ability to survive the first few winters after fire. Within a few years, shrubs and deciduous trees would regenerate in burned areas and increase forage and building materials for dams.

Boreal (western) toad

Affected environment

The range of the boreal toad extends from Alaska south to Mexico, across the western United States and across western Montana. Maxell (2000) conducted a systematic survey of standing waterbodies in 40 randomly chosen 6th hydrological unit code watersheds across western Montana. Boreal toads were found in 27 percent of the watersheds (Kuennen, 2013a), with breeding documented in 21 percent. At sites where toads were observed, only small numbers of adults and relatively small numbers of eggs or larvae were observed. In Glacier National Park, adjacent to the Forest, surveys conducted in 1999-2000 detected breeding boreal toads in 5 percent of the watersheds surveyed. Maxell's conclusion was that toads were recovering since a decline in the 1980s or were continuing to decline because populations were small, isolated, and/or subject to one or more factors impacting populations separately or synergistically, as had been known to occur in Colorado, Utah, Wyoming, and New Mexico (B. A. Maxell, 2000). However, a subsequent study of boreal toads in Glacier National Park found that they dramatically increased in numbers after fires in 2001 and 2003.

Similarly, there were extensive wildfires in the North Fork, South Fork, Swan Valley, and Hungry Horse geographic areas of the Forest in 2003. Extensive monitoring has occurred on the Forest during 15 years of annual citizen-science Herpetology Days surveys. Across the Flathead National Forest, juvenile or adult boreal toads have been observed in 35 of the National Hydrologic Dataset subwatersheds. In the last 10 years or so, the Montana Natural Heritage Program database has 62 records of this species on the Forest, including an estimated 58,000 juveniles and immature toads from about 27 sites. Boreal toads may be in decline in the more arid grazing lands east of the Continental Divide and their breeding ponds on the Forest (as well as their populations) may fluctuate, but 15 years of monitoring on the Forest does not provide evidence of a decline.

Boreal toads are prolific breeders and are highly mobile. They breed in a wide variety of aquatic habitats, ranging from low-elevation beaver ponds, reservoirs, streams, marshes, lakeshores, potholes, wet meadows, ditches and marshes to high-elevation ponds, fens, and tarns at or near treeline. They exhibit a preference for shallow, warm areas with mud or silt bottoms (B. A. Maxell, 2000). Breeding sites used by toads can experience a high level of fluctuation in water levels from year to year due to drought and natural variation in groundwater and runoff levels, as well as through changes in water yield and water temperature caused by tree harvest and wildfires. Small breeding ponds created by seeps may dry out in some years before metamorphosis occurs, killing tadpoles and rendering reproduction entirely unsuccessful at that site for the year (B. A. Maxell, 2000). After breeding, adult toads disperse into surrounding terrestrial habitats. Toads can remain away from surface water for relatively long periods of time. Although they inhabit a variety of both wet and dry upland habitats, adult boreal toads are largely

terrestrial and may move more than a mile away from water after the breeding season is finished (MNHP-MTFWP, 2015e).

Juveniles are often present in wetlands adjacent to breeding sites and may overwinter along the borders of sites where they were born (Nussbaum, Brodie, & Storm, 1983). Adult and juvenile western toads dig burrows in loose soil, use the burrows of small mammals, or occupy shallow shelters under logs or rocks. At least some toads overwinter in terrestrial burrows or cavities where conditions prevent freezing (MNHP-MTFWP, 2015e).

On the Forest, boreal toad habitat was modeled based upon riparian landtypes. On NFS lands of the Forest, there are at least 23,000 acres of modeled boreal toad breeding habitat, not including lands in the Bob Marshall and Great Bear Wilderness Areas (USDA, 2014a, 2017a). Although small wetlands and small waterbodies on the Flathead may go through large fluctuations in water levels from year to year, monitoring has shown that they appear to reoccupy sites during years when water levels become suitable. Boreal toads are distributed across abundant aquatic, wetland, and riparian habitats in all Forest geographic areas and do not appear to be experiencing low numbers, isolated populations, or declines observed in some other areas. Based upon findings by Guscio et al. (2008) in areas adjacent to the Forest, increases in wildfires on the Forest in recent decades have improved habitat for boreal (western) toads.

According to Guscio (2008), toads that bred in the Robert burn in the spring of 2003 were found exclusively in burned habitats during the summer months, and toads used high-severity burn areas much more than expected. Severely burned areas were more open, but toads could use burned areas without great risk of increased water loss as long as they had cover provided by downed logs, etc. They also found that boreal toads shifted their use away from severely burned habitats to moderately burned areas later in the summer because partially burned areas had more groundcover and canopy cover and likely retained more soil moisture (Guscio et al., 2008). In an Oregon study, Bull found that boreal toads used sites with tree harvest or prescribed burn activities in proportion to their availability and were not avoided by boreal toads (Bull, 2006). Areas with no trees, or with tree seedlings, were used more than expected based on availability, whereas older stands were used less. Timber harvest and wildfire can affect boreal toads by changing vegetative cover, which can indirectly affect the water level and temperature in breeding sites. Since boreal toads prefer warm water, this is generally not a negative factor for the cold waters of the Forest.

Boreal toads may congregate around roads in the late evening and early morning.(B. A. Maxell, 2000). They may be run over by motor vehicles when they move from breeding habitats to non-breeding habitats, especially on highways and other high-speed roads that are traveled at night.

Cattle grazing may be a stressor for boreal toads, but this is a very minor factor on the Forest because it is predominantly a forested environment, whereas habitat east of the Continental Divide in Montana is predominantly a grassland environment. Since 1986, more than half of the cattle allotments on the Forest have been vacated and closed. As of 2014, the Flathead National Forest had nine active grazing allotments in two geographic areas: Swan Valley and Salish Mountains (see section 3.24 for more details).

Certain chemicals in the water or sprayed within about 330 feet of waterbodies can be lethal to toads during certain stages of the toad life cycle (B. A. Maxell, 2000). The Forest has mapped aerial retardant avoidance areas and also limits the use of herbicides and pesticides within about 330 feet of waterbodies unless their use is necessary to control invasive species.

Die-offs of boreal toads in the southern Rockies have been associated with chytrid fungus (*Batrachochytrium dendrobatidis*) infections (Garner et al., 2006). Limb deformities in toads have been linked directly to trematode infections by *Ribeiroia ondatrae* (Johnson et al., 2002). Chytrid fungus is

present in a variety of amphibians in Montana, and deformities in toads have been observed in some areas (B. A. Maxell, Hokit, Miller, & Werner, 2004).

Key stressors

Invasive species

Chytrid fungus is not known to be present on the Forest, nor have any deformities been observed. The invasion of breeding sites by non-native bullfrogs, which feed on boreal toad eggs and tadpoles, has occurred at one location in the Salish Mountains geographic area (MNHP, 2013b). On all lands, invasion of small, shallow breeding ponds by Reed canary grass (*Phalaris arundinacea*) can cause breeding ponds to dry out, and this has occurred in portions of the Swan Valley and Salish Mountains geographic areas.

Changing climate

Increased incidence of drought associated with a changing climate could have a negative effect on boreal (western) toads if it repeatedly causes breeding ponds to dry up before immature toads are able to survive out of water. Because the Forest has widespread, diverse waterbodies of a wide range of sizes that are used by boreal toads for breeding, the impacts of changing climate conditions on boreal toads are expected to be relatively low. Increases in wildfires are expected to have a neutral or positive effect.

Key indicator for analysis

The following species-specific indicator applies to the boreal toad:

- Key ecosystem characteristics of boreal toad habitat, including minimizing the risk of aquatic invasive species in ponds and wetlands used for breeding

In addition, refer to the effects of alternatives described under section 3.2 and section 3.7.4, subsection "Aquatic, wetland and riparian habitats," and sections 3.2.4, 3.2.9 and 3.6.

Environmental consequences

Effects common to all action alternatives

Under all alternatives, plan components for riparian habitat conservation areas or riparian management zones would provide for key ecosystem characteristics for boreal toads.

Alternative A

Riparian habitat conservation area management direction provides for most key ecosystem characteristic for boreal toads because it provides protection for riparian habitat within 150 feet of ponds, lakes, and wetlands greater than an acre in size and within 50-100 feet of wetlands less than an acre in size where boreal toads breed. Riparian habitat conservation area management direction also limits new roads in riparian habitat conservation areas. Alternative A does not have specific management direction to address aquatic invasive species in ponds, but the Forest works cooperatively with other agencies to prevent and treat invasion.

Alternatives B modified, C, and D

Under alternatives B modified, C, and D, standard FW-STD-RMZ-01 provides for key ecosystem characteristics for boreal toads because the riparian management zone around wetlands greater than 0.5 acre would be increased to a distance of 300 feet. Plan components for the boreal toad incorporate conservation recommendations in the statewide action plan published by MFWP (2015b). In addition, standards for snags and downed wood (see section 3.3.7) would provide habitat for boreal toads in upland

habitats. Standards FW-STD-IFS-01 through 05 and guideline FW-GDL-IFS-02 would indirectly reduce the risk of mortality of boreal toads as they move from aquatic to upland habitats.

Plan components for invasive species and roads included in all the action alternatives would reduce the risk of spread of aquatic invasive species as well as the risk of mortality due to roads. Desired condition FW-DC-WTR-12 states that aquatic ecosystems are free of invasive species such as zebra mussels, New Zealand mud snails, quagga mussels, and Eurasian milfoil. Non-native plant and amphibian species are not expanding into waterbodies that support native amphibian breeding sites (e.g., non-native bullfrogs, Chytrid fungus, yellow flag iris, or reed canary grass). Desired conditions FW-DC-NNIP-01 through 04 and guidelines FW-GDL-WTR-06 through 08 also would benefit boreal toads by reducing the risk of aquatic species invasion. Objective FW-OBJ-NNIP-01 would provide direction to treat 12,000 to 16,000 acres over the expected 15-year life of the plan to contain or reduce non-native invasive plant density, infestation area, and/or occurrence. Some of these acres would restore sites that provide boreal toad habitat.

Cumulative effects

Boreal (western) toads are cumulatively affected by activities occurring in waters where they breed as well as activities on land. Monitoring has shown that the invasive plant reed canary grass occupies some boreal toad breeding sites in areas of intermingled public and private lands, such as the Swan Valley and Salish Mountains. In recent years the Forest has implemented projects to reduce the invasion of reed canary grass in wetlands of the Swan Valley geographic area.

On all lands, livestock grazing in shallow breeding ponds may remove emergent vegetation used by larvae, and trampling by livestock may crush tadpoles. However, livestock grazing is a very minor activity on most of the Forest and boreal toad breeding sites are widely distributed, so livestock grazing has minor effects on the Forest.

Although diseases and parasites are not known to be a factor on the Forest, die-offs of boreal toads have occurred in the southern Rockies and may occur in the northern Rockies (including the Forest) in the future. These die-offs have been associated with chytrid fungus (*Batrachochytrium dendrobatidis*) infections. Other pathogens that may affect boreal toads include the fungus *Saprolegnia ferax* and the trematode *Ribeiroia ondatrae* (Johnson et al., 2002). Pathogens may be spread by the actions of others.

Past timber harvests have created open habitats that are favored by boreal toads, provided that downed woody material was retained in the harvest units. Downed woody material retained on NFS and State lands benefits boreal toads by providing cover. An increase in wildfire and the use of prescribed fire in recent decades has been beneficial to the boreal toad for the same reasons.

Roadside ditch breeding sites are vulnerable to seasonal dry-up and impacts from activities such as road grading and maintenance. This impact is most likely to occur on private lands. On NFS lands, the magnitude of this effect is difficult to quantify, but it appears to be relatively small because traffic levels on most NFS roads are low during the toad breeding season and most NFS roads do not have high-speed use, reducing the risk of mortality (USDA, 2017a).

Bald eagle

Affected environment

Population, life history, habitat, and distribution

The bald eagle is distributed across most of North America, including across Montana. The bald eagle was removed from the Federal list of threatened and endangered species in 2007, but it continues to be protected by the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. Bald eagle population biology, ecology, habitat, and relationships identified by research are described in the Pacific Bald Eagle Recovery Plan (USFWS, 1986) and the Montana Bald Eagle Management Plan (MBEWG, 2010; USDI-BR, 1994). Formal surveys for nesting bald eagles, including those on the Forest, are conducted by MFWP in cooperation with the USFS and other State, Federal, and volunteer partners.

The Pacific Bald Eagle Recovery Plan identified bald eagle management zones. Portions of Idaho, Washington, and Montana (including the Forest) are in the Upper Columbia Basin zone #7 (USDI-BR, 1994). In 2010, 180 of the 242 known nests in Montana's zone 7 were checked, revealing 77 percent nesting success with 190 eaglets produced. The population continues to increase, and nesting birds are starting to occupy areas that were previously considered to be marginal habitat at best (MBEWG, 2010). There has been a steady increase in the number of statewide bald eagle territories, from less than 100 in 1989 to over 600 in 2010. Nesting bald eagles are territorial (limiting their nesting density), but they are well distributed in suitable habitat across the Forest. There are 10-13 known active nest territories on or immediately adjacent to NFS lands on the Forest (USDA, 2014a).

In Montana, bald eagles nest in very large trees (typically greater than 30 inches d.b.h.) in forests with an uneven canopy structure and in direct line of sight of a large river or lake that is generally less than 1 mile away. On the Forest, nests have been located in western larch, ponderosa pine, Engelmann spruce, and black cottonwood trees.

Bald eagles generally feed near large rivers and lakes, where they prey on fish, waterfowl, and small mammals, steal food from other predators, and scavenge carrion. During the breeding season, important foraging habitat is usually less than 10 miles from the nest. Some eagles stay in the general vicinity of the nesting area during winter, but others may migrate hundreds of miles to wintering grounds. During the winter, roost trees are used by bald eagles for shelter.

Key stressors

Land management

On all lands, wildfire, along with timber harvest and other types of vegetation manipulation, can affect nesting habitat by removing nest trees, roost or perch trees, or nest screening cover. Prolonged loud activities (e.g., blasting or gravel crushing) or recreational use in which people stop and remain under a nest site may disturb nesting bald eagles. On non-Forest land ownerships, commercial or residential development near lakes and large rivers may result in loss of nesting habitat or disturbance to nesting bald eagles. Direct mortality from collisions with power lines or along high-speed highways may occur when bald eagles scavenge roadside carrion.

Chemical contaminants

In the past, one of the greatest threats to bald eagles in the United States was the high level of persistent organochlorine pesticides (such as DDT) occurring in the environment. Because bald eagles are at the top of the food chain, DDT affected their successful reproduction by causing egg-shell thinning. DDT was subsequently banned in the United States, and bald eagle populations grew at exponential rates following

the ban. Lead poisoning is still known to occur when bald eagles ingest lead from lead shot, bullet fragments, or sinkers buried in their food.

Changing climate

An increase in stand-replacing wildfires could result in the loss of nest trees, especially if the trees are located in very dense stands and/or there are ladder fuels present to carry fire into the crowns of the nest trees. Bald eagles use large lakes and rivers as well as terrestrial habitats and so are not believed to be sensitive to climate change effects on their widely varied food sources. This is because they can move long distances to find food.

Key indicator for analysis

The following indicator applies to the bald eagle:

- Key ecosystem characteristics for the bald eagle, including very large trees and snags for nesting and roosting within 0.5 mile of large rivers and lakes, and to reduce the risk of human disturbance to eagles at active nest sites

In addition, refer to the indicators and effects of alternatives described section 3.2.10, section 3.7.4, “Aquatic, wetland, and riparian habitats,” and sections 3.3.6 and 3.3.7.

Environmental consequences

Alternative A

The 1986 forest plan provides direction to apply the guidelines and recommendations contained in the Pacific Bald Eagle Recovery Plan, as updated in 2010 (MBEWG, 2010), during site-specific analysis. Implementation of the following management direction has contributed to a recovered bald eagle population and would continue to do so under alternative A:

- Prohibit cutting of snags for firewood within 300 feet of any river, lake, or reservoir.

- Prohibit disturbance-causing activities such as road construction, logging and seismic exploration using explosives within ½ mile of active bald eagle nests during the nesting period February 1 through August 1.

Alternatives B modified, C, and D

Compared to alternative A, the action alternatives place more emphasis on management to promote very large tree presence in the valley areas where many bald eagles nest by retaining individual trees and by actively managing forest stands to make them more resilient to expected future stressors (see section 3.3 for more details).

Key ecosystem characteristics described in the “Affected environment” section would be supported by the implementation of plan components for watersheds and riparian management zones as well as vegetation structure, which are included in all the action alternatives. In addition, species-specific plan components included in all the action alternatives would promote the retention of existing and future nest/roost trees and reduce the risk of human disturbances known to disrupt nesting. Desired condition FW-DC-WL DIV-01, standard FW-STD-TE&V-03, and guideline FW-GDL-TE&V-10 would provide emphasis on the retention of key trees used by bald eagles for nesting. Guideline FW-GDL-WL DIV-02 states, “To reduce the risk of disturbance to nesting bald eagles in active nesting territories (as identified in the MFWP bald eagle nesting territory database), visual buffers within ¼ mile surrounding active and alternate bald eagle nest sites should not be removed, but may be enhanced.” Guideline FW-GDL-WL DIV-05 would benefit

bald eagles by limiting disturbance from activities known to disrupt nesting bald eagles within 0.25 miles of known, active nest sites from February 1 to August 15. This guideline would allow for site-specific implementation to reduce the risk of disturbance from the time nest-building and incubation begins until young bald eagles have fledged and left the nest area. These guidelines are consistent with the recommendations of the Montana Bald Eagle Management Guidelines (MBEWG, 2010; USDI-BR, 1994) (see also appendix C).

Cumulative effects

The Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act protect bald eagles on all lands. Habitats preferred by the bald eagle in northwest Montana are expected to continue to change as a result of human land uses on all lands, particularly in the developed valley bottoms where many nesting lakes and rivers are located. On all ownerships, fuels reduction within the wildland-urban interface could help to protect bald eagle nesting and roosting habitat, provided suitable trees are retained. Private land development on shorelines and increasing recreational use on some lakes may limit nesting habitat or increase disturbance. Continued coordination and mitigation of these effects by multiple agencies will likely continue to be necessary, although many bald eagles appear to be more tolerant of humans than was once thought.

Although DDT has been banned in the United States, bald eagles continue to be killed by other environmental contaminants (e.g., lead shot or poisons used to kill ground squirrels). This has been a documented source of bald eagle mortality on private lands in recent decades, as has collision with vehicles when bald eagles feed on road-killed animals. Changes in regulations now allow people to remove road-killed big game animals, reducing this risk. These factors cause mortality of individual birds but do not currently appear to be impacting the population as a whole.

Direct mortality due to the poaching of bald eagles was a source of mortality in the past but has been greatly reduced in recent decades as a result of public education efforts about the important role of bald eagles and other birds of prey.

Hardwood tree habitats

Introduction

Hardwood trees occur in riparian as well as upland areas. In the mountainous West, hardwood tree communities are disturbance dependent. Although hardwood trees usually make up less than 10 percent of forest cover in western forests, they are highly preferred as nesting and foraging sites for birds, insectivorous mammals, and amphibians and as a preferred substrate for many invertebrates (Fred L. Bunnell, Wind, & Wells, 2002).

In seven of nine Pacific Northwest studies compiled by Bunnell and others (2002), upland hardwood communities had significantly greater bird species richness than upland conifer communities (especially those forest communities containing quaking aspen or cottonwood trees).

On the Forest, hardwood tree communities are composed of black cottonwood, aspen, paper birch, and water birch. Examples of key ecosystem characteristics for many species associated with this habitat include soft, decayed, or hollow trunks and a branching structure that provides nesting sites. Paper birch is known for loose bark that provides shelter as well as sap and catkins that provide food. Examples of species associated with hardwood forests are the veery, great blue heron, several sapsuckers, downy woodpeckers, pileated woodpeckers, and black-capped, boreal, and chestnut-backed chickadees (Kuennen, 2013d). In addition, several bat species preferentially roost in hardwood trees, including the little brown bat and the silver-haired bat. Mammals such as the fisher, black bear, flying squirrel, and red

squirrel are known to nest, den, or rest in very large cottonwood trees where available (Fred L. Bunnell et al., 2002).

Great blue herons usually nest in colonies containing a few to several hundred pairs, building bulky stick nests high in the multiple branches of the largest cottonwood trees available. Most Montana nesting colonies are in very large trees sustained by periodic flooding along major river floodplains and lakes. The veery is a small neotropical migratory bird that nests in moist, low-elevation hardwood forests with a dense shrub understory. They nest in trees, shrubs, or on the ground and do not require trees of large size (Daniel Casey, 2000). In Montana, veeries are often associated with willow thickets and cottonwood stands along streams and lakes in valleys as well as in lower mountain elevations, including the Flathead region (Kuennen, 2013o; MBDC, 2012). The veery prefers disturbed forest, probably because hardwood trees and denser understory conditions are not found in undisturbed forests (Moskoff, 1995 (revised 2005)). On wide, low-gradient rivers (e.g., the Swan River), periodic flooding maintains a highly convoluted pattern of meanders, sloughs, and oxbow lakes. Because this pattern is changing constantly due to periodic flooding, cottonwoods and shrubs are the predominant vegetation; conifers are more patchy because they only become established in the intervals between flooding events. Beaver activity also helps to maintain cottonwood/shrub communities and complements the effects of flooding.

This section assesses effects to most species associated with hardwood tree habitats.

Affected environment

According to Forest Inventory and Analysis data, the hardwood tree dominance type covers an estimated 1.3 percent of the Forest (about 31,000 acres). These are areas where black cottonwood, aspen, or paper birch are the dominant species, though there may be conifer trees present as well. Though they do not dominate, hardwood trees are present on other areas of the Forest as well, usually as a minor component of conifer-dominated forests. Aspen is present on an estimated 0.9 percent; paper birch is present on an estimated 1.4 percent; and black cottonwood is present on an estimated 2.0 percent of the Forest, according to Forest Inventory and Analysis data (see section 3.3.3).

Nearly 70 percent of the hardwood tree dominance type is located in the valley bottoms of the Swan Valley geographic area and the far north and far south ends of the North Fork geographic area. Hardwoods are often associated with the wet meadows and ponds that occur in these areas. The acreage of habitat suitable for the growth of very large cottonwood trees for nesting is naturally very limited on the Forest, ranging from about 270 acres in the Salish Mountains geographic area to about 5,700 acres in the Swan geographic area, mostly on other land ownerships, with a small portion on Forest lands (see USDA, 2014a for more details). Some upland areas are also capable of growing hardwood trees. On the Forest, aspen and paper birch occur in upland areas and are not as dependent upon seasonal flood flows as cottonwood is. Increases in wildfire in some geographic areas (e.g., the North Fork, South Fork, and Hungry Horse geographic areas) since 2003 have increased hardwood tree dominance and presence in upland areas in recent decades. To sustain hardwood tree communities, Bunnell and others (2002) recommend encouraging upland patches of hardwoods, avoiding the conversion of riparian areas to conifer communities, and controlling domestic grazing in riparian areas.

Key stressors

Land management: On all lands, vegetation management activities such as timber harvest, thinning, prescribed fire use, fire suppression, and livestock grazing can affect the quantity and quality of hardwood tree habitats. Private land development in the valleys can affect the availability of hardwood tree habitats.

Flooding: Regulation of flood flows by Hungry Horse Dam can affect the regeneration of riparian cottonwood groves on the lower South Fork and main stem of the Flathead River.

Key indicator for analysis of most wildlife species associated with hardwood trees

The following indicator is important for the wide variety of wildlife species associated with hardwood tree habitats:

- Hardwood tree dominance type and presence

In addition, refer to effects of alternatives in sections 3.2 and 3.3.

Environmental consequences

Summary of modeled alternative consequences

Trends over time in the non-coniferous vegetation types (hardwood and grass/shrub plant communities) are difficult to portray through modeling. Persistent non-forested plant communities are relatively rare types on the Forest and are naturally fragmented in nature, and there is no specific direction in the Spectrum model (see appendix 2) to sustain these non-coniferous vegetation types. Therefore, model results, although helpful, should be supplemented with other information for discerning the trend and amounts of these communities over time. Since hardwood trees are largely associated with early-successional forest conditions, modeling of forest successional stages (i.e., forest size classes), disturbance processes, and their effects on non-coniferous vegetation can provide insight and information for the assessment of trends in hardwood species over time.

Because deciduous trees and shrubs along low-gradient streams are maintained by periodic flooding, Ecosystem Research Group modeled upland riparian deciduous communities that are maintained by other disturbance factors such as fires, insects, and disease on the Forest. Their query was designed to assess the availability of habitats that provide shrubs and deciduous trees within riparian habitat conservation areas/riparian management zones. For the current condition, a GIS layer including the locations of all VMap areas with cover types dominated by shrubs and deciduous trees was used. For purposes of modeling future vegetation treatments, areas that are mapped as riparian habitat conservation areas/riparian management zones are not suitable for timber production. Future habitat was modeled as forest openings containing riparian shrubs and hardwood trees, primarily resulting from moderate- or high-severity wildfires and insects and disease within 20 years following the disturbance.

The model predicts that under all alternatives, upland riparian deciduous communities would stay within the minimum and maximum range of the natural range of variation over the five-decade future time period. Acres of riparian habitat in an early-successional condition would decline slightly during the first two decades, followed by an increase in habitat that returns to near current levels for alternatives B and D. Results of vegetation modeling for alternative B modified are similar to the results for alternative B (see appendix 2).

According to this model, under alternative A, upland riparian deciduous communities would stay well below current levels, probably because wildfires are suppressed in the model and there is no modeling of prescribed burning. Under alternative C, these communities would slightly exceed current levels by decade 5, likely because this alternative includes the most prescribed burning to meet desired conditions. Since upland riparian areas generally produce substantially higher levels of shrubs after a reduction in canopy closure, it might not matter much whether that loss in canopy occurs from fire, insects, disease, or vegetation management. Consequently, it is likely that habitat for riparian species associated with shrub and hardwood habitats would stay at or above current levels, assuming that the modeled increases in natural disturbances are highly probable by the end of decade 5. More frequent fire might favor longer-term (more persistent) presence of these vegetation types, if conifer regeneration is delayed.

Alternative A

Amendment 21 includes the forestwide objective (#6-Veg) to encourage cottonwood, birch, aspen, western red cedar, and western larch as stand components in areas where these species are best adapted. Direction includes implementing management activities to achieve this objective through actions such as planting, thinning, and prescribed fire where consistent with watershed, fisheries, and other riparian objectives and standards. Although the no-action alternative provides some direction to maintain hardwood trees, it does not have specific objectives to increase hardwoods. As a result, other management objectives have often received greater management consideration. The Forest has grazing allotments in two geographic areas, the Salish Mountains and Swan Valley geographic areas. Protection of riparian hardwood communities is implemented through some allotment management plans. This alternative has no restrictions on future grazing allotments.

Alternatives B modified, C, and D

All action alternatives would contribute towards maintaining or improving nesting, denning, roosting, and foraging habitat for species associated with hardwood trees on NFS lands. This is due to plan components that recognize the importance of hardwood trees in providing biodiversity, and desired conditions to maintain or increase hardwood trees on suitable sites. Under the action alternatives, hardwood trees would be addressed by desired condition FW-DC-TE&V-09, which was informed by the model analysis of the natural range of variation and the anticipated influences of future disturbances, particularly fire (see appendix 2). The current conditions of hardwood dominance type and presence of hardwood trees are estimated to be within but at the lower end of the desired range. Maintaining or trending upward in amount of area in hardwood dominance type or in amount of area where hardwood species are present is the desired condition.

A simulation model was used to estimate natural range of variation for certain key vegetation characteristics and to project vegetation conditions into the future (see appendix 2, SIMPPLLE model description). Model results suggest a downward trend in the hardwood dominance type over the next five decades when assessed forestwide. However, the model indicates that fire will continue to be a dominant feature of the landscape, and the model shows the amount of early-successional forest (seedling/sapling size class) trending upward over time forestwide. This suggests that there may be more potential for hardwood species to maintain or increase their presence on the landscape than might be indicated by the model due to the abundance of disturbances that create the early-successional forest openings favored by hardwood species.

Standard FW-STD-GR-05 and guideline GA-SV-GDL-04 would limit cattle grazing allotments and numbers on NFS lands, decreasing the risk that hardwood tree habitats would be impacted by cattle grazing.

The forest plan includes vegetation management objective FW-OBJ-TE&V-03. This objective would promote treatments (e.g., timber harvest, planned ignitions, thinning, planting) to increase hardwoods on 500 to 5,000 acres. This is especially important in areas where hardwoods are not regenerated by flooding and where conifer competition reduces hardwoods (see also section 3.3.4).

Hardwood species are often associated with water features, and the desired conditions for riparian management zones recognize and promote the presence of hardwoods. FW-DC-RMZ-04 and 05 provide for diversity of vegetation composition and structure within riparian management zones, acknowledging that early-successional forest structures supporting riparian-associated grasses, forbs, shrubs, and deciduous trees (cottonwood, birch and aspen) are an important part of this diversity.

Cumulative effects

This section summarizes activities and effects that are common to most species associated with hardwood tree habitats.

In the past, hardwood trees in upland areas in many western forests were considered to be competitors with the higher-value coniferous trees, so they were not maintained or promoted. Fire suppression in some areas has reduced hardwood tree presence. In recent years, paper birch has become more valuable for firewood and is likely to continue to be a popular firewood tree in the future. Very large cottonwood trees may have been removed due to private land development or changes in water flow due to impoundments, such as Hungry Horse Reservoir, but there are no records of how many trees or groves have been lost.

There are hardwood trees with dense shrubs on State or other Federal lands along the major river floodplains of the Forest, including groves of large cottonwoods along the Forest's boundary adjacent to the south and west sides of Glacier National Park and in the wildlife refuge at the south end of Swan Lake. Cottonwood groves in these two areas would be protected unless they are killed by wildfire. In the future, an increase in high-severity wildfires may kill very large cottonwood trees. Additional streams have been listed as eligible for wild and scenic river designation under all alternatives, so their outstandingly remarkable values would be maintained. Designation of rivers as wild and scenic in the National Wild and Scenic River System would prevent impoundments in the future, benefiting hardwood tree habitats.

In the future, riparian areas on private lands of the Flathead Valley are likely to continue to be developed, resulting in loss of hardwood tree habitat or increases in other nest predator species associated with human developments.

In summary, proposed management direction on the Forest, in the context of all lands of the larger landscape, contribute to hardwood tree habitats. This would be accomplished by plan components to maintain or increase hardwood trees on suitable sites. Although the Forest does not have authority over all the stressors, the ecological conditions of hardwood tree communities and the processes that maintain them would be provided on NFS lands. Coarse-filter plan components provide for biodiversity and the ecological conditions that support the long-term persistence of the majority of species associated with these habitats. Hardwood tree habitats are distributed across all Forest geographic areas.

Cliff, cave, scree, and rock habitats

Introduction

Cliff, cave, scree, and rock habitats are widespread on the Forest (see forest plan figures B-03-09; note these habitats are included in the "non-forest" potential vegetation type, but they also occur as microsites throughout the forest within other vegetation types.). These habitats are inherently stable for long periods of time because they are changed primarily by geologic forces. About a dozen vertebrate species and about a dozen invertebrates known to occur on the Forest are associated with these habitats on the Forest (see appendix 6). Population surveys of bats are difficult to conduct because of the difficulty in finding and accessing many caves, the nocturnal behavior of bats, their large home ranges, and the difficulty of species identification (Hendricks & Maxell, 2005).

Examples of key ecosystem characteristics include cliffs used for nesting by many bird species; caves and crevices used for roosting and hibernating by many bat species; and rock outcrops or boulder and talus accumulations used by some mammals for hibernation, shelter from the weather, or to escape from predators. Examples of species associated with cliff, cave, scree, and rock habitats include the mountain

goat, white-throated swift, turkey vulture, northern alligator lizard, Cordilleran flycatcher, peregrine falcon, hoary marmot, pika, bushy-tailed woodrat, cliff or violet-green swallow, and a variety of bat species. These species are found across the Forest but may have spotty distribution because their primary habitats have naturally spotty distribution. Cliff, cave, scree, and rock habitats make up 2 percent or less of the Flathead ecosystems.

Some species associated with boulders and talus habitats, such as the pika and hoary marmot, are restricted to alpine and subalpine habitats (Kuennen, 2013d, 2013g). Pikas tend to make short-distance movements to gather vegetation next to talus slopes, which they store in rock crevices, whereas marmots travel farther to feed in meadows (MNHP-MTFWP, 2015c). These two species are not known to be sensitive to human disturbance and are observed most frequently in the Flathead's wilderness areas, where there are virtually no human activities that affect their habitat. There is no inventory of talus slopes and boulders on the Forest.

Caves provide the primary habitat for roosting and hibernating of most bat species in the Northern Region (B. A. Maxell, 2015; NEPA, 2013). Temperature, access by predators, and proximity to foraging habitat and water are some of the factors influencing habitat selection by bats. Caves are extensively used by bats for roosting; bats roost in clusters in microsites within caves of a suitable temperature. The size, configuration, and complexity of a cave influences the microclimate by affecting airflow, air temperature, and humidity. Particular caves may not be equally suitable for the different types of roosting during all times of the year (Rancourt, Rule, & O'Connell, 2005). Old mines, buildings, and bridges are also used by bats. Twelve species of bats have been detected by acoustic surveys on the Forest (A. Shovlain, USFS wildlife biologist, personal communication, 2011). These are all eight *Myotis* species known to occur in Montana plus the big brown bat, the silver-haired bat, the hoary bat, and the Townsend's big-eared bat.

The following section assesses effects to most of the species associated with cliff, cave, scree, and rock habitats on the Forest. Following the general discussion, three species are discussed as examples in order to help display differences in effects of the alternatives. The three species are the Townsend's big-eared bat, mountain goat, and peregrine falcon.

Affected environment

There are a large number of caves on Forest lands, with a wide variety of lengths and depths. Very few of the caves have been inventoried to determine species presence or absence, and the number that have environmental conditions that could support hibernating bats or maternity roosts is unknown. The highest number of caves on the Forest is in the South Fork and Middle Fork geographic areas, where about 163 caves and relatively large rock crevices have been identified within the Bob Marshall Wilderness (Ballensky, 2011). The majority of caves in the Bob Marshall Wilderness have little or no use by people due to their remoteness and the difficulty of accessing them, so they provide a high level of security from disturbance for roosting and wintering bats. Cliffs occur across the Forest at all elevations. For example, cliffs are located near water at Tally Lake and Tally Lake Gorge, along the Flathead River between Columbia Falls and Hungry Horse, and along the South Fork of the Flathead River south of Hungry Horse Reservoir and west of Flathead Lake. Accumulations of boulders and talus occur across the Forest in areas where there are steep slopes.

Key stressors

Blasting, crushing, or removal of rock

On all lands, these activities can result in habitat loss but can also create manmade environments used by some species (see the discussion of saleable minerals in section 3.23 for more details).

Human disturbance of cliff, cave, scree, and rock habitats

Closure of caves to reduce vandalism can make habitat inaccessible to bats if there are no other entry points. Humans can cause disturbance to nesting birds or roosting bats in key habitats.

Changing climate

Species such as the hoary marmot and pika may be susceptible to summer heat stress associated with summer warming. In the northern Rocky Mountains, the temperature tolerance limits of pika are not likely to be reached in the near future (McKelvey & Buotte, in press). Specific microhabitat features such as local moisture sources, the physical structure of talus fields, and northerly aspects may help to buffer the effects of climate changes (Millar & Westfall, 2010).

Disease

White-nose syndrome is a disease that kills large numbers of some species of bats. As of 2016, this disease has been documented in Washington as well as the central states such as Missouri (Heffernan, 2015). In other States, white-nosed syndrome has been documented in two of the bat species known to occur on the Forest, the big brown bat and the little brown bat (B. A. Maxell, 2015). Caving equipment or clothing can spread disease from cave to cave if decontamination measures are not used. Bats can fly long distances across many land ownerships.

Key indicator for most wildlife species associated with cliff, cave, scree, and rock habitats

The following indicator is important for the wide variety of wildlife species associated with cliff, cave, scree, and rock habitats:

- Presence and ecological conditions of cliff, cave, scree, and rock habitats

Environmental consequences

Effects common to all alternatives

Under all the alternatives, ecosystem plan components would meet the needs of most species associated with cliff, cave, scree, and rock habitats (e.g., scree and boulders). These habitats are created by geologic and topographic forces that are very stable.

Alternative A

There is no management direction specific to cliff and rock habitats, but there is management direction for specific species (such as peregrine falcons) associated with this habitat, as detailed in sections of this final EIS on specific species).

Alternatives B modified, C, and D

Desired conditions FW-DC-CAVES-01 through 06 and guidelines FW-GDL-CAVES-01 through 03 for cave and karst features promote ecological conditions to support bats and other animal species that use these habitats. Although the majority of caves on the Forest are not accessible to humans for much of the year, one cave that is very accessible has been vandalized in the past, requiring installation of a protective door. This cave system has multiple chambers that are accessible to bats. Plan components that specify the use of bat-friendly gates, if needed, would help to make caves accessible to bats while protecting the cave resource. The desired condition to educate cavers about the risk of spreading disease (FW-DC-CAVES-06) would also help to protect bats. Guideline FW-GDL-WL DIV-03 states that if old buildings or bridges known to be used as bat roosts are removed, measures should be used to mitigate the loss of bat habitat (e.g., the Forest could install a bat house or roost structure or remove the building or bridge during a time period when bats are not using it, if feasible). Most gravel pits on the Forest are in areas where glacial till

deposits occur, so caves, talus, and boulder areas are not impacted by gravel extraction. Guideline FW-GDL-E&M-06 states that available resources at existing gravel pits should be used before constructing new pits.

Cumulative effects

This section summarizes activities and effects that are common to most species associated with cliff, cave, scree, and rock habitats.

Blasting of cliffs or rock may occur in the future in relation to activities such as widening of highways, but most cliffs are on State or NFS lands or within Glacier National Park (adjacent to the Forest) and the value of cliffs in providing habitat for bats and other cave-associated species is recognized, so the risk of cliff habitat loss is very low. There have been very few past impacts to high-elevation talus and boulder habitats on the Forest because they are generally within wilderness and inventoried roadless areas (see figure 1-73). High-elevation talus and boulder areas are also protected in the Mission Mountains Tribal Wilderness of the Confederated Salish and Kootenai Tribes and in Glacier National Park.

Caving and rock-climbing are popular recreational activities in some areas and may increase in the future, but these activities require specialized training and/or equipment and they are not likely to increase as rapidly as other types of recreation. Recreational cave and mine exploration on all land ownerships can lead to an increased rate of the spread of diseases such as white-nose syndrome. There is a decontamination protocol in place for cavers on NFS lands, which should aid in slowing the spread on NFS lands, but diseases may continue to be spread elsewhere. Because both people and bats may carry diseases and travel long distances, disease can be spread across a wide area. Disease control requires a cooperative effort. Multiple agencies are monitoring bats, which will help support adaptive management of bats.

In summary, the proposed management direction on the Forest, in the context of all lands of the larger landscape, contributes to cliff, cave, scree, and rock habitats. This would be accomplished by plan components designed to protect caves and to keep caves accessible to wildlife if they are closed to prevent vandalism. Although the Forest’s ecological capacity to provide cliff, cave, scree, and rock habitats is limited by geologic and topographic factors and the Forest does not have authority over all the stressors, the ecological conditions for cliff, cave, scree, and rock communities and the processes that maintain them would be provided on NFS lands. Coarse-filter plan components would provide for biodiversity and the ecological conditions that support the long-term persistence of the majority of species associated with these habitats. Cliff, cave, scree, and rock habitats are distributed across all Forest geographic areas.

Townsend’s big-eared bat

Affected environment

The Townsend’s big-eared bat is distributed across the western United States, southwestern Canada, and Central America. Overall, the recent population trend is not well known, but the species appears to be declining in abundance in some portions of the range and to be stable or increasing in others (Gruver & Keinath, 2006; NatureServe, 2015a). In Montana, this species has been documented across all but the northern tier of the state (MNHP-MTFWP, 2015d), but the population and trend is unknown (B. A. Maxell, 2015). Intensive population surveys of bats are difficult to conduct because of the nocturnal behavior of bats, their large home ranges, and the difficulty of species identification while a bat is in flight. Recent acoustic surveys of bats have provided additional information on occurrence. However, “Townsend’s big-eared bats are unusually difficult to survey for because they are quite effective at

avoiding mist-nets and are difficult to detect acoustically because they use low-intensity calls” (Hendricks & Maxell, 2005).

This bat uses caves, cave-like structures, and mines for wintering, giving birth, and roosting. The Forest has very few old mines. Caves in a complex with diverse aquatic and riparian habitats for feeding are key ecosystem characteristics. A key component of habitat for the Townsend’s big-eared bat is roosting habitat, including maternity roosts where bats give birth and raise their young, hibernacula where bats spend the winter, day roosts where bats rest during the day, and night roosts where bats congregate at night when they are actively feeding. Winter and summer roost sites may be limited based on temperature and airflow requirements. Females form maternity colonies during the spring and summer that are typically composed of 20 to 180 females. According to the Montana Natural Heritage Program, most caves and mines in Montana appear to be too cool in summer for use as maternity roosts. In Montana, daytime roosts may include snags and old buildings (Genter & Jurist, 1995).

The Townsend’s big-eared bat inhabits Montana on a year-round basis and occurs at low density due to the geologically limited availability of caves used for hibernating and roosting habitat. Cave and mine availability may limit dispersal. Adults appear to have high fidelity to roost sites (B. A. Maxell, 2015). On the Forest, this bat has been observed in three caves—two winter hibernating sites (BHSCC, 2013, 2014; Kuennen, 2013h; Kuennen, 2013q; B. A. Maxell, 2015; MNHP, 2013c; Whittle, Hanauska-Brown, Brown, & Bodenhamer, 2015) and two day/night roosts (B. A. Maxell, 2015). There are no known maternity roosts on the Forest. Many of the caves on the Forest have not been inventoried for the presence of bats, but the Forest is currently gathering valuable information from volunteers. Statewide, there are three known maternity roosts (two in caves, one in a mine) and 39 winter hibernating sites (B. A. Maxell, 2015).

White-nose syndrome is a disease that kills large numbers of some species of bats. The Townsend’s big-eared bat is identified as a vector for white-nose syndrome but is not identified as being susceptible to mortality (B. Maxell et al., 2015). A primary cause of population decline in some areas has been listed as human disturbance of caves (Pierson et al., 1999). Disturbance by humans is believed to play a role in the short-term dynamics of local populations, but in some cases what has been interpreted as site abandonment may be normal movement patterns (Sherwin, Montgomery, & Lundy, 2013). The response of Townsend’s big-eared bats to human activities is largely undocumented in Montana. The maternity colony at Lewis and Clark Caverns has persisted for over a century, even though it is exposed daily to tour groups (MNHP-MTFWP, 2015d).

The foraging behavior of this bat has not been reported or studied in Montana. Foraging and drinking habitat located near roosts and/or connected by vegetated patches or corridors may be needed to support colonies. The average travel distance from caves of Townsend’s big-eared bats is about 2 miles (Gruver & Keinath, 2006; NatureServe, 2015a). In California, the mean center of feeding activity was 2 miles from caves for females and 0.8 miles for males (Fellers & Pierson, 2002). Townsend’s big-eared bats feed on various nocturnal flying insects near the foliage of trees and shrubs, especially near beaver pond complexes, meadows, and streams.

Key stressors

Land management

Closure of caves or mines used as winter hibernation sites or maternity roosts can reduce or eliminate key habitat or change the airflow and temperature throughout a cave. Riparian management can affect feeding and day-roosting habitat. Most caves are on public lands, but old buildings or bridges used as roosts may be found on other land ownerships. The Forest has one old mine as well as old buildings on NFS lands.

Human disturbance at maternity roosts or in winter hibernacula

The levels of human use of caves in the plan area are not known, but many cave entrances on the Forest are plugged by snow during winter when this bat is known to use caves on the Forest. Many are in remote wilderness locations where they are difficult to access on a year-round basis. Only one cave closure has been necessary on the Forest to protect cave resources.

Changing climate

Climate influences food availability, timing of hibernation, timing and duration of seasonal migrations, frequency and duration of torpor, rate of energy expenditure, and reproduction and juvenile development in bats. Changes in climate or in the frequency, magnitude, or severity of disturbances such as fire and insect outbreaks have been hypothesized to have an impact on this and other bats but are not currently well understood (Sherwin et al., 2013).

Key indicator for analysis

The following species-specific indicator applies:

- Presence of key ecosystem characteristics for bats, including the Townsend's big-eared bat

In addition, refer to the indicators and effects of alternatives on caves and on feeding and roosting habitat described section 3.7.4, subsections "Aquatic, wetland, and riparian habitat associations" and "Old-growth forest, very large live tree habitat, and very large dead tree habitat."

Environmental consequences

Effects common to all alternatives

Plan components prevent the net loss of roosting habitat by protecting caves used for hibernating and/or roosting and snags that may be used for day roosts. Plan components provide for diversity and connectivity of the aquatic, wetland, and riparian sites used for feeding. The levels of human use of caves in the plan area are not known, but many cave entrances on the Forest are plugged by snow during winter, so threats to hibernacula are low. Because many caves on the Forest are in a very large wilderness area, they are also difficult to access in other seasons.

Alternative A

The 1986 forest plan does not have management direction specific to Townsend's big-eared bats but does provide direction for management of caves. The current forest plan states that the Forest will "preserve and protect caves for their unique environmental, biological, geological, hydrological, archaeological, paleontological, cultural and recreational values." This management direction helps to prevent some disturbances to caves that have the potential to threaten this bat species. However, the management direction does not specifically address human disturbance or the spread of disease.

Alternatives B modified, C, and D

Townsend's big-eared bat habitat is inherently limited by the geologic conditions that create caves with suitable temperatures to be used as maternity roosts or hibernacula, thus limiting the ecological capacity of the Forest to provide habitat. Most caves on the Forest are in wilderness management areas (management area 1a), where caves are difficult to access and management direction is protective of caves. Where caves are accessible to people, forestwide plan components to maintain cave accessibility for bats and avoid disturbance at known hibernacula (and maternity roosts, if any are discovered) would maintain, improve, or restore key ecosystem characteristics described in the "Affected environment" section (see section 3.7.4, subsections "Cliff, cave, scree and rock habitats" and "Aquatic, wetland, and

riparian habitats"). Forestwide guideline FW-GDL-CAVES-03 protects all bats, including Townsend's big-eared bat, because it states that if caves being used as roosts or hibernacula by bats are closed to reduce safety hazards or vandalism, bat-friendly closures should be installed unless alternative entries for bats are known to be available. Desired condition FW-DC-WTR-14 provides for the foraging habitat of this bat species. This desired condition states that beavers play an important ecological role, benefiting groundwater, surface water, stream aquatic habitat complexity, and adaptation to changing climate conditions. Guidelines FW-GDL-RMZ-08 through 10 provide for ecological conditions that support feeding and day roosting.

Cumulative effects

Some people are intolerant of bats, and this can lead to disturbance of bats, loss of access to roost sites, or bat mortality. Biologists in Montana are working to increase public understanding of bats and their ecological role as insect predators.

Past timber harvest on all lands has likely altered the availability of snags used for roosting in some localized areas, but insects and disease, as well as increases in wildfire (recent and anticipated for the future) have created abundant snags that can be used for roosting across the landscape (including Glacier National Park adjacent to the Forest and riparian forest habitats, wilderness areas, and inventoried roadless areas on the Forest) (see section 3.3 for more details).

Aquatic, wetland, and riparian habitats host an abundance of insects, in addition to water for bats. The Townsend's big-eared bat uses large lakes and rivers for feeding, which may have high levels of human development if surrounded by private lands. Lights associated with human developments may attract insects that bats feed upon (and also bats), whereas the use of insecticides can decrease populations of insects that bats feed upon. Since bats are nocturnal, human disturbance has a minor direct effect on feeding.

Changing climate conditions could alter prey abundance, but because the key ecosystem characteristics for bats are abundant on the Forest, this effect is expected to be minor. Grazing will continue on other ownerships, and if it reduces the availability of riparian shrub habitats, there could be a reduction in bat foraging habitat. Grazing has declined on the Forest in recent decades and there are standards to limit increases in the future, which provides for bat foraging habitat on NFS lands.

Surface temperature changes may change the interior temperatures of caves and abandoned mines. Because bats are selective regarding the microclimates in which they will roost, this may cause bats to shift their use elsewhere inside caves or abandon some altogether. There is currently a high degree of uncertainty regarding temperature changes in caves, but a volunteer caving group is helping to monitor this factor.

Mountain goat

Affected environment

The mountain goat is distributed across most of British Columbia as well as in the mountainous regions of Alaska, Washington, Idaho, Montana, and Colorado. On the Forest, mountain goat densities are highest in Glacier National Park and adjacent wilderness and roadless areas of the Forest, including the Bob Marshall Wilderness Complex, Mission Mountains Wilderness, Jewel Basin Hiking Area, and adjacent high-elevation lands. These areas are located in the Swan Valley, Hungry Horse, South Fork, and Middle Fork geographic areas (Kuennen, 2013e). The Salish Mountains and North Fork geographic areas do not have mountain goat populations. Mountain goats on the Forest are within the "Bob Marshall regional population" and have an estimated population of about 360 (range 322-367); about 13 harvest permits are

issued annually (B. L. Smith & DeCesare, 2017). Weaver (2014) developed models of mountain goat habitat for the Forest and determined that the Forest has about 61,643 acres of winter habitat and about 189,621 acres of summer habitat (Weaver, 2014p. 59, table 5). Weaver's summer and winter habitat data layers were discussed with MFWP biologists and helped refine information used in the Flathead's assessment (USDA, 2014a).

Mountain goats are usually found in the most rugged mountainous areas of steep cliffs and rock bluffs, narrow ledges, rocky canyons, talus, and rock slopes. They are considered nonmigratory, although there may be movement from high-elevation summer habitats to slightly lower elevations during the winter period. In northwest Montana in the Swan Range, mountain goats occur at elevations of about 5,000 feet to 7,600 feet (T. Thier, MFWP, personal communication, 2016). Highly traditional behavior restricts mountain goats to regular seasonal use patterns. Mountain goats feed on grasses, sedges, lichens, forbs, and shrubs.

The kidding time period when females are giving birth to young is a critical time period for mountain goats. Compared to other ungulates, according to a 1991 study by Baily, mountain goats have low reproductive success, and survivorship of goat populations is closely tied to the health of mountain goat nursery groups (Festa-Bianchet, Urquhart, & Smith, 1994). Winter is also a critical time period for mountain goat survival. According to Varley, in winter they use cliffs on south-facing slopes and wind-swept areas where snow accumulations are lower (NWSGC, 1998). Compared to other North American ungulates, mountain goats have a high natural mortality rate (Chadwick, 1977). Mountain goat populations on the Forest are also affected by mortality due to hunting, but the impact is estimated to be minimal given the small number of annual permits issued and the low success rate of permitted hunters.

Mountain goats are hunted under a permit-drawing system with mandatory reporting that is regulated by MFWP. All or portions of about half a dozen mountain goat hunting districts are located on the Forest. In the Bob Marshall Wilderness Complex, mountain goat populations appear stable in recent years but below historical population levels. In an effort to increase mountain goat populations, hunting licenses issued for native mountain goat populations have declined nearly tenfold from the 1960s to the present, as has the annual harvest (B. L. Smith & DeCesare, 2017). After extensive aerial surveys in both the Cabinet Mountains and the Bob Marshall Wilderness Complex, biologists observed an overall recruitment rate of 27 kids per 100 adults in 2008, indicating good kid production (J. Vore, 2013). A survey of hunting district #140 conducted by MFWP in 2013 detected 50 mountain goats in the area from the Middle Fork of the Flathead River to the Hungry Horse Reservoir, and the ratio was 32 kids:100 adults—the highest kid production recorded since 1982 (J. Vore, 2013).

Some types of human disturbance have been shown to alter goat behavior and cause a physiological response (Jim Williams, MFWP, personal communication, 2015). In summer, mountain goats are tolerant of humans on foot and also of predictable traffic on roads. Mountain goats may become habituated to humans on trails. Varley reported that sudden loud noises such as blasting or low-altitude helicopter flights elicited extreme alarm responses by goats (NWSGC, 1998).

In winter, goats are at risk of disturbance due to some types of human activities. Varley's review of human disturbance on mountain goats concluded that human disturbance such as motorized over-snow vehicle use on mountain goat winter habitats is rare due to the steepness, ruggedness, and low snow accumulations of mountain goat winter habitats. Snowmobilers seek out the deep snow that mountain goats avoid. However, the author noted that the use of helicopters within 1 mile of winter habitat (e.g., being used to drop off backcountry skiers in remote areas) may pose a threat to mountain goats in winter (NWSGC, 1998).

Geist reported in 1971 that aircraft overflights can alter mountain goat behavior and cause negative physiological responses, which may reduce survivorship (Varley, 1998). Foster and Rahs (1983) reported that mountain goats in British Columbia responded to aircraft with a "severe flight response" during 33 percent of observations. Fifty-five percent of severe flight responses were observed when disturbances occurred at distances less than about 500 feet. Response behavior was correlated with distance to disturbance and distance at which the disturbance was visible, as well as to available security cover, but was not dependent on time of year, group size, or direction of the approach from above or below. Foster and Rahs (1983) also detected temporary range abandonment as a result of disturbance. Recommended separation from known mountain goat habitat (especially nursery groups) ranges from about 500-650 feet (S. F. Wilson & Shackleton, 2001). According to Penner in 1998, the strongest responses were elicited by helicopters (Varley, 1998). Of the available literature, Côté in 1996 (Varley, 1998) and Foster and Rahs (1983) studied the effects of helicopters on mountain goats based upon observational data. The two studies independently suggested a 1.25-mile buffer around mountain goats to completely avoid harassment. In a more recent study, Gordon and Wilson (2004) recommended that helicopter activity within about 1,650 yards of occupied mountain goat habitat should be managed to reduce behavioral disruptions.

Female mountain goats show strong fidelity to established seasonal ranges, whereas males are more likely to cross ranges to access females during the breeding season (Chadwick, 1977). Mountain goats may cross highways, and they may be killed when they do so. The behavior of mountain goats in relation to their crossing U.S. Highway 2 near Glacier National Park was studied by Singer (1978), leading him to recommend construction of a highway crossing to reduce the mortality of mountain goats. Two highway underpasses were subsequently built during highway reconstruction by the U.S. Department of Transportation and Montana Department of Highways. These underpasses received high levels of use by mountain goats, and crossing success increased (Singer & Doherty, 1985).

Key stressors

Human disturbance

Activities such as low-altitude fixed-wing or helicopter flights can disturb mountain goats, especially during the time periods when they are raising young or during the winter. The Federal Aviation Authority regulates aircraft. The Forest Service does not have statutory authority over public aviation. The Forest Service does have authority over its own use of aircraft, and it authorizes helicopter landings for purposes such as timber harvest or recreation on NFS lands. Landing of fixed-wing planes occurs at authorized sites on NFS lands. Motorized vehicle access on NFS lands is managed by the Forest.

Changing climate and weather

Effects of changing climate on mountain goats is currently being investigated (see section 3.7.5, subsection "Wolverine," for more discussion of anticipated changes in winter climate).

Key indicator for analysis

The following species-specific indicator applies to the mountain goat:

- Risk of human disturbance of summer and winter mountain goat concentration and kidding areas.

In addition, refer to the indicators and effects of alternatives on "Cliff, cave, scree, and rock habitats."

Environmental consequences

Effects common to all alternatives

Plan components would support key ecosystem characteristics for mountain goats because their cliff habitats would have low levels of disturbance during key time periods. Most of the Forest's mountain goat habitat is in steep, rugged, remote terrain within existing wilderness and inventoried roadless areas, where there is a relatively low level of human disturbance. Motorized use and mechanized transport does not occur in existing wilderness, and designated aircraft landing strips in wilderness occur only where allowed by enabling legislation. Helicopter landings in wilderness is specifically authorized on a case-by-case basis (e.g., for emergencies). Under all alternatives, plan components to limit motorized access in grizzly bear habitat also benefit mountain goats (see also section 3.7.5, subsection "Grizzly bear"). Alternatives differ with respect to areas suitable for motorized over-snow vehicle use (see figures 1-42-45).

Alternative A

The current forest plan does not have management direction specific to mountain goats but does have an objective of providing sufficient habitat to contribute to meeting the objectives of MFWP management plans (p. II-8). Management direction for the Jewel Basin Hiking Area (which overlaps areas of summer and winter mountain goat habitat) does not allow motorized use, reducing the risk of mountain goat disturbance. Under this alternative, existing motorized over-snow vehicle use would continue where it is currently allowed, which includes small areas that overlap with winter mountain goat habitat (see figure 1-14).

Alternatives B modified, C, and D

Forestwide guideline FW-GDL–WL DIV-04 would limit the impacts of helicopter disturbance to known mountain goat winter concentration and kidding areas from December 1 to July 15. Under all action alternatives, the risk of disturbance to mountain goats from motorized over-snow vehicle use or wheeled motorized trail use would be low because most mountain goat habitat on the Forest is already in existing wilderness, backcountry nonmotorized use areas, or the Jewel Basin hiking area, where these uses are not allowed. Although all action alternatives have a very low risk of disturbing mountain goats because mountain goats use very steep terrain, alternative C is slightly more protective because all modeled mountain goat habitat would be in recommended wilderness (management area 1b). Under alternative B modified, most mountain goat habitat would be in existing or recommended wilderness. Under alternatives B modified and C, mechanized transport or motorized use (e.g., mountain bikes, chainsaw use) would not be suitable in management area 1b (see figures 1-15 through 1-17).

Cumulative effects

Mountain goat habitat is found in Glacier National Park, adjacent to the Forest, and on the Forest itself. Connectivity between Glacier National Park and NFS lands in the Middle Fork of the Flathead River has been maintained by an existing highway underpass that is used by mountain goats to access a mineral lick on the Forest Service side of U.S. Highway 2. Glacier National Park, encompassing about a million acres adjacent to the Forest, is closed to mountain goat hunting.

Past habitat management and hunting of mountain goats has been at levels that have sustained the population in most areas. Mountain goats occurred along the Whitefish Divide in the North Fork geographic area at one time but have been absent for close to 50 years. They were probably over-harvested at a time when regulations and road access made goat hunting easier (T. Thier, MFWP, personal communication, 2011). In the past few decades, the Forest has closed many miles of roads in the

Whitefish Range. Montana Fish, Wildlife and Parks may reintroduce mountain goats to an area of the Whitefish Range in the future, but this is currently highly uncertain.

Mountain goats may be affected by increases in recreation near their kidding areas or winter habitat, but in the heavily used Jewel Basin and adjacent Glacier National Park, they generally appear to be tolerant of people and may even become habituated to people. Mountain goats are generally not tolerant of dogs, so people hiking with dogs have had conflicts with mountain goats. Recreation personnel in the Glacier Park and the Jewel Basin are working to educate hikers to reduce the risk of conflicts.

Research on mountain goat-human interactions and on the impacts of climate change are underway in Glacier National Park. In the future, summer heat stress and the timing of snowmelt may affect mountain goats; however, there is a level of uncertainty about the effects of winter climate change at the highest elevations where mountain goats live. Glacier National Park, tribal lands of the Confederated Salish and Kootenai Tribes, and Forest lands provide a combined acreage of over 2 million acres where disturbance to mountain goats is relatively low.

Peregrine falcon

Affected environment

The peregrine falcon is a large neotropical migratory bird known to breed across Montana and winter in Mexico and South America. Peregrine falcons are breeding or permanent residents across most of the western United States. They were formerly listed under the Endangered Species Act. Nationwide estimates of territory occupancy, nest success, and productivity all substantially exceeded the target values needed to sustain recovery of the species, and the peregrine falcon was delisted from the endangered species list in 1999 (USFWS, 1999). Peregrine falcon population biology, ecology, habitat, and relationships identified by research are described in the Federal Register (USFWS, 2003b), the Montana Natural Heritage Program (MNHP-MTFWP, 2015b) and the NatureServe Web site (2015b).

Chemical contaminants used in the 1940s built up in the food chain and caused egg shell thinning so that peregrines were unable to produce young. Peregrine falcon populations crashed over most of their known range, and by the early 1980s and there were no known nesting peregrine falcons in the state of Montana. The number of known active peregrine falcon territories in Montana increased dramatically from 14 in 1994-96 to 84 active territories in 2017 (MPI, 2017).

The Montana Peregrine Institute monitors peregrines (www.montanaperegrine.org/index.html). As of 2015, there were 13 reported breeding territories within the Forest geographic areas; four in the Flathead River watershed, one in the Swan, two in the Stillwater, and six listed as being in the vicinity of Whitefish. This includes four new territories with data that is still considered tentative (MPI, 2017), but the monitoring results represent a large increase in reported territories in the last 10 years.

Peregrine falcons typically nest in a scrape on cliff ledges near lakes or major rivers and prey upon birds by diving in the air. Adult falcons demonstrate a high degree of breeding fidelity and are known to reuse the same cliff nest site for several decades (USFWS, 2003b). Nesting habitat is created by geologic factors and has not changed significantly since populations crashed. Habitat for bird species that peregrines prey upon is diverse and generally provides for a high diversity of bird species.

Courtship, nesting, and fledging generally occur between February 1 and mid-August. Falcon nests are generally placed in areas where concentrated human activities do not occur. Human activities have the potential to negatively impact falcons during the nesting period, depending on the type of activity and the distance. Disturbance near active nests can displace individuals and cause nest abandonment (Hamann et

al., 1999). Peregrine populations have recovered with the level of human activities currently occurring on NFS lands.

Peregrines are sensitive to some types of human disturbance, such as blasting and low-altitude helicopter flights at nest sites, during the time periods when they are raising young. Activities that may affect peregrine populations also include collection of young for falconry, illegal shooting, and collision with power lines, fences, or cars. Because peregrine falcons do not feed on road-killed animals, they are not as susceptible to vehicle collisions as bald eagles. In the past, peregrine populations were in drastic decline as a result of DDT use on croplands. DDT has been banned in the United States, but contaminants in peregrine winter habitat can reduce their reproduction or cause direct mortality. Many of the activities that may be threats to peregrines are not under the authority of the Forest Service or occur on other land ownerships

Key stressors

Human disturbance

Activities that may occur on NFS lands near peregrine falcon nesting habitat include timber harvest and associated road use, blasting, helicopter use, and some types of human recreation activities (USFWS, 1999). The Federal Aviation Authority regulates aircraft. The Forest Service does not have statutory authority over public aviation. The Forest Service has authority over its use of aircraft and manages helicopter landings on NFS lands. The Forest manages motorized vehicle access to habitat on NFS lands.

Changing climate

Peregrine falcons are not believed to be sensitive to climate changes. Although climate changes may affect the potential prey of peregrine falcons, they prey on a wide variety of other birds, so they would be likely to shift to species that become more abundant as the climate changes. They can move long distances to find food.

Key indicator for analysis

The following species-specific indicator applies to the peregrine falcon:

- Risk of human disturbance near active nest sites

In addition, refer to the key indicator for cliff, rock, scree, and cave habitats.

Environmental consequences

Effects common to all action alternatives

Plan components support key ecosystem characteristics for peregrine falcons because plan components limit disturbance at cliffs used as nesting sites during key time periods and support diverse habitats for a wide variety of bird species to provide prey (as well as for other birds of prey).

Alternative A

Recovery of the species has occurred during implementation of the existing forest plan. The 1986 forest plan provides direction to do a biological evaluation prior to implementing national forest vegetation management activities within 0.25 mile of nests or the use of pesticides within 15 miles of nests and to apply the American Peregrine Falcon Recovery Plan (appendix SS of the 1986 forest plan) during site-specific analysis.

The 1986 forest plan also states that the following guidance will be applied to activities that may affect the peregrine falcon:

- Prohibit disturbance-causing activities such as road construction, logging and seismic exploration using explosives within ½ mile of active peregrine falcon nests during the nesting period; February 1 through August 1.

Alternatives B modified, C, and D

As discussed under section 3.7.4, subsection “Cliff, cave, scree, and rock habitats,” and the “Aquatic, wetland, and riparian habitats,” key ecosystem characteristics described in the “Affected environment” section would be supported by implementation of plan components. Plan components would maintain or improve feeding habitat and promote a diversity of prey species. In addition, species-specific plan components included in all action alternatives would support the peregrine falcon by limiting activities known to disrupt nesting during the nesting season. Forestwide guideline FW-GDL-WL DIV-05 addresses disturbance to peregrine falcons by specifying that new projects or special-use authorizations for activities that are known to disrupt peregrines should be avoided from February 1-August 15 within 0.5 mile of cliffs used as active nest sites (identified in cooperation with MFWP) unless they include strategies or design features to mitigate disturbance. This guideline does not apply to emergency activities or areas identified as suitable for motorized over-snow vehicle use during their designated open season.

Cumulative effects

Because peregrine falcons tend to nest at low elevations along rivers and lakes that are heavily used by people, increases in human population and recreational use of the large rivers and lakes where peregrines nest could increase human disturbance. However, because peregrines often nest in places that are inaccessible to people, this is expected to have a minor effect. There is no known rock climbing in areas of the Forest with peregrine nests. Peregrine falcon nesting territories have increased with existing levels of human use.

Federal and State water quality laws protect waterbodies from contaminants that could affect the food chain of the peregrine falcon. Montana Fish, Wildlife and Parks regulates falconry and enforces penalties for the illegal shooting or poisoning of peregrine falcons. Montana Fish, Wildlife and Parks also works with State and Federal highway departments to ensure that nesting cliffs near highways are not impacted by highway construction.

Persistent grass/forb/shrub habitat

Introduction

About 175 wildlife species and two invertebrate species are known to occur on the Forest that use grass/forb/shrub or meadow habitats to meet at least some of their needs on a seasonal basis (see appendix 6). The Forest manages a small amount of persistent grass/forb/shrub habitats compared with surrounding lands (e.g., tribal lands of the Confederated Salish and Kootenai Tribes, the Helena-Lewis and Clark National Forest). Similar to the hardwood tree-dominated communities, persistent grass/forb/shrub-dominated plant communities are uncommon on the Forest. Less than 5 percent of the Flathead National Forest is estimated to provide this habitat (see appendix D of the forest plan). As a result, many species that are known as grassland species (Daniel Casey, 2000) or that depend upon grass/forb/shrub habitats year-round, are not yearlong residents on the Forest. For example, bighorn sheep are observed feeding on grassy slopes in the Bob Marshall Wilderness Complex along the boundary of the Helena-Lewis and Clark National Forests during the summer months but are not yearlong residents.

Affected environment

On the Forest, much of the persistent grass/forb/shrub habitat occurs in areas where moisture or soil conditions limit tree growth. Many of these areas occur as small patches or stringers surrounded by coniferous forest. Examples of key ecosystem characteristics for species associated with this habitat are abundant grasses, forbs, and shrubs that provide foraging and nesting sites. Species such as great gray owls hunt in wet or dry meadows and pastures(Hayward & Verner, 1994). Species such as elk forage in wet meadows as well as on open grassy slopes. There are no specific species discussed in this section because most of the species on the Forest are also associated with early-successional forest habitats created when disturbances (such as fire, timber harvest, or avalanches) change coniferous forest to transitional grass/forb/shrub habitat, as discussed in section 3.7.4., subsection “Coniferous forest habitats.”

This section assesses the effects to most species associated with persistent grass/forb/shrub habitats.

Key stressors

Because many persistent grass/forb/shrub habitats on the Forest occur in remote areas, fire, fire suppression, and invasive weeds and their treatment are the primary processes or activities that have affected these habitats on the Forest. Non-native plant invasion and livestock grazing can affect the quality or quantity of grass/forb/shrub communities, affecting nesting and feeding habitat or cover for wildlife. Seeds of non-native plants can be carried to NFS lands from other lands by wind, water, motorized and nonmotorized vehicles, machinery, livestock, wild animals and people, so control of this stressor requires a cooperative effort. The Forest has the authority to manage non-native plant invasion on NFS lands.

Key indicator for analysis of most species associated with grass/forb/shrub habitats

In addition to the effects discussed under section 3.3.3 on vegetation composition, the following indicator is used to focus the analysis.

- Quality and quantity of persistent grass/forb/shrub habitats

Environmental consequences

Effects common to all alternatives

Plan components would support key ecosystem characteristics because ecosystem processes (e.g., slow soil development, fire, and avalanches) would maintain or create these habitats and because controlling invasive weeds would maintain or restore the ecological integrity of grass/forb/shrub habitats.

Alternative A

The 1986 forest plan does not have specific objectives to treat grass/forb/shrub habitats with prescribed fire or to treat a certain number of acres to reduce the density or spread of invasive weeds in grass/forb/shrub habitats. However, since the need has been recognized, these activities have been accomplished under the guidance of an invasive species EIS and numerous cooperative projects between the Forest, the counties, the State, and non-government organizations.

Alternatives B modified, C, and D

Alternatives B modified, C, and D would benefit wildlife by having specific plan components to maintain or improve the composition of grass/forb/shrub habitats, to control invasive weeds, and to limit livestock grazing (see also sections 3.6 and 3.24). Desired condition FW-DC-TE&V-09 addresses the diversity of grass/forb/shrub habitats and would benefit wildlife. Desired conditions for grazing (FW-DC-GR-01

through 03) would also benefit wildlife. Standard FW-STD-GR-05 limits cattle grazing in the grizzly bear primary conservation area, which would limit the risk of spread of non-invasive plant species and benefit wildlife because the area covered by cattle allotments would not increase (the Forest does not have sheep grazing allotments).

Under alternatives B modified, C, and D, plan components for non-native invasive plants (FW-DC-NNIP-01 through 04, FW-GDL-NNIP-01, and FW-OBJ-NNIP-01) would benefit wildlife species by controlling invasive species with integrated pest management approaches by treating 12,000 to 16,000 acres over the expected 15-year life of the plan in order to contain or reduce non-native invasive plant density, infestation area, and/or occurrence. Over the life of the plan, a total of 1,500 to 5,000 acres would be treated through management activities such as prescribed burning to maintain persistent grass/forb/shrub plant communities (see FW-OBJ-TE&V-04).

Cumulative effects

This section summarizes the activities and effects that are common to most species associated with grass/forb/shrub habitats. The Forest has very limited persistent grass/forb/shrub habitats because most of the Forest gets sufficient precipitation and has sufficient soil development to support trees.

Grass/forb/shrub habitats have shifted from where they occurred historically and are anticipated to continue to shift over time as human settlement and climate conditions change. In the distant past, prescribed fire was used as a tool by Native Americans to create and sustain persistent grass/forb/shrub habitats, especially in valley bottoms in the warm-dry and warm-moist potential vegetation types where some key wildlife species spent the winter. Subsequently, some Flathead Valley lands were converted to human developments or agricultural lands. If properly managed, livestock grazing is compatible with maintenance of grass/forb/shrub habitats. Some wildlife species have adapted to these changes and now use agricultural lands that provide grasses and forbs. Even where forested lands were not permanently converted to developments, wildfire exclusion has resulted in succession of grass/forb/shrub habitats, especially adjacent to where human developments occur.

It is unlikely that changes in climate on the Forest would reduce precipitation for a long enough period of time to convert forested lands to grasslands, but wildfires are likely to play a dominant role in the future. In the future, if wildfires burn the same acreage more than one time in rapid succession, trees (even lodgepole pine, which produce seed at a relatively young age) may not grow old enough to produce seed between burns, so grass/forb/shrub areas may persist for longer periods of time. This occurred in some areas of the Forest after wildfires in 1910, 1919, and 1926.

In summary, proposed management direction on the Forest, in the context of all lands of the larger landscape, contribute to persistent grass/forb/shrub habitats. Although the Forest does not have authority over all the stressors, the ecological conditions of persistent grass/forb/shrub communities would be provided on NFS lands. This would be accomplished by plan components to support natural ecosystem processes that create these habitats and to restore habitats that have been affected by invasive species. Coarse-filter plan components provide for biodiversity and ecological conditions that support the long-term persistence of the majority of species associated with these habitats. Grass/forb/shrub habitat is distributed across all Forest geographic areas.

High-elevation habitats

Affected environment

High-elevation ecosystems include species associated with krummholz (stunted and wind-deformed trees), high-elevation tree species such as whitebark pine, snow, and alpine habitats (see appendix 6).

These habitats occur in portions of the cold potential vegetation type, which covers approximately 335,500 acres, or 14 percent, of the Forest (see appendix D of the forest plan). Most ecosystems that occur at high elevations are not substantially altered from historical conditions. Historically, these ecosystems have been affected by high winds, extreme temperatures, avalanches, unstable rock, poorly developed soils with low organic matter, and/or high ultraviolet radiation levels. Snow retention provides moisture for plants during the growing season, as well as habitat. Examples of species associated with high elevations (that have not been addressed in other sections of this final EIS) include the wolverine, American pipit, golden-mantled ground squirrel, white-tailed ptarmigan, and gray-crowned rosy-finch. Examples of key ecosystem characteristics of high-elevation habitats on the Forest are that they have colder temperatures, more snow cover than lower elevations, and snow that persists into the spring. Wildlife species associated with this habitat may use the accumulated snow for nesting, denning, or shelter from the wind and cold. Some species dig beneath the snow for foraging.

For example, the white-tailed ptarmigan and gray-crowned rosy-finch are restricted to the highest elevations in wilderness areas on the Forest during the breeding season (Kuennen, 2013l, 2013p). Habitat for the white-tailed ptarmigan is alpine locations; moist vegetation near snowfields and streams and willow-dominated (*Salix* spp.) plant communities are present in all areas heavily used by ptarmigan in summer. In winter, according to work by Choate and Scott, ptarmigan occupy rocky areas and patches of krummholz (Choate, 1963). Gray-crowned rosy-finches nest in abandoned buildings, crevices, cliffs, and talus among glaciers or persistent snowfields and forage in barren, rocky, or grassy areas adjacent to the nesting sites.

This section assesses effects to most species associated with high-elevation habitats.

Key stressors

Land management

On the Forest, there have been few stressors to species associated with high-elevation habitats and persistent spring snow because the majority of this habitat is in remote or protected areas on NFS lands, through designation as wilderness and inventoried roadless areas (figure 1-73). The main activities that occur are related to dispersed recreation. Recreational uses and management activities (such as trail construction) may be stressors in some locations.

Changing climate

There is a great deal of uncertainty surrounding climate change and its potential effects on high elevation habitats, because the level of uncertainty associated with winter temperature and precipitation is higher than for summer temperature and precipitation. Whether it is invasive species (e.g., white pine blister rust), drought, uncharacteristic wildfires, or some other agent or combination of agents that serves to stress high-elevation ecosystems, recent research suggests that climate change will likely exacerbate those stressors and that “stress complexes” will continue to manifest (Robert E. Keane et al., in press). Potential effects considerations associated with climate change are described in section 3.1.2, the introduction to section 3.3, and section 3.5.2 under the “Alpine habitat group.”

Key indicators for analysis of most species associated with high-elevation habitats

In addition to the effects discussed under section 3.7.5, subsection “Wolverine,” the following key indicators are used to focus the analysis:

- Land management
- Changing climate

Environmental consequences

Effects common to all alternatives

High-elevation habitats are affected by inherent geologic and climatic conditions. Ecosystem plan components would meet the needs of species associated with high-elevation habitats. Species associated with this habitat live at the highest elevations in existing wilderness where there are generally few, if any, threats to habitat. There are no differences in existing wilderness for any alternative.

There are differences in alternatives with respect to recommended wilderness (figures 1-01 to 1-04) and suitability for motorized over-snow vehicle use (figures 1-42 to 1-45), discussed in detail in the section on wolverines (see section 3.7.5, subsection “Wolverine”).

Cumulative effects

This section summarizes activities and effects that are common to most species associated with high-elevation habitats (for wolverine, see section 3.7.5, subsection “Wolverine”).

During the summer and fall, nonmotorized trails at high elevations receive use primarily by hikers, horseback riders, and mountain bikers. Some NFS roads access high-elevation habitats, but a number of NFS roads as well as some high-elevation wheeled motorized trails have been closed in recent decades, making areas less accessible to people. The area where motorized over-snow vehicle use is allowed was more widespread in the past; it has been limited since implementation of the winter-use provisions of the Flathead’s winter motorized recreation plan, which is amendment 24 to the 1986 forest plan (USDA, 2006). This decision identified areas and routes open and closed to motorized over-snow vehicle use. Amendment 24 currently allows motorized over-snow vehicle use on about 31 percent of the Flathead National Forest (all outside of wilderness areas), and it is not allowed on about 69 percent of the Forest. Many high-elevation areas are open to motorized over-snow vehicle use from December through March only, but the amendment 24 decision included four “late spring” areas where motorized over-snow vehicle use is allowed during April and May (see section 3.7.5, subsection “Grizzly bear,” for more details).

Glacier National Park, the Mission Mountains Tribal Wilderness (adjacent to the Forest), and State lands managed by Montana Department of Natural Resources and Conservation (in and adjacent to the Forest) also provide high-elevation habitat with persistent spring snow. Glacier National Park and the tribal wilderness are closed to motorized over-snow vehicle use. Montana Department of Natural Resources and Conservation lands on portions of the Stillwater State Forest in the Salish Mountains geographic area, the Coal Creek State Forest in the North Fork geographic area, and the Swan State Forest in the Swan Valley geographic area are generally open to motorized over-snow vehicle use.

Ski areas also are located in high-elevation habitats with persistent spring snow. Whitefish Mountain Resort has operated on NFS lands under a special-use permit as a ski area since the 1940s and as a year-round resort since the 1980s. This area has the highest level of year-round use of any recreation area in persistent snow and high-elevation habitats on the Forest. The Blacktail Mountain Ski Area also operates on NFS lands under a special-use permit, but it is not operated as a year-round resort.

There are no mineral or energy developments in high-elevation habitats on the Forest (see section 3.23 for more details).

Habitat conditions associated with snow that persists through the spring were not a concern in the past but have become a concern in recent decades due to changes in the timing of snowmelt that have been documented worldwide and in areas of Glacier National Park (adjacent to the Forest) over the last century. The most important climate change predictions for this group of species are that the mean monthly minimum temperature (spring and autumn) and the mean monthly maximum temperature

(winter) may rise above freezing more months out of the year. Seasonal precipitation is projected to be slightly higher in winter and spring. The combination of these two factors may be beneficial, neutral, or detrimental to these habitats, depending upon whether more precipitation falls as rain or as snow and at what elevations. If the temperature in winter or spring rises above freezing for a more prolonged period of time, snow does not persist as long. However, if increased precipitation falls as snow at high elevations, this could offset the increased melting. Winter climate change predictions have less certainty than summer climate change predictions (see sections 3.1.1 and the Forest assessment (USDA, 2014a) for more details).

In summary, proposed management direction on the Forest, in the context of all lands of the larger landscape, contributes to high-elevation habitats, including those with persistent spring snow. Although the Forest does not have authority over all the stressors to high-elevation habitats, ecological conditions and the processes that maintain them would be provided on NFS lands. High-elevation habitat is distributed across all Forest geographic areas. Coarse-filter plan components provide for biodiversity and ecological conditions that support the long-term persistence of the majority of species.

Coniferous forest habitats

Introduction

Hundreds of vertebrate species and about a dozen invertebrate species that are associated with coniferous forests and their key ecosystem characteristics are known to occur on the Forest (see appendix 6). Plan components for terrestrial wildlife habitats are integrated with the vegetation plan components. Vegetation plan components are specified for potential vegetation types, which are groupings of individual habitat types (Pfister, Kovalchik, Amo, & Presby, 1977). Habitat types are an aggregation of ecological sites of like biophysical environments (such as climate, aspect, soil characteristics) that produce plant communities with similar composition, structure, and function. Potential vegetation types serve as a basis for describing certain ecological conditions across the Forest and are useful in understanding potential productivity, natural biodiversity, and processes that sustain these ecosystem conditions. Forest plan figures B-03 through B-09 display the potential vegetation types, their distribution, and their pattern across the Forest. The potential vegetation types are the warm-dry, warm-moist, cool-moist, and cold coniferous forest types. The cool-moist type is most abundant across the Forest, making up about 68 percent of the Forest's acreage (see forest plan appendix D for more details). Appendix 6 lists the association of wildlife species with potential vegetation type groups.

Because wildfire, insects, and disease have historically created a mosaic of habitats that range from young, open forest with shade-intolerant conifer species to dense, old forest with shade-tolerant species, most of the associated wildlife species are adapted to a complex of successional stages and species compositions that are within the natural range of variation. This complex of successional stages meets their needs for nesting or denning, foraging, resting, cover, and connectivity. For example, the goshawk nests in large trees but hunts in forested areas with an open understory. Some species are habitat generalists that are associated with all coniferous forest types in all successional stages found on the Forest. White-tailed deer spend much of the winter at lower elevations in mature coniferous forests that have sufficient canopy trees to intercept snow, but they forage in all successional stages throughout the year, including in openings. Marten prefer coniferous forest cover but prey on a wide variety of small mammals, including those that have high densities in forest openings. Some species, such as the Clark's nutcracker, are associated with particular tree species for nesting and foraging (e.g., whitebark pine and ponderosa pine) that are uncommon on the Forest. Species such as the Canada lynx and boreal owl are associated with boreal forests in the cool-moist and cold potential vegetation types (Kuennen, 2013e).

Fire and regeneration harvest in coniferous forest create early-successional habitat on a temporary basis. About 175 species on the Forest use early-successional grass/forb/shrub habitats for feeding or breeding during all or portions of the year (see appendix 6). These transitory grass/forb/shrub habitats may be a successional stage of coniferous forest development that lasts approximately 10-20 years following fire or timber harvest, or they may persist for several more decades on harsh sites with slow forest growth or in areas where wildfires have burned the same area more than once in a short period of time (see also section 3.7.4, subsection "Persistent grass/forb/shrub habitat").

Because there are specific key ecosystem characteristics for some wildlife species associated with coniferous forests, the analysis of effects can be found in three subsections of section 3.7.4 of this final EIS: (1) "Coniferous forest habitats," (2) "Old-growth forest: Very large live and dead trees," and (3) "Burned forest and dead tree habitats." Species such as the pileated woodpecker and fisher are associated with forest structure that has snags and downed wood in the very large size class for nesting, resting, feeding, or denning. Species such as the black-backed woodpecker are associated with the abundant dead trees of a wide range of sizes as well as the abundant wood-boring insects found in recently burned forests.

This section assesses the effects to most species associated with coniferous forest habitats in a variety of successional stages. Following the general discussion, five species and one species group (ungulates) are discussed as examples in order to help display differences in effects of alternatives. The five species are the flammulated owl, Clark's nutcracker, gray wolf, northern goshawk, and marten. The ungulate species group includes species such as deer, elk, and moose. For Canada lynx and grizzly bear, see section 3.7.5.

Affected environment

Coniferous forest habitats occur on over 2 million acres, or about 95 percent, of the Forest (see appendix D of the forest plan). Most of these forest habitats are located in relatively undeveloped areas (such as designated wilderness and inventoried roadless areas) and have been influenced primarily by natural ecological processes and disturbances, with a low level of human activity. Cumulative total acres of timber harvested on the Forest from the 1940s through 2012 is about 394,000 acres (about 16 percent of the total Forest acres), reaching a peak in the 1970s and declining since then (see table 18). In contrast, wildfires burned relatively few acres from 1940 to 1990 (see figure 56 in section 3.8.2) but started increasing in the mid 1990s, reaching a peak in the decade 2000 to 2010. Approximately 430,000 acres burned by wildfire on Flathead National Forest lands between 1994 and 2013, or about 18 percent of Forest acres (see table 95 in section 3.8.2, and Trechsel (2014)). The areas burned included about 69,000 acres of forest that had been harvested in the decades prior to the fires. Planting of tree seedlings within areas disturbed by fire or within regeneration harvest units has occurred across approximately 136,000 acres (about 5.6 percent) of Forest lands since 1950. About 61,000 of these acres were planted from 1990 to 2013. Planting is usually conducted to establish desired tree species on a site where natural regeneration is not expected to be sufficient, to increase tree diversity, and to restore species that have been affected by introduced diseases such as white pine blister rust.

Some species prefer the early-successional stages of a forest's development, but others prefer later stages. Some species prefer edge habitats, but other species, called forest-interior species, do not. Forest-interior species need corridors between early-successional forest and mature forest that are wide enough to reduce edge effects that matter to the targeted species (Lidicker & Koenig, 1996). Temple (1986) studied the effects of "edge" on 16 species of forest-interior birds and defined the "core area" of a forest as the area more than about 300 feet from an edge. When mature or old forests remain in small patches or stringers, surrounded by early-successional forest, they are said to be "fragmented." For the 16 bird species studied by Temple, having a core area was a better predictor of bird species presence and abundance than was the total area of the fragment. Problems associated with forest fragmentation include weather-related effects

(such as blowdown), loss of forest interior habitat, loss of habitat connectivity, and increased vulnerability to predators or nest parasites (Finch, 1991).

Key stressors

On all lands, timber harvest and associated road access, prescribed fire, wildfire, thinning, and planting can affect the quantity, quality, patch size, and connectivity of coniferous forest wildlife habitats. Fire suppression can alter the historic stand structure important to some species. These activities can also affect habitat connectivity. Habitat connectivity provided by forest cover is discussed following the section on marten. For other aspects of habitat connectivity, see section 3.7.6.

Key indicators for analysis of most species associated with coniferous forest habitats

- Forest size class

Management area suitability for timber production and management areas where timber harvest is allowable (see section 3.21 for more details)

Differences in modeled effects of alternatives on forest size class are used as an indicator of successional stage. Effects of vegetation management were modeled for each alternative. Potential vegetation types (see forest plan figure B-03), key ecosystem characteristics, and key indicators for coniferous forests are discussed in detail in section 3.3.

The SIMPPLLE model was used to estimate the effects of factors such as fire, insects and disease, and forest succession over the next five decades. Although wildfire is difficult to predict, the SIMPPLLE model has associated fire and suppression logic that simulates the effects of wildfire. Vegetation treatments, including timber harvest, were modeled using the Spectrum model, which applies potential management actions to landscapes over a specified time period, using constraints such as anticipated budgets and timber suitability and desired goals (objectives), and displays the resulting outcomes. The two models were used interactively to analyze vegetation conditions. See appendix 2 for more details on the vegetation modeling.

This section discusses potential consequences based upon the likelihood of future conditions as depicted in the simulation modeling processes. Model results are probabilistic and are not intended to produce precise values for vegetation conditions. The results are a useful tool for comparing alternatives and assessing how vegetation might change over time. Model outputs augment other sources of information, including research and professional knowledge of how ecosystem processes (such as succession) and disturbances and stressors (such as fire, insect infestation, timber harvest, and climate) might influence changes in vegetation conditions over time, especially at the scale of the plan area.

There are more similarities than there are differences in the modeled results for changes in vegetation conditions over time between alternatives. Generally, the alternatives almost always follow similar trends, with variation in the rate and degree of change over the five-decade model period. All alternatives have similar amounts of modeled natural disturbances, such as fire and insect or disease activity, which would influence vegetation conditions (including snags, downed wood) and landscape patterns over time. The model does not use prescribed fire as an option for alternative A, although prescribed fire is used to meet wildlife objectives in some areas, such as big game winter habitat. Some management areas are suitable for timber production and some are not suitable for timber production. In some areas, timber harvest is allowable under certain conditions, even if the areas are not suitable for timber production (see sections 3.3 and 3.20 and appendix 2 for more details).

The effects of alternatives on size class are summarized below, with effects on most species associated with coniferous forests in a variety of successional stages described first. The sections on individual

species discuss how Ecosystem Research Group modeled the habitat for selected species on the Forest. These species include the flammulated owl, marten, goshawk, elk, moose, and white-tailed deer (see appendix 3 for more details).

Environmental consequences

Summary of modeled alternative consequences

Some wildlife species are associated with particular size classes, but others are associated with a mix of size classes. For, example, some migratory birds prefer nesting or foraging in the seedling/sapling size class where forest conditions are more open and shrubs, grasses, and forbs are more abundant for nest sites or sources of food. Other migratory birds prefer nesting and feeding in the mature size class where forest conditions are characterized by taller trees. Ecosystem plan components would meet the needs of most species associated with coniferous forest habitats in a variety of successional stages. Forest size classes change over time, and the majority of species associated with coniferous forests are adapted to these changing conditions. Conditions change due to forest succession, natural drivers and stressors (e.g., wildfire, insects, disease) and active vegetation management (e.g., timber harvest, fuels reduction, prescribed fire). A variety of successional stages adds to forest diversity.

A summary of the model results for forest size class follows; refer to section 3.3.4 for more detailed information.

Seedling/sapling size class: Model results for all alternatives show that an upward trend in this size class is likely over the next five decades, with the exception of the warm-moist potential vegetation type. In the warm-moist potential vegetation type, early-successional forest in the seedling/sapling size class trends downward for all but alternative A. The modeled trend for the seedling/sapling size class indicates that fire (mostly high-severity wildfire but also some prescribed fire) remains a main driver of vegetation change. Most of the Forest is expected to remain within the range of natural variation for the next five decades. This size class generally provides wildlife benefits of a high quantity of forage, nesting habitat for species that nest in grass/forb/shrub habitats, and connectivity of these habitats. Transitional forests stay in this size class for a period of about 20 years, on average, before moving into the small/medium size class as a result of forest succession. The time it takes can be highly variable, however, depending upon the productivity of the site, density of trees, and whether a site is planted or precommercially thinned.

Small/medium forest size class: Model results for all alternatives show a downward trend by the fifth decade for the acreage in small and medium size classes. Existing amounts of the medium size class are high forestwide and in all potential vegetation types except warm-dry, so the downward trend is generally favorable relative to the desired condition. The small/medium size class does generally not have the benefit of a high quantity of forage, nor does it have the benefit of large and very large trees for wildlife denning or nesting, so its habitat quality for many wildlife species tends to be lower. However, it does provide cover for forest habitat connectivity. Forests on most sites may stay in a small to medium forest size class for 50 to 80 years before moving into the large size class as a result of forest succession. The time it takes can be highly variable, however, depending upon the productivity of the site and the density of trees.

Large forest size class: Modeling for all alternatives indicates there will be a strong increase in the acreage of the large size class by the fifth decade, forestwide and within all potential vegetation types. Natural succession of forests into larger size classes is the main driver of this increase. Model results indicate that natural disturbances have a substantially greater impact on reducing this size class than timber harvest amounts, with fire, insects, and disease the primary disturbances. This size class generally

provides the benefit of a high quantity of denning and nesting habitat for species associated with mature forest as well as connectivity of these habitats. The time it takes for a forest to change from the large to the very large size class through forest succession can be highly variable, depending upon the productivity of the site, density of trees, whether a site is planted or precommercially thinned, and the amount and pattern of insect or disease infestation. It may take only 20 or 30 years, or it may never occur, such as in dense forest conditions where tree growth is very limited.

Very large forest size class: Model results show that the acreage in this size class is likely to increase in the warm-dry and warm-moist potential vegetation types; to stay relatively static in the cold type; and to decrease in the cool-moist type. The trend upward in the very large size class in the warm-moist potential vegetation type is likely tied to the higher productivity and growth rates in this type as well as to the fact that most of it occurs in areas where wildfires are likely to be suppressed. Model results indicate that natural disturbances have a substantially greater impact on reducing this size class than timber harvest amounts, with insects and disease the primary disturbances. The downward trend in the cool-moist type is likely due to the effects of stand-replacement fire, which changes the forest to an early-successional stage. Some of the change is also due to the activity of insects and disease, primarily the Douglas-fir beetle. This size class generally provides the benefit of very large trees for nesting, denning, and resting.

Forestwide, alternative C shows the greatest modeled increase in the very large size class, followed by alternative D, alternative B modified, and alternative A. Though alternative C has nearly as many average acres harvested per decade as the other alternatives, the model applied much less regeneration harvest than it did non-regeneration harvest (e.g., commercial thinning), which would result in an increase in the forest size class category. However, actual treatments on the ground may or may not be of the same proportions as the model projected among the alternatives. Treatment prescriptions depend entirely on site-specific conditions and project objectives.

In summary, modeled increases in the large size class and in the very large size class of the warm-dry and warm-moist potential vegetation types would be beneficial to wildlife species associated with mature forest cover and large or very large trees. These size class changes, combined with model results showing an increase in the proportion of western larch, ponderosa pine, and western white pine, would be positive for habitat diversity and many nesting birds. Increases in the seedling/sapling size class are beneficial for species associated with grasses/forb/shrub habitats (see appendix 6). Reductions in the small/medium size class are beneficial for many species as this size class tends to have the lowest diversity.

Effects common to all alternatives

Under all alternatives, about 1.6 million acres of the Forest are lands that are not suitable for timber production because they are in existing wilderness or are in inventoried roadless areas, which are not suitable for timber production under the 2001 Roadless Area Conservation Rule (see table 149 and figures B-25 and B-26).

Timber harvest is allowable on some lands identified as not suitable for timber production for such purposes as salvage, fuels management, insect and disease mitigation, protection or enhancement of wildlife habitat, research or administrative studies, or recreation and scenic resource management (see section 3.21 for more details). Timber harvest on these lands is not scheduled or managed on a rotation basis. Timber harvest on these lands would have to be consistent with other management direction. For example, riparian habitat conservation areas (in alternative A), riparian management zones (in the action alternatives, and the backcountry management areas (5a through 5d in the forest plan) are identified as unsuitable for timber production in the forest plan, although there may be site-specific situations where timber harvest is a desirable tool to use for achieving desired conditions for certain resources, such as fuel

reduction treatments to reduce fire hazard. These treatments would have to be consistent with the desired conditions and other plan direction for the area.

There is also plan direction that limits vegetation treatments based on site-specific stand conditions. For example, old-growth forest is identified at the project level, and standards in the plan under all alternatives restrict timber harvest, regardless of management area. Additionally, in Canada lynx habitat, Northern Rockies Lynx Management Direction (NRLMD) vegetation management standards apply regardless of management area (see appendix A in the forest plan). With respect to lands where timber harvest is allowable, consequences to wildlife are difficult to predict with certainty in a programmatic document such as this because it is unknown where wildfires, insects, or disease will occur. Effects to wildlife would be considered during project implementation.

The differences between the consequences for lands suitable for timber production and lands where timber harvest is allowable are compared for each alternative. The primary differences in the alternatives are due to different combinations of management areas, whether the management areas are suitable for timber production, whether timber harvest is allowable, and the intensity of management that may occur.

Alternative A

Management areas in the 1986 forest plan (alternative A) were grouped into the management area categories used for alternatives B modified, C, and D (management areas 1 to 7) (see table 3). Under alternative A, about 534,600 acres are suitable for timber production (see figure 1-09 and table 152), the most under any alternative. Under alternative A, acres where timber harvest is allowable on lands *not* suitable for timber production is 437,700 acres (about 18 percent of the Forest).

In addition to differences in lands where timber harvest is suitable or allowable, other plan components may affect coniferous forest successional stages and their pattern on the landscape. Alternative A has limits on distance to cover and regeneration harvest (until adjacent areas recover) in some portions of the grizzly bear recovery zone/primary conservation area (see “Grizzly bear” subsection of section 3.7.5 for more details). These guidelines tend to result in an initial pattern of numerous small patches of seedling/sapling habitat, with distinct edges along boundaries of regeneration harvest areas and unharvested areas (except in areas where large stand-replacing wildfires have occurred). The seedling/sapling successional stage generally has low tree canopy cover and a distinct edge for a period of about 20 years, on average. The amount and pattern of vegetation management resulting from this alternative would provide the greatest benefits for wildlife species associated with early-successional forests and edge but would provide the least benefit for wildlife species associated with late-successional stages and interior forest habitats (see individual species discussions below).

Alternative B modified

Under alternative B modified, about 465,200 acres are suitable for timber production (see figure 1-10 and table 152). Alternatives B modified and D have similar proportions of management intensity, with approximately 52 percent of lands suitable for timber production allowing for a moderate level of intensity of management (management area 6b) and 48 percent allowing for more intense management (management area 6c). Alternative B modified has about 447,200 acres (19 percent of the Forest) where timber harvest is allowable. Under alternatives B modified and D, approximately half of these acres are comprised of inventoried roadless areas.

In addition to reflecting the differences in lands where timber harvest is suitable vs. those where timber harvest is allowable, other plan components may affect coniferous forest successional stages and their pattern on the landscape. Under this alternative, desired conditions for wildlife have been integrated with desired conditions for vegetation. There are limits on distance to cover in riparian management zones

(FW-GDL-RMZ-09). Outside of riparian management zones, there are no distance to cover specifications, but there is a forestwide guideline (FW-GDL-WL DIV-06) that has the intent that connectivity of forest cover should not be severed. In order to move towards desired conditions FW-DC-TE&V-18 and 19 for landscape pattern and desired condition FW-DC-TE&V-14 and forestwide guideline FW-GDL-TE&V-06 would create a trend towards larger and more contiguous patches of the large and very large size classes over time (this is particularly important for some forest-interior species). Seedling/sapling habitat patches in areas of active management are also likely to be larger in size and to have a less distinct edge in some areas. These patterns are more consistent with the natural range of variation and would benefit a wide variety of species. Commercial thinning, small group selection, and prescribed fire would play a strong role in achieving desired conditions under alternative B modified, according to the models. For example, in mixed-species forests containing ponderosa pine and Douglas-fir, greater use of commercial thinning, group selection harvest, and prescribed fire would maintain more cover in the upper canopy and create more of a mosaic of understory vegetation while increasing grass/forb/shrub habitats. This pattern would benefit some of the wildlife species associated with a fine-patch mosaic (see individual species discussions below, section 3.7.6, and section 3.3.8 for more details).

Alternative C

Under alternative C, about 308,200 acres are suitable for timber production (see figure 1-11 and table 152), which is the least of all alternatives. Alternative C has about 403,700 acres (17 percent of the Forest) where timber harvest is allowable. For alternative C, the largest percentage of these acres are those allocated to management area 6a (general forest low-intensity vegetation management). With respect to management area 6, it is likely that there would be less intensive harvest of live conifer trees in management area 6a areas over time because this management area is not suitable for timber production and does not have scheduled timber harvest. Less intensive or extensive timber harvest would be of greater benefit for species associated with late-successional stages or mature forest cover and would be of less benefit for species associated with early-successional stages (see appendix 6 for a list of species). At 63 percent, alternative C has the highest proportion of lands suitable for timber production with a medium intensity of vegetation management (management area 6b), and under this alternative 37 percent of the lands allow more intense management (management area 6c).

In addition to reflecting the differences in lands where timber harvest is suitable vs. those where it is allowable, other plan components may affect coniferous forest successional stages and their pattern on the landscape. The SIMPPLLE model assumes that fire suppression is less likely in wilderness and recommended wilderness management areas than in many other management areas. Because alternative C has more management area 1b (recommended wilderness), modeling for this alternative indicates there would be more acres of the seedling/sapling size class than for the other alternatives. This effect would not be beneficial to species associated with the large and very large size classes or areas of dense cover. This effect would be beneficial for species associated with the seedling/sapling size class, snags, and downed woody material of all sizes. Compared to timber harvest, early seral patches created by wildfire have more snags, are much larger (10,000-40,000 acres in recent decades), have less edge contrast, and create greater reductions in mature forest connectivity (see individual species discussions below, section 3.7.6, and section 3.3.8 for more details).

Alternative D

Under alternative D, about 482,600 acres are suited for timber production (see figure 1-12 and table 152) and there are about 522,600 acres where timber harvest is allowable (22 percent of the Forest; see section 3.20 for more details; see figures 1-09 through 1-12 for timber suitability). Under this alternative, the effects on vegetation pattern would be similar to alternative A, but the model uses prescribed fire to

achieve desired conditions in areas where timber harvest is not feasible (see individual species discussions in this section [3.7.4] and in sections 3.3.8, 3.7.5, and 3.7.6).

Cumulative effects

This section summarizes activities and effects that are common to most species associated with coniferous forest habitats. Wildlife habitats provided by a variety of successional stages are constantly changing due to processes such as wildfire, insects or disease, and forest succession as well as timber harvest, thinning, and planting.

In the past, coniferous forest lands in the Flathead Valley bottom were cleared to create agricultural lands. This resulted in loss of habitat for species associated with the dry ponderosa pine forests that formerly occupied much of the valley bottom and created habitat for species associated with grasslands or hay fields. In the past few decades, agricultural lands have been commercially developed or subdivided for residences as the human population has grown. In the future, increased urbanization and population growth of the Flathead Valley is expected to lead to increases in forest land clearing and conversion of habitat on private lands; increased loss of open space and loss of connectivity due to subdivision of agricultural lands; and greater need for structure protection with less firefighting resources available for other suppression activities. In the future, the subdivision of private property has the potential to increase the disturbance or displacement of those species that are sensitive to human disturbance. For some species, private land development may cause them to shift habitat use to undeveloped lands in Glacier National Park, the Forest, other private timberlands, or State lands managed by MFWP or the Montana Department of Natural Resources and Conservation. As a result of a growing human population, higher levels of recreational use (both motorized and nonmotorized) in areas that previously had low levels of use could also affect species that are sensitive to disturbance during certain times of the year (see individual species sections for more details).

Timber harvest, fire suppression, thinning, planting, and wildfires are the past activities that have had the greatest influence on the amount and distribution of forested habitat on NFS lands as well as State and private timber lands. These activities have created a variety of successional stages, structures, tree species mixes, and forest patterns that have been neutral for some wildlife species, beneficial to some wildlife species, and detrimental to others.

In the future, fuels reduction efforts are possible on all land ownerships, in particular in the wildland-urban interface near private residences. In the past, decades of very active fire suppression led to a build-up of fuels at the same time when more people were moving into areas adjacent to and intermingled with NFS lands on the Forest. Fire suppression in the warm-dry potential vegetation type and ponderosa pine portion of the warm-moist potential vegetation type, in particular, has changed stand structure and led to increased tree densities in forests that were historically more open.

In the future, timber harvest (including salvage of fire- or insect-killed trees) occurring on private, State, or NFS lands may cumulatively affect the quantity and quality of wildlife habitat, especially in the valley bottoms where people live. The effects to wildlife are difficult to predict because they would depend on a wide variety of factors (e.g., whether habitat that is outside of historical conditions is restored, where wildfires and infestations of insects or diseases occur, the type and location of vegetation treatments). If vegetation trends towards desired conditions for wildlife, the effects would be beneficial. If not, then habitat quality and quantity may be reduced. The desired conditions for vegetation in the forest plan would maintain or improve the diversity of forested habitats on the Forest (see section 3.3 for more details). Other forest land managers (e.g., the Montana Department of Natural Resources and Conservation) also have land management plans (e.g., the Habitat Conservation Plan of the Montana

Department of Natural Resources and Conservation) to address wildlife needs, and other agencies employ wildlife biologists to address desired conditions for wildlife and assess effects of activities on their lands.

In the past, many miles of road were built to access Federal, State, and private lands. Forest roads have resulted in direct loss of habitat for some wildlife species. For example, roads have made adjacent areas more accessible for the removal of snags for firewood gathering, and the impact is greatest near communities (see the sections below on "Burned forest and dead tree habitats" and on individual species for more discussion on the effects of roads). Forest roads have also increased human disturbance to some wildlife species (see sections on individual species).

Many miles of forest roads on all land ownerships have been closed with gates or berms or have been rehabilitated or decommissioned in the last few decades. This has reduced the motorized access for legal hunting and trapping of some wildlife species, the mortality of some species, and the disturbance or displacement of some species. As on NFS lands, effects to wildlife associated with human use of roads will likely continue in the future. Administrative use of roads closed to the public increases during emergency response situations, such as wildfire response, and also during timber harvest preparation and implementation. Animals are likely to continue to be killed by vehicle collisions on highways in the valleys.

In the past, the invasion of Forest lands by non-native species has occurred due to a variety of activities, including road building, timber harvest, livestock, and recreational activities. Multiple agencies, counties, and private organizations are involved in educating the public on the importance of preventing the spread of non-native species, and many agencies engage in management actions to prevent or control infestations. Grazing has occurred and will continue to take place on private lands, which may cause effects such as cowbird nest parasitism on forest-dwelling birds if those Forest lands are close to private lands that house livestock.

In summary, proposed management direction on the Forest, in the context of all lands of the larger landscape, contributes to coniferous forest habitats in a variety of successional stages. Although the Forest does not have authority over all the stressors, the ecological conditions of coniferous forest communities and the processes that maintain them would be provided on NFS lands. Coniferous forest habitat is distributed across all Forest geographic areas. Coarse-filter plan components that provide for biodiversity would support the long-term persistence of the majority of species associated with this habitat.

In addition to effects on most species associated with coniferous forest habitats, the following sections describe species-specific effects. For coniferous forest connectivity, see section 3.7.4, subsection "Old-growth forest, very large live tree habitat, and very large dead tree habitat," and section 3.3.6.

Flammulated owl (species of conservation concern)

Affected environment

This species is identified as a species of conservation concern by the regional forester of the Northern Region (www.fs.usda.gov/goto/flathead/SCC). The flammulated owl is a small, neotropical migratory bird that breeds in scattered areas of British Columbia and the western United States, including western Montana, and it winters in Mexico. This long-distance migration habit and low natal site fidelity are believed to contribute to genetic interchange between populations in different mountain ranges (COSEWIC, 2010). Arsenault and others reported in 2002 that flammulated owls are usually found in distinct aggregations of up to 10 territories (COSEWIC, 2010). Flammulated owl males had mean home ranges of about 35 acres in Colorado (Linkhart, Reynolds, & Ryder, 1998) and about 40 acres in Oregon

(Linkhart & McCallum, 2013). The population status, trend, and home range size of flammulated owls in Montana is unknown.

The Avian Science Center at the University of Montana conducted surveys throughout a large portion of suitable breeding habitat in 2005 (Cilimburg, 2006; K. Smucker, Cilimburg, & Fylling, 2008). They located flammulated owls on all but three of the Forests in the Northern Region; no owls were detected on the Lewis and Clark, Custer, or Gallatin National Forests. The survey detected 243 flammulated owls on 78 transects across the Northern Region, with the highest occupancy rates on the Nez Perce National Forest, followed by the Lolo, Bitterroot, and Helena National Forests. The lowest occupancy rates occurred on the Idaho Panhandle, Clearwater, and Flathead National Forests. There are very few historic records of flammulated owls on the Forest, likely due to detection difficulty and naturally low amounts of suitable forest types that provide key habitats. Suitable landscapes have an abundance of xeric ponderosa pine/Douglas-fir forest, whereas unsuitable landscapes have patches of suitable microhabitat within larger areas of wetter coniferous forest types (J. S. Marks et al., 2016, p. 264). The threshold for the amount of xeric habitat needed at a landscape scale is unknown, but most of the Forest would fall in the latter category. Flammulated owls have been detected in two geographic areas of the Forest: Swan Valley and Salish Mountains (Kuennen, 2013j).

McCallum (1994) and Hayward and Verner (1994) reviewed flammulated owl habitat, behavior, and general ecology. The structure of mature ponderosa pine/Douglas-fir forest is a key ecosystem characteristic for flammulated owls. A forest structure that includes a mosaic of (1) mature and old forest with moderate canopy cover (35 to 65 percent), (2) large snags for nesting, (3) open patches for feeding (up to about 5 acres in size), and (4) dense thickets of small trees and shrubs in the understory for roosting is key (COSEWIC, 2010; Wisdom et al., 2000). On the Flathead National Forest, the warm-dry potential vegetation type and the portion of the warm-moist potential vegetation type with ponderosa pine/Douglas-fir are capable of having these characteristics (see figure B-03).

This cavity-nesting bird primarily nests in ponderosa pine snags (COSEWIC, 2010) in cavities excavated by pileated woodpeckers (Aubry & Raley, 2002), northern flickers, or sapsuckers (Cilimburg, 2006), but it may also nest in large live trees with heart rot. In their study of the breeding status of flammulated owls in Montana, Seidensticker, Holt, and Larson (2013) found that ponderosa pine comprised 72 percent of all cavity-bearing trees used by flammulated owls, Douglas-fir comprised 26 percent, and western larch the remainder. Ninety-three percent were dead trees. Cavity-bearing trees were most often broken-top trees in the 20-50-foot height class. Forty-five percent were in the 14-22 inch d.b.h. class, with a median d.b.h. of 21 inches and a range of 10-46 inches.

Flammulated owls prey primarily on nocturnal moths and insects, which have a higher abundance and are more easily caught in open forest stands or in grassy openings. Prey availability appears to be the primary factor in migration patterns, but winter habitat requirements are poorly known.

Samson (2006a) estimated the amount and distribution of flammulated owl habitat in the Northern Region and for each of the national forests in the Northern Region. Samson (2006b) also developed habitat estimates for maintaining viable populations of flammulated owl in the Northern Region. Bush and Lundberg (2008) provided an update of habitat estimates for the Northern Region conservation assessment. These analyses indicated that the type of habitat used by flammulated owls during the breeding season is abundant and well distributed across the national forests in the Northern Region as a whole. Compared to other national forests in the Northern Region such as the Bitterroot, Nez Perce-Clearwater, and Idaho Panhandle, the Flathead has a low acreage of flammulated owl habitat as well as low potential to provide flammulated owl habitat due to the relatively low potential for xeric ponderosa pine/Douglas-fir forest types on NFS lands in this area.

Much more of the Flathead Valley had xeric ponderosa pine/Douglas-fir forest at one time, but it was cleared long ago for agriculture and the development of communities in the valley bottoms. The natural range of variation for the ponderosa pine dominance type on the Forest is 0.5-3 percent of the forest acres, and current levels are at 0.4 percent, slightly below the natural range of variation. There has been a downward trend in the ponderosa pine dominance type on the Forest, mirroring that documented in the Interior Columbia Basin ecosystem management project assessment for the Northern Rocky Mountain province. That assessment noted significant decreases in shade-intolerant dominance types (including ponderosa pine) across that ecosystem (Paul F. Hessburg et al., 1999; P. F. Hessburg, Smith, Salter, Ottmar, & Alvarado, 2000; USDA, 1996, 2014a). Analysis on the Forest has also identified that trees in both the large and very large size class within the warm-dry and warm-moist potential vegetation types providing potential flammulated owl habitat are below the natural range of variation (see section 3.3.4, subsection “Very large live trees,” for more details). Nearly 90 percent of large/very large ponderosa pine/Douglas-fir forest occurs in the Swan Valley geographic area. The remainder occurs in the south end of the Salish Mountains geographic area and in the South Fork geographic area, including the Bob Marshall Wilderness.

Key stressors

Land management

On all lands, fire suppression in ponderosa pine/Douglas-fir forests can create a dense forest structure that does not provide the structural characteristics needed by flammulated owls. Vegetation management or wildfire that creates a habitat mosaic is beneficial, but stand-replacing wildfires can reduce the mosaic of habitats needed for nesting.

Development

Because this owl’s habitat is in a potential vegetation type that occurs in valley areas of the Forest, it is susceptible to threats associated with development of its breeding habitat located on private lands.

Key indicator for analysis

Most of the habitat needs of flammulated owls (Wright, 1996) are addressed by coarse-filter plan components for vegetation. The following species-specific indicator applies:

- Key ecosystem characteristics associated with the habitat mosaic needed by the flammulated owl

In addition, refer to the indicators, and effects described in section 3.7.4 for “Coniferous forest habitats” and “Old-growth forest, very large live tree habitat, and very large dead tree habitat.”

Environmental consequences

Summary of modeled alternative consequences

In order to assess key aspects of flammulated owl habitat, Ecosystem Research Group modeled the effects of alternatives on the natural range of variation, current conditions, and effects of alternatives (appendix 3). The natural range of variation was modeled going back about 1,000 years, and the effects of the alternatives were projected for the next 50 years, including anticipated changes in climate, using the fire suppression logic of the model. Modeled habitat included forests with *presence* of ponderosa pine and Douglas-fir with an average diameter greater than 15-inch d.b.h. and average canopy cover of 15-40 percent (resulting in more acres than if only a ponderosa pine *dominance type* was considered). Based upon Forest Inventory and Analysis data, forests with an average diameter greater than 15 inches d.b.h. contain sufficient snags to provide habitat for the species that excavate nesting cavities used by flammulated owls (pileated woodpeckers and flickers; for more details see section 3.7.4, subsections

"Old-growth forest, very large live tree habitat, and very large dead tree habitat" and "Burned forest and dead tree habitats"). The logic pathways of the SIMPPLLE model show that dense stands of potential habitat (stands with > 40 percent canopy closure) will convert to highly suitable habitat (stands with 15-40 percent canopy closure) if they are treated by underburning, are burned by low- to moderate-severity wildfire, are attacked by Douglas-fir beetles, or are harvested or commercially thinned to remove understory and midstory trees and retain the largest trees.

The natural range of variation of modeled habitat for flammulated owls ranged from about 12,000-37,000 acres out of approximately 2.4 million acres on the Forest, a very small amount, and a very small range of about 25,000 acres. In the future, acres of habitat will increase from current levels during all five decades under all four alternatives. Under alternatives B modified and D, acres of current habitat are slightly higher than the minimum natural range of variation and increase to levels approximating the maximum natural range of variation by the end of decade 5. The model predicts that alternative C would exceed the maximum natural range of variation by the end of decade 5.

The above modeled results may be attributable to vegetation treatments in combination with natural disturbances. The emphasis on methods used to achieve desired conditions and the rate of their implementation would differ (e.g., timber harvest and/or prescribed fire), according to the mix of management areas for each alternative. Alternative A was modeled without prescribed burning, which likely explains why it consistently produces less flammulated owl habitat through the five-decade time period. Alternative B (similar to B modified) produces the most flammulated owl habitat, likely as a result of modeled vegetation treatments to achieve desired conditions by including timber harvest, precommercial thinning, and prescribed fire. Alternative C would achieve desired conditions with a greater emphasis on the use of prescribed fire compared to the other alternatives. Alternative D would produce slightly less habitat than B because the model was directed to manage for maximum timber production under this alternative. These effects would also be dependent upon budget (see sections 3.21 and 3.3 for more detail).

In the warm-dry potential vegetation type on the Flathead National Forest, vegetation modeling shows that over the next 50 years all alternatives would have a strong upward trend in the presence of ponderosa pine associated with a strong decrease in Douglas-fir and in stand densities. This is a desirable trend to increase the overall resilience of the forest at the landscape scale and would benefit the flammulated owl, provided it resulted in the small-patch mosaic described in desired conditions for the flammulated owl (see section 3.3.8 for more details on landscape pattern). Because most flammulated owl habitat is at low elevations and in the wildland-urban interface, wildfires would be actively suppressed under all alternatives in most cases. Since flammulated owls prefer more open forests, it would be necessary to use timber harvest and prescribed burning as tools to achieve desired conditions. In the wildland-urban interface, the most likely source of future snags would be those created by insects and disease or prescribed fire.

Under all alternatives, USFS policy and regulations regarding firewood gathering on NFS lands would apply. These regulations restrict firewood gathering to within 200 feet of open roads, thus limiting the magnitude and extent of snag loss across the Forest.

Alternative A

The 1986 forest plan does not have management direction specific to flammulated owls, but standards for the retention of old-growth, snags, and downed wood benefit flammulated owls.

Alternatives B modified, C, and D

Desired condition FW-DC-WL DIV-01 addresses key ecosystem characteristics for the flammulated owl, including composition, structure, density, pattern, and function. No additional species-specific plan components are necessary. Plan components included in all action alternatives would protect existing old-growth ponderosa pine/Douglas-fir forest, promote development and larger patch sizes of future old growth, and provide for retention of large and very large snags and defective live trees (see standard FW-STD-TE&V-01 and 03 and FW-GDL-TE&V-06 and 09). Standards GA-SV-STD-01 and GA-SM-STD-02 for the Swan Valley and Salish Mountains geographic areas specify that all snags of western larch, ponderosa pine, and black cottonwood trees greater than 20 inches shall be retained. If sufficient snags to meet the minimum level of 2-3 snags per acre for the warm-dry and warm-moist potential vegetation types are not present, live replacement trees shall be substituted for each snag. Live replacement trees shall be of the largest size present. These standards benefit flammulated owls by providing for nesting habitat.

Species-specific desired condition FW-DC-WL DIV-01 also describes desired forest composition, structure, and pattern for the flammulated owl. All action alternatives would provide key ecosystem characteristics by creating a variety of successional stages that may be used by flammulated owls for feeding and roosting in the warm-dry and ponderosa pine/Douglas-fir portion of the warm-moist potential vegetation type. By moving towards the desired conditions for vegetation, the amount and distribution of flammulated owl habitat would approximate what would have been present on NFS lands under natural disturbance processes over the long term. However, in portions of the Forest where large and very large ponderosa pine/Douglas-fir snags and/or live trees have been removed, it may take many decades for this benefit to occur. Vegetation treatments to move forests towards desired conditions for flammulated owls would also make ponderosa pine/Douglas-fir forests more resilient to drought and stand-replacing wildfires because dense, intermediate-sized trees that have accumulated over decades and could carry fire into the crowns of larger trees would be reduced. If large and very large ponderosa pine trees are killed by mountain pine beetles or very large Douglas-fir trees are killed by bark beetles or root rot, this would provide nesting snags that could be used by flammulated owls.

Additional standards and guidelines may be beneficial to flammulated owls but would depend upon site-specific application. Road access restrictions (FW-STD-IFS-02, GA-SM-STD-01, GA-SV-OBJ-04) could indirectly help to retain very large ponderosa pine snags that have the potential of being used by flammulated owls for nesting if road closures occur in suitable habitat. Temporary public access for firewood gathering allowed under FW-STD-IFS-04 could result in snag loss, but guideline FW-GDL-OFP-01states, “Prior to temporarily opening a road to provide public access for gathering firewood, measures should be taken to protect the most valuable snag(s) as habitat for wildlife (e.g., by placing “wildlife tree—no cutting” signs on selected snags),” which would help to retain snags that are highly suitable for use by flammulated owls.

The 2012 planning rule requires the Forest to determine whether the plan components provide the ecological conditions necessary to maintain or restore a viable population of a species of conservation concern in the planning area (36 CFR 219.9(b)(1)). Key ecosystem characteristics include dry ponderosa pine/Douglas-fir forests with a mosaic of (1) large and very large snags for nesting, (2) an open midstory, (3) patches of dense Douglas-fir and ponderosa pine seedlings/saplings, (4) small openings for foraging, and (5) a landscape with an abundance of dry ponderosa pine/Douglas-fir forest.

It is likely beyond the authority of the Forest Service or not within the capability of the plan area to maintain long-term persistence of the flammulated owl in the plan area. However, the forest plan has plan components, including standards and guidelines, to maintain, improve, and restore ecological conditions

within the plan area to contribute to maintaining a viable population of the species within its range, considering the following:

- The Forest is at the edge of the range of the flammulated owl and does not have landscapes with an abundance of dry ponderosa pine/Douglas-fir.
- The life requisites of the flammulated owl operate at scales much larger than the plan area in that they migrate to the neotropics in winter and are in the plan area only during the breeding season.
- Most private lands in the Flathead Valley that once provided very large ponderosa pine on xeric (dry) sites have been developed or converted to agriculture. Much of the NFS land with the potential to provide highly suitable habitat is characterized by intermingled private ownership and open roads providing access to private lands. The Forest Service does not have authority over private lands and lacks the authority to close roads that are needed to access private land.
- Breeding season habitat on the Forest is inherently limited in the plan area by the lack of ecological conditions capable of growing large, contiguous areas of xeric ponderosa pine/Douglas-fir forest across a large landscape area. Habitat with the potential to be highly suitable for flammulated owls is limited, is distributed in lower elevations of two Forest geographic areas, and may not occur in large enough areas to support clusters of nesting birds.
- The structure of the warm-dry potential vegetation type that provides potential habitat for flammulated owls is the type that has been most impacted by past fire suppression and historic timber harvest. These factors affect the Forest's ability to restore the composition, structure, function, and pattern of habitat for this species over the anticipated life of the plan.

Although the Forest does not have authority over all the stressors that may affect the flammulated owl, the action alternatives includes plan components that would maintain, improve, and restore ponderosa pine forests that are more similar to historic conditions and are anticipated to be more resilient in likely future environments. This would be accomplished by plan components, including standards and guidelines, to maintain existing old-growth ponderosa pine/Douglas-fir forests and to retain large/very large ponderosa pine, Douglas-fir, and western larch snags and live trees in other forest stands. Plan components for the flammulated owl have been integrated with plan components for ecosystem services and multiple uses (36 CFR § 219.10).

Cumulative effects

On managed lands in the Swan Valley and Salish Mountains geographic areas, past timber harvest, firewood gathering, and conversion of ponderosa pine forests to agriculture or developed sites on private lands have caused habitat declines. NFS lands in the Swan Valley still have very large ponderosa pine trees. The habitat structure for the flammulated owl also declined from the 1940s to 1980s, due in part to fire suppression (Daniel Casey, 2000). Fire suppression allowed young Douglas-fir trees to suppress the recruitment of shade-intolerant ponderosa pine, increased stand densities, and reduced the amount of open understory and moderate canopy needed by this owl for foraging. The buildup of dense ladder fuels may also place flammulated owl habitat at higher risk of stand-replacing disturbance (wildfire and/or insect epidemics). Reduction of stand densities on all lands would make forests more resilient to wildfire and drought. Much of the ponderosa pine on the Flathead National Forest is in the wildland-urban interface with areas of intermingled private ownership, so the use of fire for restoration may be limited. Adjacent national and State forest land managers have instituted programs to retain old growth and to restore the structure and composition of ponderosa pine forests on suitable lands.

The preliminary Northern Region Adaptation Partnership risk assessment for the flammulated owl stated that, rangewide, the expected effects of changing climate conditions are not straightforward, with an unknown magnitude and likelihood. If the climate becomes warmer, it would favor the vegetation conditions that flammulated owls prefer (open ponderosa pine or dry forest habitats). Within mature ponderosa pine forests of the Bob Marshall Wilderness, for example, snags and decayed live trees suitable for nesting are abundant due to recent wildfires (and are not accessible for firewood gathering). Disturbances such as stand-replacing wildfire could also reduce current mature dry forests, turning large acreages into primarily young forests (or to grasslands or shrublands), or these changes could be offset by increases in dry forest habitats (McKelvey & Buotte, in press). Changes in the timing of prey availability may also affect flammulated owls (T. Jones & Cresswell, 2010), but this is uncertain.

Clark's nutcracker (species of conservation concern)

Affected environment

The Clark's nutcracker is identified as a species of conservation concern by the regional forester of the Northern region (www.fs.usda.gov/goto/flathead/SCC). This species is distributed across the western United States and southwestern Canada. The Clark's nutcracker occurs in northwest Montana year-round (Kuennen, 2013h). Although it is not at risk across its range, there is concern on the scale of the plan area due to an introduced disease that has caused a substantial decline in the primary habitat of this species, which is mature whitebark pine. Additionally, the Clark's nutcracker has a mutualistic relationship with whitebark pine (a candidate species), so each species needs the other. The Clark's nutcracker is the primary disperser of the large whitebark pine seeds, helping to perpetuate its primary food source. Because the Clark's nutcracker has a mutualistic relationship with whitebark pine trees, the decline in whitebark pine puts both Clark's nutcrackers and whitebark pine trees at risk in localized areas due to human-caused disruption of seed-dispersal mechanisms (McKinney, Fiedler, & Tomback, 2009).

Key ecosystem characteristics for the Clark's nutcracker include high-elevation conifer forests found in the cold potential vegetation type (see figures B-03 through B-09) with the presence of live, seed-producing whitebark pine to provide sufficient food to support nesting. Outside the breeding season, this species is associated with live, seed-producing ponderosa pine found in the warm-dry and warm-moist potential vegetation types at lower elevations.

The Clark's nutcracker is a specialist on large conifer seeds (Tomback & Linhart, 1990). Adult nutcrackers are heavily dependent on seeds from live whitebark and limber pine during the breeding season (Tomback & Linhart, 1990), especially during the summer post-fledging period (Vander Wall & Hutchins, 1983). Unlike national forests to the east of the Continental Divide, the Flathead National Forest does not have limber pine. Loss of mature whitebark, limber, and ponderosa pines to disease, insect outbreaks, and fire may lead to local and widespread nutcracker population declines (Tomback, 1998). Clark's nutcrackers appear to be in decline in some areas of northwest Montana. Sightings of this species have declined in Glacier National Park as well as on the Forest. Teresa Lorenz, research wildlife biologist with the Pacific Northwest Research Station, visited the Flathead National Forest and Glacier National Park in 2009 with the intent of beginning a study but could not locate enough birds. Breeding bird surveys, used to monitor populations of Clark's nutcrackers in Montana, indicate a nonsignificant decline in numbers of Clark's nutcrackers of 2.2 percent per year in Montana from 1980-2007, coincident with declines in whitebark pine due to blister rust infection in northwest Montana. Obtaining statistically significant trends for this species is difficult. According to Lorenz (2008), breeding bird survey data are particularly limited in value for monitoring species such as the Clark's nutcracker because they are non-territorial and wide-ranging and may not be actively nesting when counts are conducted.

The effects of long-term whitebark pine seed declines on Clark's nutcrackers are unknown. Although they are known to feed on Douglas-fir seeds, this is a low-energy seed that may not be sufficient to support breeding (D. Tomback, University of Colorado, personal communication with Cara Staab, 2015). Observations of nesting nutcrackers over the years suggest that adults attempt to breed only in the years when they have sufficiently large stores of seeds (Tomback, 1998). As summarized by Lorenz (2008),

> On a landscape scale, conifers do not produce the same amounts of seed every year. Years of heavy seed production are often followed by 1 to 3 years of low or moderate production. Nutcrackers therefore must be highly opportunistic and adaptable in order to survive years of low seed production. Many aspects of the nutcracker's life history, such as their varied diet and their yearly movements, reflect this opportunistic nature. Other aspects, including morphology and the timing of the breeding season, reflect their dependence on conifer seed. (p. 22)

If large-scale mortality of whitebark pine is leading to an increase in the number of non-breeding years for Clark's nutcrackers, there could be population- and ecosystem-level consequences (Schaming, 2015). Schaming (2015) studied Clark's nutcrackers in the Greater Yellowstone Ecosystem and found population-wide failure to breed during years of low whitebark pine cone production. If the birds did not have sufficient stores of cached seeds in the fall, they did not breed the following year. Schaming also measured body condition index during the breeding season and found that it was significantly lower in non-breeding years. The habitat carrying capacity for this species is diminished due to the loss of a key breeding season food source and the lack of a high-calorie back-up seed source west of the Continental Divide (D. Tomback, Department of Integrative Biology, University of Colorado Denver, personal communication, 2016).

McKinney and others estimated that forests must have a basal area of at least 21.8 square feet/acre for a high likelihood of seed dispersal by nutcrackers (McKinney et al., 2009). Of all the whitebark pine ecosystems studied, Clark's nutcracker occurrence, seed dispersal, and whitebark pine regeneration are lowest in northern Montana (Robert E Keane & Parsons, 2010). According to Forest Inventory and Analysis data (Trechsel, 2016), from a landscape perspective, the Forest is well below the threshold specified by McKinney et al. (see table 47), though there may be individual stands in some parts of the Forest where whitebark pine is more abundant, perhaps exceeding the minimum 21.8 square feet/acre basal area. Forestwide, there are also few trees per acre of potential cone-bearing whitebark pine trees (see table 47), and whitebark pine presence is below the natural range of variation both forestwide and in the cold potential vegetation type (Trechsel, 2017b).

Table 47. Basal area and trees per acre of live whitebark pine on the Forest in the cold and cool-moist potential vegetation types (PVTs)

Live Whitebark Pine Trees	Cold PVT (square feet/acre)	Cool-moist PVT (square feet/acre)
Total basal area	11.4	1.3
Trees per acre ≥ 10" d.b.h. ("mature," may be producing cones)	6.95	0.88
Trees per acre ≥ 15" d.b.h. ("mature," more likely to be producing cones)	1.86	0.15

The natural range of variation for the whitebark pine dominance type on the Forest is about 2-7 percent of NFS lands on the Forest; current levels are about 2.4 percent (see sections 3.3.4 and 3.5.1 for more details).The Forest is in the Northern Divide ecosystem for whitebark pine, where forests have been suffering from introduced blister rust infection for a longer period of time than forests in other regions

(Fiedler & McKinney, 2014). Refer to sections 3.3.1, 3.3.4, and 3.5.1 for more details on the existing condition of whitebark pine.

Key stressors

Land management

Management actions can affect the maintenance and restoration of live, seed-producing whitebark pine and ponderosa pine. Other than on NFS lands, most whitebark pine habitat in the vicinity of the plan area is in Glacier National Park. Tribal lands of the Confederated Salish and Kootenai Tribes also have whitebark pine and ponderosa pine.

Changing climate

Changing climate has the potential to have positive or negative impacts on whitebark pine and ponderosa pine ecosystems (Bartlein, Whitlock, & Shafter, 1997), as well as on Clark's nutcrackers.

Key indicator for analysis

- Key ecosystem characteristics, including live, seed-producing whitebark pine and ponderosa pine.

See section 3.3.3 for more details on both these tree species and section 3.5.1 for details on whitebark pine.

Environmental consequences

Summary of modeled alternative consequences

Modeling of future vegetation shows that whitebark pine dominance type would continue to decline forestwide over the next five decades, but there might be a slow upward trend in its presence within the cold potential vegetation type. None of the alternatives achieves the desired minimum level of whitebark pine presence forestwide within the next five decades. Due to the severe effect of blister rust and the insufficient density of cone-producing trees to support Clark's nutcrackers to disperse seed, a great deal of time, along with an aggressive restoration program, including planting of rust-resistant seedlings, would likely be needed to accelerate the rate of recovery for whitebark pine and increase live, seed-producing whitebark pine, as well as nutcrackers, over time. Treatments would increase the likelihood that blister rust-resistant whitebark pine of all sizes would have an increased chance of surviving in likely future environments that might include drought, wildfire, disease, and insects, benefiting Clark's nutcrackers.

Alternative A

The 1986 forest plan did not have management direction for Clark's nutcrackers, for restoring the whitebark pine forests they nest in, or for their ponderosa pine winter habitat. Nevertheless, efforts have been made to cage cones to collect whitebark pine seeds to grow nursery stock. Cooperative projects to plant whitebark pine in recently burned areas have also occurred.

Alternatives B modified, C, and D

All action alternatives include plan components to restore the ecological integrity of whitebark pine communities. To contribute to rangewide restoration efforts, the design, planning, and implementation of whitebark pine treatments on the Forest would be guided by the principles within a whitebark pine restoration strategy developed by Keane and others (2012) under all alternatives. To the degree possible at the forestwide scale, restoration efforts would be directed towards promoting whitebark pine rust resistance, conserving genetic diversity, saving seed sources, and implementing restoration treatments. Restoration of whitebark pine is a long-term undertaking.

Desired condition FW-DC-WL DIV-01 addresses the Clark's nutcracker, and no additional species-specific plan components are necessary. Plan components of the action alternatives would support key ecosystem characteristics for the Clark's nutcracker by providing for whitebark pine restoration. Plan components would allow for the reduction of competing trees and ladder fuels around existing disease-resistant survivors, allow for the collection of seeds to grow nursery stock, and allow for planting (see sections 3.3.4 and 3.5.1 for more details on whitebark pine and ponderosa pine). Plan components FW-DC-PLANT-03 and 04, and FW-OBJ-PLANT-01 would promote the restoration of mature, seed-producing whitebark pine. FW-DC-TE&V-07 and 08 and FW-OBJ-TE&V-01 would promote the restoration of ponderosa pine. These coarse-filter plan components would support key ecosystem characteristics for the Clark's nutcracker on NFS lands.

The 2012 planning rule requires the Forest to determine whether the plan components provide the ecological conditions necessary to maintain or restore a viable population of a species of conservation concern in the planning area (36 CFR 219.9(b)(1)). Key ecosystem characteristics include high-elevation conifer forests in the cold potential vegetation type (see figure B-03) with the presence of live, seed-producing whitebark pine to provide sufficient food to support nesting and low-elevation conifer forests in the warm-dry and warm-moist potential vegetation type with seed-producing ponderosa pine for winter feeding.

Plan components provide for ecological conditions to maintain the persistence of the Clark's nutcracker within the plan area, considering the following:

- The species persists year-round with a limited population in the plan area, even though an introduced disease has caused substantial declines in whitebark pine trees that provide key food resources during the breeding season.
- The Forest has the potential to provide breeding habitat at high elevations distributed across all but one geographic area of the Forest, so there would be sufficient distribution to be adaptable to likely future stressors. The Clark's nutcracker is widely distributed and is not threatened across its range.
- The co-evolved, mutualistic whitebark pine-nutcracker interaction facilitates rapid regeneration of whitebark pine after fire, but if Clark's nutcrackers are not present because seed densities are too low, the tree is not likely to regenerate naturally, even with favorable environmental conditions. The preferred alternative includes plan components that would actively maintain, improve, and restore seed-producing whitebark pine (see section 3.3 for more details).
- Although it would take decades for whitebark pine trees to increase in abundance and for young trees to reach cone-producing size, Clark's nutcrackers are highly mobile and are adapted to seeking out food sources across broad landscapes. As long as the species persists in the Rocky Mountains, it is likely that it would recolonize suitable habitats on the Forest as they are restored.
- Management treatments to move ponderosa pine forests towards desired future conditions would provide ecological conditions that are more similar to historic conditions and that are anticipated to be more resilient in anticipated future climates (see section 3.3 for more details). Ponderosa pine forests would provide winter habitat for Clark's nutcrackers.

Although the Forest does not have authority over all the stressors that may affect Clark's nutcrackers, the preferred alternative includes plan components that would maintain, improve, and restore the ecological conditions of key nesting and wintering habitats.

Cumulative effects

Whitebark pine occurs at high elevations in Glacier National Park and the Mission Mountains Tribal Wilderness, adjacent to the Forest, where it is also in decline. After enough consecutive years with low seed production, Clark's nutcrackers may not continue to reproduce on the west side of the Continental Divide but may continue to reproduce east of the Continental Divide where there are live, seed-producing limber pine, another breeding-season food source.

Many land managers on the west side of the Continental Divide, as well as several private organizations, have an interest in maintaining and increasing the live whitebark pine trees that support breeding populations of Clark's nutcrackers (see section 3.3.1 for more details). A changing future climate may result in more high-elevation wildfires that would create a suitable environment for natural regeneration of whitebark pine, but this is anticipated to occur only if there are enough nutcrackers and enough seeds for them to cache. If fires are too frequent, established regeneration will never grow above the lethal scorch height and mature individuals would not become established, affecting nesting season food availability for Clark's nutcrackers. These effects could occur on all lands.

As the climate changes, ponderosa pine in the Northern Region is expected to handle rising temperatures and deeper, longer droughts with only moderate difficulty. Increasing fire severity and occurrence could eliminate many live, mature ponderosa pine (Robert E. Keane et al., in press), but on the Forest most mature ponderosa pine is in the wildland-urban interface (see figure 1-13), where fires are likely to be suppressed.

Forest ungulates

Ungulates—white-tailed deer, mule deer, moose, and elk—are also known as big game species because they are hunted in accordance with State regulations. These species are discussed in the following sections.

Affected environment

White-tailed deer: Population, life history, habitat, and distribution

White-tailed deer are distributed across most of the United States, southern Canada, and Central America. They are widely distributed across Montana and are the most abundant ungulate species on the Forest (MFWP, 2015a). As of 1998, white-tailed deer populations in northwest Montana had increased to an apparent record high level (compared to the previous 20 years). Mackie et al. (Mackie, Pac, Hamlin, & Dusek, 1998) stated that this likely resulted from favorable habitat changes, mild winters, low hunter harvest rates, and possibly a numerical advantage favoring deer in the presence of predators. White-tailed deer numbers have varied considerably since 1998, but MFWP reports that numbers are currently increasing (MFWP, 2015a) (T. Thier, MFWP, personal communication, 2016).

White-tailed deer are opportunistic in their habitat use during mild winters but may rely on an energy-conservation strategy during harsh winters. Compared to other ungulates, white-tailed deer may be more sensitive to harsh winter conditions due to their small body size and short legs, with fawns being particularly susceptible to mortality during February and March (Dusek, Wood, Hoekman, Sime, & Morgan, 2006). During or following particularly hard winters, mortality due to malnutrition occurs, and snow accumulation may also make white-tailed deer more susceptible to being killed by a host of predators, especially mountain lions (Dusek et al., 2006). If adult female harvest rates are high in conjunction with high predation and poor fawn recruitment, a significantly lower population could persist for a time, even after a return to favorable environmental conditions (Mackie et al., 1998). In winter, white-tailed deer primarily feed within forested areas with an understory that is open enough to support shrubs and small trees. Oregon grape, Douglas-fir, and lodgepole pine seedlings/saplings, willows, and

serviceberry shrubs make up a large portion of their winter diet. The conifer canopy also provides arboreal lichens that are blown to the ground or are available when the tops of young trees are bent over by the snow (Dusek et al., 2006). The nutritional condition of white-tailed deer going into winter is also important. Several studies of white-tailed deer have been conducted in northwest Montana, including on the Forest (Dusek et al., 2006; J. T. Morgan, 1993; Mundinger, 1984).

White-tailed deer are distributed across the Forest in spring, summer, and fall and are associated with a wide variety of cover conditions and foods. Mackie and others (1998) stated that timber management to optimize deer habitats in western Montana "should emphasize perpetuation or enhancement of habitat diversity" (p. 136). A study of white-tailed deer occupying northwest montane forests in the Salish Mountains geographic area of the Forest concluded that riparian areas and adjacent uplands containing pole/immature timber were very important as centers of deer use in summer (J. T. Morgan, 1993).

Summer habitats are managed primarily by the USFS, whereas in winter habitat, NFS lands are often adjacent to or intermingled with private lands. In winter, white-tailed deer are found in all the major river valleys of the Forest (see figures 1-22 through 25). Dusek et al. (2006) reported that in the Salish Mountains geographic area, white-tailed deer winter primarily along the eastern fringe of lower foothills from Little Bitterroot Lake east to Ashley Creek, south to Smith Lake/Truman Creek, and north to Pilot Knob . In the Stillwater River Valley, white-tailed deer winter from Lost Creek to the northernmost extent of Pete Ridge near Tally Lake (Dusek et al., 2006). In the Swan Valley, white-tailed deer winter from the area around Swan Lake south to the area near Holland Lake. Vegetation management on the Forest has created diverse composition and structure, providing white-tailed deer habitat quantity and quality.

Elk

Elk are distributed across western North America and all of Montana. The trend for elk populations on the Forest appears to be stable (T. Thier, MFWP, personal communication, 2016). In 2004, MFWP reported that elk populations wintering in hunting districts that include the Forest were lower in number than in past decades, likely due to forest succession in the absence of wildfire. Acres of elk habitat burned by wildfire have increased since 2003, and many of the burned areas are now providing abundant forage.

Mule deer

Mule deer are distributed across western North America and all of Montana. Mule deer are distributed throughout the Rocky Mountains and have spotty distribution elsewhere in the western United States and Canada. They occur in most of western and central Montana. According to MFWP, mule deer numbers in MFWP Region 1 appeared to hit a record low in 2011 after two severe winters in 2009-2010 and 2010-2011, but numbers were beginning to rebound in some areas in 2013 (T. Thier, MFWP, personal communication, 2013).

In mountainous regions such as the Forest, many of the mule deer and elk have similar habitat use patterns. They use distinct seasonal ranges, migrating locally through "transitional habitats" to lower elevations for all or a portion of the winter and moving to moist riparian habitats and higher elevations for the summer. Elk and mule deer habitat, mapped by MFWP (MFWP, 2013a, 2013c), is discussed in more detail in the Forest assessment (USDA, 2014a). There have been several studies of elk habitat use on the Forest (Biggins, 1975; Bureau, 1992; Fuller, 1976; Simmons, 1974; J. M. Vore, Hartman, & Wood, 2007; J. M. Vore & Schmidt, 2001) and one study of mule deer habitat use on the adjacent Kootenai National Forest (Stansberry, 1991). Nonwinter elk and mule deer habitat occurs across the whole Forest. Winter habitat overlaps with the valley-bottom white-tailed deer winter habitat in some areas but also occurs in areas associated with steep south- and west-facing slopes where wind and sun exposure reduce winter snow depths. Elk and mule deer are not as strongly associated with large areas of winter snow intercept

cover at low elevations as white-tailed deer are. Elk and mule deer are less common on the Forest than white-tailed deer but are of high interest for hunting and observing.

Stansberry (1991) found that steep south-, southwest-, and west-facing slopes were used by mule deer in greater proportion than their availability on the landscape during all seasons. Mule deer use all forest types, especially those with a fine-grained or small-patch mosaic. In winter, patches of conifer cover help to moderate temperature extremes, reduce wind velocity, and reduce radiant heat loss. Snow depth under the conifer canopy is also minimized, providing easier access to foraging sites during harsh winters (Youmans, 1979). Spring and summer habitat use by mule deer on the Forest is similar to elk. In late fall and winter, mule deer may be found on small rocky cliffs interspersed with coniferous forests. Moist habitats are especially important to elk during calving. Research conducted during the 1970s on the Forest found that elk calving areas varied from year to year, depending upon snow depth.

Recent research has shown that forage and the condition of ungulates going into winter is just as important as the ungulate condition and forage during winter. Recent studies have indicated that management can be improved by integrating nutritional ecology on elk summer range (Cook, 2011). For example, many of the important food plants, including shrubs such as redstem ceanothus, serviceberry, Rocky Mountain maple, and grasses, grow only in forest openings or in forests with a more open canopy. Proffitt and others (2016) found that plant composition following fires was the biggest driver of differences in nutritional resources, suggesting that maintaining a fire mosaic will likely benefit ungulate populations. These authors reported that decades of fire suppression, resulting in forest maturation and a more closed canopy, may have reduced ungulate nutritional resources and population carrying capacity in their western Montana study area. Elk and mule deer are known to forage on grasses, forbs, and shrubs in areas that are transitionally or permanently non-forested areas interspersed with forested areas providing cover and security.

Research indicates that elk prefer to have hiding cover near open habitats used for foraging (Thomas & Toweill, 1982). Controlled burns, timber harvest, precommercial thinning, or other vegetation management strategies aimed at creating a mosaic of forest conditions can be beneficial to elk by providing abundant food resources in close proximity to cover and maintaining forage beneath the canopy of forested areas. On the Forest, very large stand-replacing fires have created large areas of forage where there may be a long distance to cover for the first 10-20 years after the fire. After a few decades, cover is restored, but trees may create enough shade to substantially reduce forage.

Elk winter habitat is mapped by MFWP. The Flathead National Forest has many areas where small groups of elk occur in the winter and two key elk wintering areas. One is in the Dry Parks/Horse Ridge/Spotted Bear River/Spotted Bear Mountain winter range areas of the South Fork geographic area. This area has steep, open south- and west-facing slopes interspersed with mature trees that provide winter habitat for approximately 300-400 elk, based upon MFWP annual survey reports. The Spotted Bear River portion of this elk habitat area was affected by high-severity wildfires in 2015, resulting in extensive regeneration of winter habitat cover and forage. The other area is the Firefighter area in the Hungry Horse geographic area, which provides winter habitat for approximately 100 elk. These elk tend to use winter habitat with heavier cover of lodgepole pine forest (J. M. Vore et al., 2007). The number of elk and mule deer wintering on other portions of the Forest has not been studied, but they appear to be mostly smaller groups of about 20-50 (J. Vore, personal communications, 2009, 2013).

Developments, roads, recreational activities, forest cover, and topographic variation affect elk habitat security and connectivity. Naylor et al. (2009) found that elk will move in response to a variety of recreational activities. They found that elk moved more when exposed to off-highway vehicles, followed by mountain biking, hiking, and then horseback riding. The effects of this increased movement are unknown. Elk response to human activities facilitated by open roads was studied extensively in the 1980s.

The Montana Cooperative Elk-Logging Study (Lyon et al., 1985) defined security areas as habitat where elk can go to avoid disturbance due to human activities such as hunting, logging, and recreational motorized vehicle use. Road access on public lands, combined with hunting season limits set by the State, have a combined effect on elk mortality and hunter opportunity (Christensen, Lyon, & Unsworth, 1993). Research has also shown that there is a direct relationship between level of road access and bull elk mortality (Leptich & Zager, 1991; Unsworth & Kuck, 1991), so availability of security areas is especially important during the fall hunting season.

During the hunting season, elk in northwest Montana are known to select habitats with contiguous, nonlinear hiding cover patches over 250 acres in size and more than 0.5 mile from open roads (Hillis et al., 1991). These "security areas" help to maintain an elk population that is sufficient to provide hunter opportunity (Canfield, Lyon, Hillis, & Thompson, 1999). All or portions of about 11 elk and deer hunting districts occur on the Forest and are regulated by MFWP. Figure 1-30 displays elk security areas (see also section 3.7.5, subsection "Grizzly bear," since areas providing grizzly bear habitat security also provide elk security).

Elk may make long-distance seasonal movements. Tracking of elk with satellite transmitters has shown that they move from winter habitat on the Flathead Indian Reservation to summer habitat west of Flathead Lake, which extends as far as 60 miles north to Kootenai National Forest lands near Fortine (Mann, 2013). In northwest Montana, localized movements between seasonal habitats are not known to follow any particular travel corridor or linkage area (Stansberry, 1991).

Human disturbance in areas where elk winter may stress the elk. Research in Montana has found that cross-country skiers may be more disturbing to elk than motorized users (Canfield et al., 1999). On the Forest, two areas have with groomed cross-country ski routes, but they are not in areas mapped as winter elk habitat by MFWP. Key winter elk habitat areas in the South Fork geographic area are closed to motorized over-snow vehicle use in winter, also making them less accessible to cross-country skiers due to long travel distances.

Moose

Moose are of interest for hunting and observing and are of key interest to the Confederated Salish and Kootenai Tribes for subsistence. Moose populations have been largest in MFWP Region 1 (northwest Montana) and Region 3 (southwest Montana), where moose populations increased and expanded in range through the early 1990s. This is believed to be due to the prevalence of early-successional forest created by fire and timber harvest (Brown, 2006). Since the 1990s, aerial survey trends and hunter harvest statistics indicate that populations in Montana have declined, but much uncertainty about the significance and causes of the apparent trends are unknown (T. Smucker, Garrot, & Gude, 2011).

Potential limiting factors to moose populations have been identified as hunting harvest, predation, vegetative succession and degradation, parasites, and climatic conditions (N. J. DeCesare, Smucker, Garrott, & Gude, 2014). In 2013, MFWP began a 10-year study designed to improve understanding of means to monitor the current status and trends of moose populations as well as the relative importance of factors limiting their population growth (N. DeCesare & Newby, 2016). The Cabinet-Fisher portion of the study area has habitat most similar to habitat on the Forest. In the first two years of the study, moose in the Cabinet-Fisher study area had the lowest calf survival rate of the three Montana study areas but the highest adult survival rate (MTFWP, 2015b).

In winter, moose are primarily found in the Salish and Hungry Horse geographic areas of the Forest (MFWP, 2013b). Moose are distributed across the Forest in summer. In summer, high-quality moose habitat is provided by shrubs (e.g., willow, alder, red osier dogwood, paxistima) that occur in a variety of

riparian areas as well as in burns and harvest areas. Aquatic and riparian areas are key in summer, when moose may move from high-elevation habitats where they feed upon shrubs, to low-elevation feeding sites where they feed upon aquatic plants (Matchett, 1985). Johnson and Carothers reported in 1982 that in some parts of the western United States, cottonwood/willow riparian habitats have been reduced by as much as 90‑95 percent (N. J. DeCesare et al., 2014). According to a 2007 study by Peek, persistent riparian habitat along rivers and streams may have provided long-term stability historically to moose populations and functioned as corridors to allow moose to expand into post-fire habitats (N. J. DeCesare et al., 2014). According to Eastman in 1974 as well as others, moose frequently use both logged and burned forest habitat in the first 10 to 30 years after harvest or fire (Brown, 2006; T. Smucker et al., 2011; Telfer, 1995). In the Yaak River drainage of northwest Montana, moose selected for clearcut areas that had been logged 15–30 years prior as well as areas within 100 meters of a cutting unit (Matchett, 1985). If deep, soft snow has accumulated, moose use forested riparian areas and other areas of mature forest, feeding upon species such as Pacific yew beneath the canopy. By late winter and early spring, when the snow crusts over, moose may move up in elevation and feed on deciduous shrubs in openings. Unlike elk, moose do not avoid roads or motorized use and do not appear to select cover for travel (Matchett, 1985). Moose are known to travel on roads or compacted snowmobile trails in winter. Individual moose may be more vulnerable to hunter harvest in areas of high road density, but allowable harvest levels are currently limited by a permit drawing, with regulations set by MFWP. The Confederated Salish and Kootenai Tribes also have treaty rights to hunt moose. All or portions of about seven moose hunting districts are located on the Forest. The number of moose permits in MFWP Region 1 gradually doubled between 1983 and 1995. Between 1995 and 2010, the number of moose permits issued in Montana was reduced by 40 percent, with most of this reduction occurring in Regions 1 and 3. The highest moose harvest has been in the Salish, North Fork, and Hungry Horse geographic areas.

Moose have a northern distribution across most of Alaska, Canada, and the northern tier of the United States, but the factors that define the southern limits of their current distribution are not well understood (Lowe, Patterson, & Schaefer, 2010). Moose populations and their distribution may be affected by a changing climate, but there is scientific uncertainty on specific effects. Within Montana it is unclear whether any climatic variables underlie spatial variation in the productivity of local populations (N. J. DeCesare et al., 2014). DeCesare and Newby’s 2015 annual report on moose research in Montana summarized information about moose and climate change (MTFWP, 2015b). Climate and weather conditions can directly and indirectly influence moose populations, according to Karns and Van Ballenberghe in 2007, Ballard in 2007, and Brown in 2011 (MTFWP, 2015b). Climatic patterns determining the timing of spring green-up, summer precipitation, and winter snow conditions can influence survival and recruitment indirectly through effects on forage availability and quality (MTFWP, 2015b) and, according to Samuel in 2007, through climate-mediated effects on parasite densities, such as winter ticks (MTFWP, 2015b). Although data are not available on the impact of ticks on moose in Montana, negative effects of ticks on moose populations have been well documented elsewhere, so negative effects of ticks on moose in Montana seem likely (N. J. DeCesare et al., 2014). Effects of climate on moose can be seen in their metabolic response to temperatures and in the energetic costs of traveling through deep snow, according to Renecker and Hudson in 1986 (MTFWP, 2015b). Moose are well adapted to cold temperatures and have been shown to modify their movements and habitat use if they become heat stressed.

All ungulate species are susceptible to predation. Mountain lions (cougars), grizzly bears, wolves, black bears, and coyotes can be effective predators of newborn elk calves through their first few months of life. According to a 1976 study by Schlegel, black bears have been documented as predators of newborn elk calves in mountain environments (Mackie et al., 1998). Young and old moose may be susceptible to predation by wolves and bears (Kunkel & Pletscher, 1999).

Key stressors

Land management

On all lands, vegetation and fire management can affect ungulate habitat by increasing or decreasing habitat diversity and quality. Riparian habitats and other high-elevation moist sites are key for ungulate species in spring, summer, and fall. Patches of tree canopy that mitigate the effects of periodic hard winters are key at lower elevations. Excessive density of roads open to motorized public use during the hunting season can decrease habitat security and have indirect effects on hunter harvest and retention of bulls or bucks in ungulate populations.

Changing climate and weather

Elk and deer have wide ranges and a high degree of plasticity towards habitat, which is likely to make them resilient to a changing climate. Moose may be more susceptible to effects of a changing climate, but effects are uncertain and are currently under study.

Key indicators for analysis

The following indicators are used for analysis of effects on forest ungulates (e.g. elk, moose, mule deer, and white-tailed deer):

- Key ecosystem characteristics providing snow intercept cover in key winter habitats
- Key ecosystem characteristics providing habitat diversity
- Security in key habitat areas

In addition, refer to indicators for coniferous forest and wildlife associated with aquatic, wetland, and riparian habitats.

Environmental consequences

Summary of modeled of alternative consequences

Ecosystem Research Group modeled winter cover for white-tailed deer, since winter conditions are most limiting for this ungulate species, and they also modeled forage for all ungulate species (see appendix 3 for more details).

Ecosystem Research Group interpreted vegetation model outputs over the next five decades in comparison to the natural range of variation going back about 1,000 years. The natural range of variation for snow intercept cover in areas modeled as white-tailed deer winter range varies from about 29,518 to 110,721 acres out of approximately 325,491 acres of modeled winter habitat on the Forest. The current level of habitat is estimated to be at the midpoint of the natural range of variation. In the future, modeled winter snow intercept cover initially increases and then declines to below current levels by the end of the fifth decade under all alternatives due to modeled effects of Douglas-fir beetle on mature trees. Alternatives B modified and D provide slightly less modeled snow intercept cover than alternatives A or C, likely due to vegetation treatments to meet other desired conditions in the warm-dry and warm-moist potential vegetation types, which are mainly in the wildland-urban interface (see figure 1-13).

Most of the white-tailed deer winter habitat on the Forest is in the warm-dry and warm-moist potential vegetation types where forest structure is most altered by fire suppression, timber harvest, and fuels reduction. Fire suppression targets much of the warm-dry and warm-moist potential vegetation types because it overlaps the more heavily roaded, valley-bottom areas where people live (the wildland-urban

interface). In some of these areas, fire suppression has resulted in a dense midstory of Douglas-fir trees, creating a forest structure that provides snow interception for white-tailed deer but is not characteristic of historic conditions and is not anticipated to be sustainable under anticipated future summer climate conditions (see section 3.3 for more details). Because most white-tailed deer winter habitat is in the wildland-urban interface, wildfires would be expected to continue to be suppressed under all alternatives. As a result, desired conditions for vegetation would primarily be accomplished by a combination of timber harvest, precommercial thinning, planting, and use of prescribed fire to provide a sustainable mosaic of forest conditions. The model predicts that all alternatives would stay within the minimum and maximum range of the natural range of variation over the five-decade time period. The modeled reductions in snow interception by the fifth decade could cause higher levels of winter stress or mortality during harsh winters, but this effect would be less frequent if a changing climate causes more precipitation to fall as rain rather than snow in the valleys where winter habitat is located.

In order to assess key aspects of habitat diversity for ungulates outside the winter time period, the effects of the alternatives on nonwinter forage were modeled by Ecosystem Research Group (see appendix 3). The natural range of variation was modeled going back about 1,000 years, and the effects of the alternatives were projected for the next 50 years. The model predicts that all alternatives would stay within the minimum and maximum range of the natural range of variation over the five-decade time period, hovering somewhere around the midpoint of the natural range of variation and current levels. The natural range of variation of foraging habitat for elk ranges from about 290,000 to 1,100,000 acres out of approximately 2.4 million acres on the Forest, a very large range. Under all alternatives, the number of acres of habitat initially increases slightly and then declines back to current levels. In the future, there are very slight differences in alternatives. Model results for alternative A show less forage than the other alternatives, most likely due to the lack of prescribed fire modeled for that alternative. Model results for the other alternatives show slightly more forage, likely due to higher amounts of prescribed burning to meet desired conditions.

Alternative A

The 1986 forest plan includes “Big game” management direction and management area direction. Management area direction for white-tailed deer winter habitat (management area 9 in the existing plan) includes preparation of a long-range activity schedule for each winter range to provide the size, age, diversity, and distribution of habitat needed by this species; implementing habitat improvement projects; timber harvest to create small openings; and maintenance of winter thermal/snow intercept cover in each winter habitat block. The 1986 forest plan closes key big game winter habitat areas on NFS lands in management area 9 to public motorized over-snow vehicle use (e.g., Pilot Knob and Pete Ridge in the Salish geographic area). Winter habitat management is coordinated with MFWP to support white-tailed deer populations that use Forest lands. Management area direction for roaded and unroaded lands that provide elk winter habitat (management area 13) includes (1) preparation of a long-range activity schedule for each winter range to provide the size, age, diversity, and distribution of habitat needed by these species when implementing habitat improvement projects and (2) maintaining at least 30 percent winter thermal cover. Areas allocated as management area 13 that are steep and have sparse tree cover are listed as not suitable for timber production, whereas more heavily timbered winter habitat areas are listed as suitable for timber production. Management area 13 in the existing plan also includes direction to close key winter range areas to motorized over-snow vehicle use if there are conflicts. These actions are coordinated with MFWP and other private cooperators (e.g., the Rocky Mountain Elk Foundation) to support elk populations that use Forest lands.

Forestwide, big game management direction includes incorporating moist site and security area recommendations displayed in appendix DD of the 1986 forest plan. Moist sites and security areas are analyzed at the project level. Other forestwide management direction also provides for elk security. The

1986 forest plan has limits for open motorized access density, total motorized access density, and security core in the grizzly bear recovery zone/primary conservation area that indirectly provides high levels of habitat security for elk during all seasons (and also for other ungulates). In the Salish Mountains geographic area on the Tally Lake and Swan Lake Ranger Districts (grizzly bear management zone 1), elk security is addressed through unrestricted road density requirements. These requirements specify a range in miles per square mile of roads open to public motorized vehicle use and apply to smaller geographic *units* (see discussion in section 3.7.4, subsection “Grizzly bears”). In winter, some areas providing winter habitat for forest ungulates are open to motorized over-snow vehicle use, but this use is restricted near key areas (e.g., Spotted Bear, Rhodes Draw to Tally Lake, the North Fork, Columbia Falls to West Glacier (see figures 1-22 and 1-29), reducing the risk of disturbance. The 1986 forest plan provides for key ecosystem characteristics of the Forest’s ungulate species.

Alternatives B modified, C, and D

The action alternatives do not have management areas specific to elk or deer winter habitat. Under alternatives B modified and D, about 67 percent of the white-tailed deer winter habitat on NFS lands is in management area 6b, 6c, or 4b, where timber harvest would be likely to occur (see sections 3.3.2 and 3.8.3 of this final EIS for more details). Under alternative C, about 50 percent is in these management areas (see figures 1-03). Steep open areas (also providing elk and mule deer winter habitat) are generally mapped as management area 6a (general forest low-intensity vegetation management) under all alternatives. This management area is not suitable for timber production, but timber harvest is allowable under certain conditions, which would be assessed at the project level. Desired conditions for specific geographic areas also address key winter habitats for forest ungulates: GA-HH-DC-02, GA-NF-DC-08, GA–SM-DC-04 and 05, and GA-SV-DC-05 and guideline GA-SM-GDL-01.

The action alternatives have desired conditions for the warm-dry and warm-moist broad potential vegetation types, which is where much of the Forest’s winter habitat for ungulates occurs (see FW-DC-TE&V-08). Plan components for vegetation structure, composition, and pattern provide for key ecosystem characteristics described in the “Affected environment” section and contribute to diverse and resilient forest conditions. Desired conditions for the warm-dry and warm-moist potential vegetation types would maintain snow intercept cover in forested areas where elk and mule deer winter habitat overlaps with white-tailed deer winter habitat. To achieve desired conditions in the warm-dry and warm-moist potential vegetation types, conifer trees in the understory and midstory would be removed and large, full-crowned trees in the overstory canopy would be retained to provide snow intercept cover. Achieving a lower stand density by removing midstory and understory trees would make forests in key winter habitat areas better able to withstand drought or insect and disease outbreaks that would result in loss of snow intercept cover. However, removing understory Douglas-fir would reduce arboreal lichens and needles that provide forage in the understory canopy layers. As a result, desired conditions specify retention of clumps of conifer seedlings/saplings to provide forage during the winter and to grow into large trees as succession occurs. Achieving a lower stand density would also help to maintain shrubs in the understory and would increase wind in the canopy that blows arboreal lichens to the ground, making them accessible to ungulates for food. Where winter habitat for forest ungulates overlaps with flammulated owl habitat, implementation of these desired conditions and guidelines would allow for restoration of the landscape structure needed by flammulated owls while also providing for the winter habitat needs of white-tailed deer and other forest ungulates.

Key ecosystem characteristics for ungulate habitat during all seasons (described in the “Affected environment” section) would be supported by implementation of plan components for watersheds and riparian management zones as well as vegetation structure, composition, and pattern. Habitat types providing moist sites used by ungulates during the non-winter seasons are generally found in the cool-moist and cold potential vegetation types. Most of the acreage in these types is mapped as lynx habitat,

with standards that promote high understory density and cover but limit timber harvest and thinning activities that create openings providing elk forage. However, in areas where wildfires occur, forage for elk and other ungulates is abundant. FW-DC-TE&V-19 states that forests in the cool-moist and cold potential vegetation types provide habitat for a variety of wildlife species. Processes (e.g., fire, wind, insects and disease) that create diverse patches and patch sizes also create openings dominated by grasses, forbs, and shrubs providing nonwinter foraging habitat for wildlife species (e.g., a wide variety of plant species that produce berries for grizzly bears; species such as willow, alder, or yew that provide cover and forage for snowshoe hares and moose). Forestwide guidelines FW-GDL-RMZ-09, 12, 14, and 15 benefit habitat connectivity by promoting retention of understory vegetation and limiting construction of new roads, temporary roads, and landings in riparian management zones.

Motorized and non-motorized access can affect forest ungulates through direct disturbance or increased access by hunters. Areas suitable for motorized over-snow vehicle use vary by alternative. Under alternatives C and D, an area of the North Fork geographic area would become suitable for motorized over-snow vehicle use that is not currently suitable, which would affect less than 1,000 acres of mapped deer or elk winter habitat. Under alternative B modified, the area of mapped deer or elk winter habitat that is suitable for motorized over-snow vehicle use would be reduced in size so that it would be less than under alternatives C or D (see figures 1-22 to 1-29). This addition would have a minor effect on forest ungulates because the majority of winter habitat in the North Fork is not open to motorized over-snow vehicle use. Some areas providing winter habitat for elk are open to motorized over-snow vehicle use, but this use is restricted near key areas (e.g., Spotted Bear, Rhodes Draw to Tally Lake, the North Fork, Columbia Falls to West Glacier), reducing the risk of disturbance. In the grizzly bear recovery zone/primary conservation area, standards FW-STD-IFS-02 and GA-SM-STD-01 for motorized access would indirectly benefit ungulates. Areas that provide secure core for grizzly bears exceed 2,500 acres, distributed across many grizzly bear subunits, and would provide habitat security for ungulates in all but the Salish Mountains geographic area. In the Salish Mountains geographic area, grizzly bear management zone 1 (which encompasses most of the rest of the Forest), standard GA-SM-STD-01 would maintain habitat security for ungulates because it specifies that the linear density of roads open to public motorized vehicle use on NFS lands is limited to the baseline. With respect to the distribution of open roads, GA-SM-GDL-01 states,

> In order to provide elk habitat security, access management actions should not result in a decrease in total acres of NFS lands within the geographic area that are at least 250 contiguous acres and at least one half mile from roads open to wheeled motorized use by the public. If vegetation management occurs in elk security habitat, a mosaic of cover and forage should be provided, in consideration of the site-specific topography and vegetation types. Roads may be temporarily opened, after consultation with a forest wildlife specialist, for up to 30 days during July and August to allow for activities such as firewood gathering.

In summary, this set of plan components would maintain ecological conditions that support MFWP ungulate objectives for all action alternatives. Under alternatives B modified and C, there would be additional management area 1b (recommended wilderness) and an additional limit on motorized access for trails open to public motorized use in the Salish demographic connectivity area, providing a higher level of habitat security but less motorized access for hunters in the future as site-specific decisions are implemented.

Cumulative effects

Since the late 1980s, close to 40,000 acres on NFS lands have had cooperative habitat improvement projects benefiting elk and deer habitat, including prescribed burns, planting, slashing of small conifers to

maintain forage openings, and weed control (see also the section on elk in the Forest's assessment (USDA, 2014a).

Residential subdivision of private lands is likely to continue or even increase in the future. The acquisition of former Plum Creek Timber Company lands in the Swan Valley under the Montana Legacy Project by the USFS, Montana Department of Natural Resources and Conservation, and private conservation buyers prevents residential subdivision that could result in loss of white-tailed deer habitat and promotes recovery of white-tailed deer snow intercept cover on lands that have had regeneration harvest. Conservation easements in other geographic areas (such as on the F. H. Stoltze Land & Lumber Company property in Haskill Basin north of Whitefish) also helps to control residential subdivision.

Changing climate conditions are expected to increase the frequency of summer drought and increase fire size and severity. Drought may cause moist vegetation to dry up sooner, decreasing forage quality. In addition, areas burned by high-severity fires provide a seed bed for invasive weeds, which do not provide forage for elk and deer (McKelvey & Buotte, in press). The Forest has experienced an increase in wildfires in areas providing elk habitat in the last few decades (USDA, 2014a), creating an increase in the quality and quantity of nonwinter forage, especially in the North Fork, Hungry Horse, and South Fork geographic areas. This trend has also occurred on lands in Glacier National Park. Vegetation management on all landownerships would benefit white-tailed deer if it is done in a way that maintains snow intercept cover for harsh winters but increases habitat resilience and forage quantity/quality. Whether this will occur or not is unknown, but many forest land managers have professional foresters, silviculturists, and wildlife biologists to coordinate timber management to benefit multiple resources, including ungulates.

Many of the cumulative consequences for moose are the same as those listed for white-tailed deer, elk, and mule deer. However, moose are more of a cool and cold climate species. In the future, increases in temperature associated with a changing climate could directly stress moose or make them more susceptible to other mortality factors, but there is currently a high level of uncertainty with respect to climate effects on moose. The combined effects of climate, parasites, and predation on moose in Montana is currently being investigated.

In the past, severe winters, in combination with high populations of predators, contributed to high mortality of ungulates, especially white-tailed deer. Montana Fish, Wildlife and Parks manages ungulate and predator populations through trapping and hunting regulations, adjusting regulations to meet population and harvest objectives. Deer harvest has been high, but the Forest continues to have very high populations of white-tailed deer. Glacier National Park, encompassing about a million acres adjacent to the Forest, is closed to hunting but has high levels of ungulate predators.

A downward trend in the mileage of roads open to motorized use year-round and during the hunting season has helped to maintain elk and deer habitat security on all lands. In addition to Forest lands, there are many closed roads on Montana Department of Natural Resources and Conservation and private forest lands. This has increased nonmotorized hunting opportunity but has reduced motorized hunting opportunity. Montana Fish, Wildlife and Parks reported on the elk population objective status by hunting district in 2013, and for elk hunting districts with identified objectives, all those on the Forest (including all lands) are "at objective" (see the section on elk in USDA, 2014a for more details).

Subdivision and commercial development of habitat, particularly winter habitat, can reduce habitat quantity and quality for ungulate species. White-tailed deer mortality is high in areas where they are concentrated along county, State, and Federal highways or high-speed roads in the valley bottoms, especially in winter when they are concentrated in these areas.

Gray wolf

Affected environment

The gray wolf is distributed across most of Alaska, Canada, northern Minnesota and Michigan, and throughout the Rocky Mountains, including western Montana. The gray wolf was delisted in Montana and Idaho in May of 2011, with hunting and/or trapping of wolves under State management occurring soon after. According to the USFWS, as of the end of 2013, the northern Rocky Mountain wolf population had exceeded its recovery goals since 2002 (Jimenez, 2014).

Montana wolf pack territories are large and change from year to year, depending on prey availability and relationships with neighboring packs (L. Bradley et al., 2014). As of 2014, the number of wolf packs within or adjacent to the Forest was well above the targeted recovery level and the wolves were distributed across the Forest. In 2014, MFWP verified a minimum count of 338 wolves and 17 breeding pairs in the Northwest Montana recovery area, compared to 412 wolves and 15 breeding pairs in 2013 (L. Bradley et al., 2015). Gray wolves commonly hunt in packs. The main prey species in Montana are deer, elk, and moose. Domestic livestock such as cattle and sheep are also preyed upon. Gray wolves may also eat alternative prey, such as rodents, vegetation, and carrion (MTFWP, 2003). At a landscape scale, the gray wolf exhibits no particular habitat preference except for the presence of native ungulates (deer, elk, moose) within its territory on a year-round basis. Ungulate winter ranges, usually located in valley bottoms, are key for wolf survival.

Pack activity is centered on the den site where pups are born and on nearby rendezvous sites where pack members convene from late April until September. Boyd-Heger (1997) found that wolves in the North Fork of the Flathead River drainage of the Forest appeared to select denning and rendezvous sites that had relatively low elevation, flat terrain, and were close to water. The wolf recovery plan stated that key components of wolf habitat are (1) a sufficient, year-round prey base of ungulates and alternative prey, (2) somewhat secluded denning and rendezvous sites, and (3) sufficient space with minimal exposure to humans at a landscape scale (USFWS, 1987). Gray wolves establishing new packs in Montana have demonstrated greater tolerance of human presence and disturbance than was previously thought characteristic of this species (MTFWP, 2003). However, wolves are less abundant in areas of high open road and trail density (Whittington, St Clair, & Mercer, 2005), likely due to higher human-caused mortality in these areas. Many miles of roads on the Forest have been closed in recent decades, providing habitat security for wolves (see section 3.7.5, subsection “Grizzly bear,” for more details). With respect to habitat connectivity, NFS roads are not a barrier, and wolves often travel on closed roads (K. Laudon, MFWP, personal communication, 2011).

At a landscape scale, the USFWS conducted a multi-scale assessment for the Northern Rocky Mountain segment of the gray wolf population in 2009 (USFWS, 2009). This assessment stated, “There is more than enough habitat connectivity between occupied wolf habitat in Canada, northwest Montana, and Idaho to ensure exchange of sufficient numbers of dispersing wolves to maintain demographic and genetic diversity in the NRM [Northern Rocky Mountain] wolf metapopulation. We have documented routine movement of radio-collared wolves across the nearly contiguous available suitable habitat between Canada, northwestern Montana, and central Idaho” (p. 15161). The assessment also notes, “Wolf dispersal into northwestern Montana from the more stable resident packs in the core protected area (largely the North Fork of the Flathead River along the western edge of Glacier NP [National Park] and the few large river drainages in the Bob Marshall Wilderness Complex) and the abundant National Forest Service lands largely used for recreation and timber production rather than livestock production, helps to maintain this segment of the NRM wolf population” (p. 15160).

Key stressors

Land management

On all lands, the effect of land management on wolves is primarily a result of effects on wolf prey and security near den sites.

Changing climate

Projected changes in climate could result in negative, neutral, or positive impacts to habitat for the gray wolf and would be strongly influenced by effects to the primary species wolves prey upon—deer, elk, and moose (see section 3.7.4, subsection “Forest ungulates,” for more details).

Direct mortality

Montana Fish, Wildlife and Parks allows hunting and trapping of wolves under a regulated season, as directed by the Montana Gray Wolf Conservation and Management Plan (MTFWP, 2004). Wolf-livestock conflicts most often occur with sheep. There are no sheep grazing allotments or permits on NFS lands on the Flathead National Forest. Sheep are grazed on some private lands in the Flathead Valley.

Key indicator for analysis

Wolves are habitat generalists with habitat needs that are largely provided by coniferous forest habitat diversity. Management direction that provides for wolves’ ungulate prey species and the habitat security of the prey species also provides for wolves.

The following species-specific indicators are relevant to the gray wolf:

- Key ecosystem characteristics of wolf habitat and risk of human disturbance near active wolf den and rendezvous sites

Environmental consequences

Alternative A

The 1986 forest plan provides forestwide management direction specific to the gray wolf, which contributes to habitats that support wolves. Management direction specific to wolves includes timing limitations for timber harvest near dens and rendezvous sites. Implementation of big game management direction benefits wolves by providing habitat conditions to support wolf prey species. Implementation of amendment 19 benefits wolves by providing security for wolves and their big game prey species and also reduces the risk of wolf mortality.

Alternatives B modified, C, and D

Key ecosystem characteristics described in the “Affected environment” section would be supported by implementation of plan components for watersheds and riparian management zones as well as plan components for diverse vegetation included in all action alternatives. In addition, standards for motorized access would maintain baseline open road densities across the Forest, as well as baseline total route densities and secure core in the grizzly bear recovery zone/primary conservation area, providing secure habitat for wolves and reducing the risk of excessive wolf mortality. Plan components would also benefit wolf prey species. Guideline FW-GDL-WL-DIV-05 provides direction to limit disturbance within 0.25 mile of known, active dens and rendezvous sites, incorporating measures to avoid or mitigate impacts of activities from April 1 to July 1. The distance from active den and rendezvous sites is less under the action alternatives than under alternative A but is expected to have minor effects because wolves have been found to be more tolerant of human activities than previously thought (MTFWP, 2003). In order to protect

wolves, wolf den sites are not mapped, but the USFS coordinates with MFWP to gather information on known den and rendezvous sites. Forestwide guidelines FW-GDL-09, 12, 14, and 15 benefit habitat connectivity by promoting the retention of understory vegetation and limiting construction of new roads, temporary roads, and landings in riparian management zones.

Cumulative effects

Montana Fish, Wildlife and Parks adjusts hunting and trapping regulations to meet population and harvest objectives. Glacier National Park, encompassing about a million acres adjacent to the Forest, is closed to hunting and trapping. Elsewhere, wolf hunting and trapping has been allowed from 2011 to present. The minimum known wolf population dropped from about 650 in 2011 to about 536 and 32 breeding pairs in 2015 but was still well above the target population of 10 breeding pairs for three consecutive years established for recovery. In the future, the wolf population may see a decreased growth rate or see a population decline, but hunting and trapping have not kept wolf populations from exceeding recovery goals.

Human-wolf conflicts can occur when wolves prey upon livestock, sometimes leading to removal of individual wolves or packs. Because grazing has been very limited on the Forest as well as on State and private lands in recent decades, only one wolf pack has been removed due to past livestock conflicts. On NFS lands, limits on livestock allotments adopted for the grizzly bear would also benefit wolves.

Timber harvest occurring on private, State, or other lands may affect the distribution, amount, and quality of ungulate habitat or cause disturbance to wolves. The wolf population in northwest Montana increased exponentially while these activities were going on within their habitat, so it is unlikely there have been any substantial effects. Access management has trended towards reducing the miles of open roads and so has improved wolf habitat security and likely decreased mortality on NFS lands as well as on State and some private timber lands. Glacier National Park provides a high level of wolf security and has very few miles of roads. The desired condition for connectivity in the forest plan directs the Forest to work with other agencies and landowners when highways are proposed for construction or reconstruction to incorporate crossing structures where needed. This should aid in minimizing the risk of vehicle collisions with wolves or their prey and would also aid in maintaining connectivity between areas of NFS lands as private lands are subdivided in the future (see also section 3.7.4., subsection “Forest ungulates,” and section 3.7.5, “Grizzly bear”).

Because wolves and their prey are habitat generalists, changes in climate are expected to have a minor effect on their habitat (see ungulate section above for more details).

Northern goshawk

Affected environment

The goshawk is a breeding resident across most of Alaska, Canada, and the western United States. A 2005 survey effort across road-accessible NFS lands in the Northern Region estimated that goshawks were present in 39 percent of the territory-sized sample units (95 percent confidence interval = 29-50 percent) (Kowalski, 2006a, 2006b). Although the survey design did not estimate goshawk occupancy rates for any individual national forest, it did indicate that goshawks are fairly common and are widely distributed across managed areas of the Northern Region, including the Flathead National Forest. The northern goshawk is a large bird with a large territory and is distributed across all Forest geographic areas. Presence of the northern goshawk has been reported on the Flathead National Forest (Kuennen, 2013k), with 44 “positive” observations recorded from 1982 to 2000 (including observations of nests and young) and numerous observations reported from 2000-2010 (USDA, 2017a).

In their status review of the northern goshawk, the USFWS found that the goshawk typically uses mature forests or larger trees for nesting habitat (the nest area); however, it is considered a forest habitat generalist at larger spatial scales. The USFWS found no evidence that the goshawk is dependent on large, unbroken tracts of "old growth" or mature forest (USFWS, 1998). However, nest areas include forests with a narrow range of structural conditions (R. T. Reynolds, Graham, & Boyce Jr., 2008; J. R. Squires & Reynolds, 1997). Goshawks generally select stands based on structure, but selection varies by forest type. For example, in lodgepole pine stands, canopy closure ranged from a mean of 34 to 80 percent and the tree size ranged from 9 to 15 inches d.b.h. Hayward and Escano (1989) found that nest sites in mixed species stands of northwest Montana were often located in stands that supported widely spaced large trees. Squires and Kennedy (2006) found that nest areas are usually mature forests with medium to large trees, canopy closure of 60 to 90 percent, and an open understory. On the Forest, nests have also been found in more dense mixed-species stands where there is a break in the topography or canopy that provides an open approach to the nest.

Goshawks use large landscapes, integrating a diversity of vegetation types to meet their life-cycle needs (J. R. Squires & Kennedy, 2006). The average patch size of core nesting areas varies according to available habitat conditions but averaged 40 acres in west-central Montana. The post-fledging area of 200-500 acres is defined as the area used by the family group from the time the young fledge until they are no longer dependent on the adults for food (R. T. Reynolds, Graham, & Reiser, 1992). In warm and dry forest communities, reducing tree densities by "thinning from below" may reduce forest fuels while simultaneously creating stand conditions that are favorable for goshawk foraging (R. T. Reynolds et al., 1992; J. R. Squires & Kennedy, 2006).

Key stressors

Land management

On all lands, goshawks may be negatively affected by timber harvest that removes nest trees, by associated disturbance too close to nesting sites, or by fire suppression that creates a forest structure that is too dense for hunting. Vegetation management activities and wildfire can be beneficial if they maintain or create desirable forest structure.

Changing climate

Goshawks are habitat generalists that are not expected to be sensitive to the effects of changing climate. Effects of changing climate conditions on goshawks could be positive, negative, or neutral.

Key indicator for analysis

The following species-specific indicator applies to the goshawk:

- Key ecosystem characteristics of goshawk habitat and the risk of human disturbance near known active nest sites

Environmental consequences

Summary of modeled alternative consequences

In order to assess key aspects of habitat for goshawks, Ecosystem Research Group modeled the effects of the alternatives (appendix 3). The natural range of variation was modeled going back about 1,000 years and the effects of alternatives were projected for the next 50 years, including anticipated changes in climate and the fire suppression logic of the model.

Goshawk habitat was modeled based upon habitat type group, including tree size classes greater than 10 inches d.b.h. and canopy cover greater than 40 percent (Greenwald, Crocker-Bedford, Broberg, Suckling, & Tibbitts, 2005) The northern goshawk habitat model assessed nesting habitat because it is assumed that post-fledging and foraging habitat is not limiting (Brewer, Bush, Canfield, & Dohmen, 2009; Kennedy, 2003). These aspects of goshawk habitat are addressed in discussions of vegetation structure in section 3.3.

Modeling shows that acres of nesting habitat increase to near the maximum natural range of variation in the first two decades and then declines to near the minimum natural range of variation by the fifth decade. Vegetation modeling results suggest that forestwide there would be an upward trend in the large tree size class forestwide and within all potential vegetation types. Natural succession of forests into larger size classes is the main driver of this increase. Model results indicate that natural disturbances have a substantially greater impact on reducing this size class than timber harvest amounts, with fire, insects, and disease the primary disturbances. The combination of increased fire, insects, and disease results in a substantial decline in modeled canopy closure (which reduces goshawk nesting habitat quality and quantity but may increase foraging habitat quality and quantity). Because alternatives B modified and D provide slightly less modeled nesting habitat than alternatives A and C, timber harvest also likely plays a role in reduced canopy closure. Although the modeled nesting habitat declines over the five decades, it remains within the natural range of variation under all alternatives.

The modeled outcomes estimate acres of nesting habitat with no consideration of distribution across the landscape. For that reason, modeled levels of nesting habitat may have little relationship to the actual density of nesting goshawks because they are highly territorial and can nest in relatively small, isolated parcels of nest habitat (R. T. Reynolds et al., 1992). Research has shown that landscapes fragmented by timber harvest support nest densities comparable to unfragmented landscapes as long as nest habitat persists at levels sufficient to support goshawks at maximum densities based on territoriality (Clough, 2000).

Alternative A

The 1986 forest plan does not have management direction specific to goshawks but does have standards to maintain existing old growth.

Alternatives B modified, C, and D

Under all action alternatives, plan components would support key ecosystem characteristics for goshawks because (1) all alternatives protect existing old-growth forest and old-growth forest habitat (FW-STD-TE&V-01), (2) all alternatives have forest plan direction that provides for retention of larger-diameter live trees and other key stand structural components that would contribute to future old-growth development within harvest units (FW-STD-TE&V-03; FW-GDL-TE&V-06 through 09), (3) all alternatives focus on stand conditions that would make old-growth forest and habitat more resilient in a changing climate, (4) activities known to disrupt goshawks would be restricted during the nesting season in 40-acre or larger stands containing known nest sites (FW-GDL-WL DIV-05), thus reducing the risk of disturbance that would disrupt nesting, and (5) desired conditions would provide diverse forest structure and composition to support post-fledging habitats used by goshawks (see also section 3.3).

Cumulative effects

In the past, regeneration harvest likely resulted in loss of goshawk nesting habitat on NFS lands as well as State and private timber lands. In the future, goshawk habitat could be negatively impacted by loss of large trees for nesting on all lands if drought, insects and disease, or stand-replacing wildfires are extensive and frequent in the future, but habitat suitable for hunting of prey species may be increased by

wildfires. On all lands, future effects due to vegetation management as well as effects due to climate changes and the potential for increased fire, insects, and disease would depend upon distribution across the landscape, which cannot be predicted. Because goshawks are highly territorial, their nesting density is naturally low. Goshawks are highly mobile and are likely to be able to find sufficient nesting habitat.

Marten

Affected environment

Marten are distributed across most of Canada, the Rocky Mountains (including western Montana), the Great Lakes region, and portions of the Pacific Coast region. Marten are widely distributed across the Forest and are found in all geographic areas. There are recent observations, or verified DNA from non-invasive monitoring, and trapping records for the last 10 years (Curry et al., 2016; Swanson, 2017; SWCC, 2014; USDA, 2014e). Marten populations fluctuate in response to prey availability, juvenile dispersal, and mortality of adult females. Marten trapping is regulated by MFWP. Population parameters indicate a relatively stable or slightly declining population on a statewide basis (Giddings, 2009). There is speculation that trapper access to public lands has decreased over time from route and area closures to protect other species.

The literature uses a variety of terms to describe marten habitat including mature forest, mid- to late-successional forests, and late seral forest. Very few studies have defined average diameters associated with these descriptions. When citing the literature, the terms used by various authors are retained. However, in describing the current condition on the Forest and when comparing the alternatives, a consistent set of terms is used and their definitions are given.

Marten are "subnivean" (below the snow) foragers (Ruggiero, Aubry, Buskirk, Lyon, & Zielinski, 1994) and are well suited to deep snow conditions. Similar to lynx, marten are often associated with mixed spruce-fir forests during winter (Koehler & Hornocker, 1977). Mesic forests support the greatest understory plant species diversity and the greatest vole populations, the primary prey species for marten in many areas (Koehler & Hornocker, 1977). According to Buskirk and Powell (1994) and Tomson (1999), the American marten is closely associated with late-successional, mesic forests, with an abundance of snags, coarse woody debris, low shrubs, and small understory trees. A complex physical structure near the ground provides refuge sites, access to prey, and a protective thermal environment (Buskirk & Ruggiero, 1994). Baker reports that in summer, marten may also use young forests where coarse woody debris is abundant, although they may be more vulnerable to predation in young forests (Ruggiero et al., 1994; Tomson, 1999).

As stated in the USFS fire effects and management summary for American marten (Stone, 2010), this species generally avoids cover types that lack overhead cover (e.g., prairies, herbaceous parklands or meadows, clearcuts, and tundra) due to an absence of preferred prey, structures for denning, concealment cover, escape cover, and/or access points to subnivean spaces. Although marten tend to avoid openings (Koehler & Hornocker, 1977), they may travel along the edges of open areas or cross open areas. In a northern Idaho study, Tomson (1999) found that although 28 percent of his marten relocations were in non-forested openings, all were less than about 525 feet from cover (similar to the findings of Soutiere (1979) in Maine that marten seldom cross openings greater than about 540 feet). Ruggiero and others (1994) reported that marten avoided patches less than about 40 acres but cautioned managers that the "dearth of knowledge in this area makes managing forested landscapes for martens highly conjectural" (p. 24). Special management of riparian areas may help to provide cover for habitat connectivity and avoidance of predators. In northern Idaho, individual marten were located closer to streams than to random locations, and both resting sites and travel routes were often located near riparian corridors. At temperate latitudes, mesic forests used by marten are commonly riparian, and these areas contain

important habitat features such as large amounts of coarse woody debris and/or high prey density, leading to enhanced foraging opportunities.

Some portions of the Flathead National Forest have large openings due to stand-replacing wildfire. A high percentage of the South Fork and North Fork geographic areas has been burned by wildfire in recent decades (18.7 and 20 percent, respectively), whereas a low percentage of the Swan Valley and Salish Mountains geographic areas has been burned by wildfire (2.6 and 2.7 percent, respectively). Regeneration harvest also reduces cover. The Salish Mountains geographic area has the highest percentage recently harvested (8.5 percent), and the Middle Fork geographic area has the lowest (0.1 percent) (USDA, 2014a).

Key stressors

Land management

Timber harvest and fire management affect marten habitat by creating a variety of successional stages and forest structures in a variety of patch sizes, providing diverse habitats for marten and their prey. Timber harvest can also reduce dense cover. In the cool-moist potential vegetation type that provides marten habitat on the Forest, harvest on NFS lands generally creates small openings whereas stand-replacing wildfire creates very large openings.

Changing climate

Increased drought and associated wildfires resulting from a warmer, drier future climate may have detrimental effects on marten habitat. Marten are known to make low use of burns during the first 10 years after fire. Low marten abundance in areas of high-severity fires can persist for up to about 75 years, but after about 75 years, marten are abundant in burned areas (Fisher & Wilkinson, 2005).

Key indicator for analysis

The following species-specific indicator applies to marten:

- Key ecosystem characteristics for marten habitat

For a discussion of key ecosystem characteristics for habitat connectivity, see section 3.7.6.

Environmental consequences

Summary of modeled alternative consequences

Hillis and Lockman (2003) assessed the availability of marten habitat across the Northern Region and determined that the amount of suitable habitat was comparable to historic levels. In order to assess key aspects of marten habitat, Ecosystem Research Group modeled effects of alternatives (appendix 3). The natural range of variation was modeled going back about 1,000 years, and the effects of alternatives were projected for the next 50 years. Modeled marten habitat included the cool-moist and warm-moist potential vegetation types (except for ponderosa pine types). Marten habitat was modeled as coniferous forests with an average tree diameter of at least 10 inches d.b.h. and a canopy cover class of at least 40 percent. The model predicts that all alternatives would stay within the minimum and maximum natural range of variation over the five-decade time period. There is a very wide range of variation between maximum and minimum natural range of variation—about 650,000 acres.

According to the model, in the future, acres of modeled habitat initially increase for all alternatives, with a level near the maximum natural range of variation, likely due to forest succession outpacing fire, insects, disease, and vegetation management treatments. Then, acres of modeled habitat decline under all

alternatives. The modeled decline in habitat is steeper than for fisher, likely the result of marten occupying higher-elevation habitats than fisher (where the model indicates more stand-replacing wildfire). Because the marten requires denser stands than the fisher, the combination of increased fire, insects, and disease is resulting in a decline in modeled canopy closure which reduces marten habitat quality and quantity. Even with this decline, habitat remains within the natural range of variation.

Effects common to all alternatives

In addition to consequences discussed in section 3.7.4., subsections "Coniferous forest habitats," "Old-growth forests, very large live tree habitat, and very large dead tree habitats," "Burned forest and dead tree habitats," and "Aquatic, wetland, and riparian habitats," all alternatives adopt the vegetation standards of the NRLMD (USDA, 2007c), which benefits marten as well as lynx because habitat for these two species overlaps and is abundant in the cool-moist vegetation type (figures B-03 through B-09). Meeting vegetation standards VEG S1, VEG S2, VEG S5, and VEG S6 for lynx (see forest plan appendix A) also benefits marten by promoting a mix of successional stages including multistoried forest and dense young forest, limiting the amount of regeneration harvest per decade, and limiting the amount of forest that does not yet have branches sticking above the snow surface. These standards, in addition to plan components for snags and downed woody material, old growth, and riparian areas, would benefit marten by providing for the key habitat structure they need for denning, hunting, resting, and foraging. Patch size, patch distribution, and distance between patches changes constantly due to wildfire, insects, disease, and vegetation management activities, so these factors are most appropriately analyzed at the project level. Under all alternatives, areas mapped as not suitable for motorized over-snow vehicle use would reduce trapping access (figures 1-42 through 1-45). The mix of activities varies by alternative, as described below, but all alternatives have plan components to provide key ecosystem characteristics of marten habitat.

Alternative A

The 1986 forest plan does not have management direction specific to marten, but plan components for riparian habitat conservation areas and amendment 21 support habitat requirements for marten, as discussed in section 3.7.4, subsections, "Aquatic, wetland, and riparian habitats" and "Old-growth habitat, very large live tree habitat, and very large dead tree habitat." Alternative A would further reduce motorized public access, which would indirectly help to maintain large snags and downed wood.

Alternatives B modified, C, and D

Alternatives B modified, C, and D have plan components for riparian management zones, old growth, snags, and downed wood that would also benefit marten by providing for a mix of successional stages to provide for foraging and denning, cover for travel and avoiding predation, and complex structure near the ground surface to support their subnivean foraging habits. With all action alternatives, access management for no net increase in open roads would help to maintain large snags and downed wood.

Cumulative effects

The cumulative consequences discussed in 3.7.4., subsections "Coniferous forest habitats," "Old-growth forests, very large live tree habitat, and very large dead tree habitat," "Burned forest and dead tree habitat," and "Aquatic, wetland, and riparian habitats," also apply to marten. On all lands, a proportion of the mid-successional forest and the medium tree size class will advance into a late-successional or large tree size class as natural succession progresses over time (see section 3.3 for more details). Timber harvest and/or stand-replacing wildfires (which are characteristic of the cool-moist potential vegetation type) would also be expected to alter or remove existing mid- and late-successional forests in the future. Insects or diseases may kill the older, larger trees, which are often the most susceptible to infestation and mortality. These dead trees would then become snags and downed logs, an important component of

marten habitat, if they were not removed by salvage harvest or firewood cutters. On lands in Glacier National Park, adjacent to the Forest, salvage harvest after fire would not occur except to provide for human safety. On private and State lands, dead trees are more likely to be removed.

Montana Fish, Wildlife and Parks manages marten populations through trapping regulations, adjusting the regulations to meet population and harvest objectives. Glacier National Park, encompassing about a million acres adjacent to the Forest, is closed to trapping.

Old-growth forest, very large live tree habitat, and very large dead tree habitat

Introduction

About 30 wildlife species on the Forest are associated with old-growth forest and habitat (see glossary) or its key ecosystem characteristics, described in the following section (N. M. Warren, 1998) (see also appendix 6). Ecosystem plan components would meet the needs of most species associated with old-growth forest and habitat as well as species associated with very large live trees and very large dead trees in other successional stages.

Species associated with old-growth forest use very large live and dead trees in a variety of ways, including for nesting, roosting, denning, feeding, and shelter. For example, several small mammal, amphibian, and invertebrate species use accumulations of large downed woody material, debris, and duff on the forest floor for shelter (Carey, 1996). According to Helms in 1998, variation in live tree size and spacing in old-growth forest also provides canopy gaps and understory patchiness. Patches of open canopy within or adjacent to old-growth habitat provides foraging opportunities for some species. Birds that nest in very large snags prefer various tree species, minimum diameters, minimum snag heights, and types of snag decay (Thomas, 1979). The minimum diameter and density of very large snags used for plan components in the no-action alternative came from a comprehensive publication on managed forests in the Blue Mountains of Oregon and Washington (Thomas, 1979, pp. 68-77, 387; USDA, 1999). Thomas based desired snag densities on territory size for primary excavators (woodpeckers) and the number of pairs per hundred acres because these birds are territorial.

The study by Thomas (1979) listed the following wildlife species, also known to occur on the Flathead National Forest, as requiring snags (and also broken-topped live trees) with a minimum d.b.h of 20 inches for nesting or denning: pileated woodpecker, barred owl, fisher, Vaux’s swift, and riparian-associated species including the wood duck, common and Barrow’s goldeneye, and common merganser. With the exception of the pileated woodpecker, minimum tree diameters required by these species have not been determined based upon research in Montana. Of the species requiring trees greater than 20 inches d.b.h., only one, the pileated woodpecker, is a primary excavator. Primary excavators hollow out nest and roost sites for themselves that are then used by close to 60 other species on the Forest, some of which are incapable of excavating their own cavity. For example, flying squirrels and fishers are known to use cavities excavated by pileated woodpeckers. Brown creepers are distributed across the Forest (Kuennen, 2013f) and are known to nest in cavities made by pileated woodpeckers or northern flickers or beneath the bark of decaying live trees (Hejl, Newlon, McFadzen, Young, & Ghalambor, 2002). Brown creeper foraging habitat is similar to nesting habitat. Brown creepers forage on tree species with furrowed bark such as Douglas-fir (especially on older, larger trees); they move up tree trunks and probe within bark furrows for insects and small invertebrates (Hejl et al., 2002).

Bate (1995) studied the effects of forest vegetation characteristics on woodpeckers in the warm-dry forests of central Oregon. She found that woodpecker density increased as the density of large live trees greater than 20 inches d.b.h. and hard snags greater than 10 inches d.b.h. increased (excluding lodgepole pine), but she was not able to detect a threshold where woodpecker abundance dramatically changed. As a

result, she did not recommend a minimum number of live trees or snags per acre to support woodpeckers. Although minimum snag diameters are known for many species, there may be a high level of uncertainty with respect to minimum snag densities.

The availability of old-growth forest and very large trees varies greatly over time and across the landscape. Unlike some of the forests on the Northwest Coast, in the northern Rocky Mountains very little of the coniferous forest goes for hundreds of years without wildfire (see sections 3.3.6 through 3.3.8 for more details). Tree species in the northern Rocky Mountains have adaptations to survive and persist in areas where natural disturbance regimes are characterized by periodic stand-replacing wildfire (see sections 3.3.1 and 3.3.3). As a result, many of the northern Rocky Mountain wildlife species associated with old-growth forest are also associated with individual components of old-growth forest (very large live, decayed, dead, and large fallen trees) occurring in forest stands that have a predominantly younger age class. Very large trees have wildlife value even when the surrounding area has been burned or logged (Henjum, 1996) and can serve as reservoirs of genetic diversity. Very large remnant trees enrich the subsequent forest stand structure by providing a source of large snags and coarse woody debris and improving the connectivity of the forest landscape for many wildlife species. In western forests, where fire is a dominant disturbance process, maintaining a large and very large-diameter cohort of trees in perpetuity may be an appropriate method to achieve objectives for wildlife and fire resiliency (J. R. Franklin, Berg, Thorburgh, & Tappeiner, 1997; J. R. Habeck, 1990).

This section assesses the effects to most species associated with old-growth forest and its key ecosystem characteristics, including very large live and dead trees. Following the general discussion, two species are discussed as examples in order to help display differences in effects of alternatives. The two species are the fisher and pileated woodpecker.

Affected environment

The Forest has adopted the definitions of old-growth forest developed by the Regional Old Growth Task Force and documented in Green et al. (2011) (see glossary). The definitions are specific to forest type (dominant tree species) and habitat type group. Key attributes for identification of old-growth forest are the age, numbers, and diameter of the old tree component within the stand and the overall stand density. Minimum thresholds have been established for these attributes that provide measurable criteria for implementation of standards related to old-growth forest stands. For example, the most common old-growth forest type on the Forest requires at least 10 trees per acre that are at least 180 years in age and 21 inches in diameter, with a minimum stand density of 80 square feet basal area. Standards for old-growth forest are based upon measurable criteria and are monitored using Forest Inventory and Analysis data. These criteria can be used to develop a statistically sound estimate of the amount of old growth across the Forest. Because Forest Inventory and Analysis data is not a spatial data set, patch sizes and connectivity of old growth is unknown at the Forest scale but is analyzed at the project level. Refer also to section 3.3.6 and table 24 for more detailed information on old-growth forest definitions.

Old-growth forest acres on the Forest, as derived from Forest Inventory and Analysis inventory data, comprises about 9.5 percent of the total Forest acres (approximately 232,000 acres). Old-growth forest totals about 3.8 percent of the warm-moist, 8.7 percent of the cold, 9.5 percent of the warm-dry, and 10.9 percent of the cool-moist potential vegetation type. A large amount of Forest lands have burned with stand-replacing wildfire over the past 15 years (see section 3.8.2). Monitoring indicates that these fires are primarily responsible for the loss of an estimated 2.6 percent of old-growth forest (approximately 52,000 acres) over that time period (see section 3.3.6 for more details). In the past, old-growth forest was reduced due to timber harvest, but old-growth forest has not been reduced through harvest treatments for at least 15 years (the current forest plan prohibits the removal of old growth through harvesting).

In addition to the measurable criteria established by Green et al. (2011), associated forest structural conditions provide key ecosystem characteristics for wildlife species (e.g., very large live trees, decayed trees, very large snags, and large fallen trees). These characteristics may be present in forest stands that do not meet all of the Green et al. criteria. This condition is referred to as “old-growth habitat” (see glossary). In addition, mature forest may contain remnant trees that are very large and have survived repeated wildfires but are low in number. Table 48 displays current conditions, forestwide and for each potential vegetation type (see figure B-03), for forest that has at least 10 trees per acre in the very large size class. Table 49 displays current conditions, forestwide and for each potential vegetation type, for forest that has fewer than 10 trees per acre in the very large size class but still has high value for wildlife (see section 3.3.4 for details on very large trees and forest size classes). The threshold for the number of very large live trees per acre needed by wildlife species in the northern Rocky Mountains is unknown.

Density criteria and existing conditions for the very large tree component and for the density and presence of individual very large live trees are displayed in table 48 and table 49. The source of the data for the existing condition is Forest Inventory and Analysis data using the R1 summary database (Hybrid 2011, reports run in 2016) analysis tools. The current proportion from this data set is expressed as an estimated mean percent, with a lower and upper bound estimate provided at a 90 percent confidence interval.

Table 48. Very large live tree component definitions and current estimated percent, forestwide and by potential vegetation types

Potential vegetation type	Very large live tree density criteria	Current estimated percent
Forestwide	Incorporates the criteria specific to each potential vegetation type	14.1 (11.9-16.5)
Warm-Dry	At least 8 trees per acre ≥ 20” d.b.h.	16.4 (10.1-23.3)
Warm-Moist	At least 10 trees per acre ≥ 20” d.b.h.	9.5 (2.9-17.1)
Cool-Moist	At least 10 trees per acre ≥ 20” d.b.h.	16.7 (13.6-20.0)
Cold	At least 10 trees per acre ≥ 15” d.b.h.	8.1 (4.3-12.4)

Table 49. Current estimated density and presence of very large live trees across Forest lands forestwide and by potential vegetation type

Potential vegetation type	Current estimated presence[1]	Current estimated trees per acre	Current predominant species of very large live trees
Forestwide	15.9 (13.5-18.5)	4.2 (3.5-5.0) ≥ 20” d.b.h.	Douglas-fir, western larch, spruce
Warm-Dry	16.4 (10.1-23.3)	4.0 (2.4-5.7) ≥ 20” d.b.h.	Douglas-fir
Warm-Moist	13.6 (5.3-23.3)	2.7 (0.9-4.8) ≥ 20” d.b.h.	Douglas-fir
Cool-Moist	19.1 (15.7-22.6)	5.2 (4.2-6.4) ≥ 20” d.b.h.	Western larch, Douglas-fir
Cold	8.5 (4.4-13.1)	2.2 (1.1-3.4) ≥ 15” d.b.h.	Spruce

1. Percentage of the analysis unit that has at least one live ≥ 20” d.b.h. tree present

Table 50 displays current conditions in each potential vegetation type for snags on the Forest in the very large size class. The current proportion from this data set is expressed as an estimated mean percent, with a lower and upper bound estimate provided at a 90 percent confidence interval.

Table 50. Current snag densities on the Forest (snags per acre equal to or greater than 20 inches d.b.h) (Trechsel, 2017c)

Snag Analysis Group (potential vegetation type)	Mean	Lower Bound	Upper Bound
Lodgepole pine	0.4	0.0	0.9
Warm-Dry	1.2	0.2	2.6
Warm-Moist	1.5	0.3	3.1
Cool-Moist	2.1	1.4	3.0
Cold	1.4	0.6	2.5

The numbers above are based upon Forest Inventory and Analysis data, which accounts for snags lost due to natural and human-related disturbances, such as fire, timber harvest, post-fire salvage, and firewood gathering. Due to recent stand-replacing wildfires, snags are currently near the upper end of the natural range of variation (see section 3.3.7 for more details).

Key stressors

Land management

The primary stressors to old-growth forest and associated species and to very large live and dead trees are loss and fragmentation due to timber harvest, road construction, firewood gathering, wildfire, prescribed fire, and insects and disease.

Changing climate

Both drought and wildfire have historically been stressors, but their magnitude and duration are anticipated to increase based upon modeled climate changes (see section 3.1.2 for more details). The time period used for modeling is beyond the anticipated life of the forest plan, but because very large trees take a long time to grow, changing climate is considered for longer time periods. Drought may also lead to decreasing tree growth rates and an increase in insects and/or disease. Forest management actions in portions of the Forest may make trees more resilient when it comes to these changes.

Key indicator for analysis of most species associated with old-growth forest, very large live and dead trees

The following indicators are important for the wide variety of wildlife species associated with old-growth forest and very large live and dead trees.

- Key ecosystem characteristics for species associated with old-growth forest, the very large tree size class, and the distribution of very large live trees, very large snags, and large downed woody material in other forest size classes

In addition, refer to key indicators addressed in sections 3.3.6 through 3.3.9 and section 3.7.4, subsection “Coniferous forest habitat associates.”

Environmental consequences

Summary of modeled alternative consequences

Modeling indicates that the very large tree size class trends steadily downward forestwide over the five-decade modeling period under all alternatives. However, the very large tree size class trends upward in the warm-dry and warm-moist potential vegetation types. Much of this decrease is likely attributable to wildfire and/or the high amount of both Douglas-fir and spruce beetle portrayed in the model, both of which would cause widespread mortality of trees in the very large size classes and revert forests back to a

smaller size class (see sections 3.3.4 and 3.3.9 and appendix 2 for more details). The warm-dry and warm-moist potential vegetation types are mostly in the wildland-urban interface, where fire suppression efforts may help to protect old-growth forest. As modeled, the warm-dry potential vegetation type shows a distinctly different trend in the very large size class when compared to other settings. Vegetation management treatments likely play a major role in promoting the development of the very large tree size class in this type because it removes the smaller-diameter understory trees (mainly Douglas-fir) and preserves larger-diameter overstory trees (mainly ponderosa pine). Commercial thinning may also be influencing this increase in the very large size class.

Modeling also estimated the future acreage of the Forest with very large snags and the density of very large snags within those areas. For areas with very large snags greater than 20 inches d.b.h., the proportion of the Forest with from 1 to 3.9 snags per acre decreases. However, the proportion of the Forest with more than 3.9 snags per acre increases, which may be beneficial for wildlife. By the fifth decade, modeling suggests that about 9 percent of Forest has at least 4 snags per acre in the 20-inch and larger size class. Essentially, the amount of area with a higher density of snags increases over time to a level that is fairly similar among the alternatives.

All alternatives include a standard to maintain all existing old-growth forest, meeting Green et al. (2011) definitions, and to set limitations on vegetation treatments within old-growth forest, retaining as much old-growth forest as possible in all alternatives (see section 3.3.6 for more details).

Alternative A

Amendment 21 of the 1986 forest plan provides direction to (1) protect all existing old growth as defined by Green et al. (2011). In this amendment, timber harvest areas are required to (2) retain an average of 1 snag per acre greater than 20 inches d.b.h. in the dry potential vegetation group and an average of 1 snags per acre greater than 20 inches d.b.h. in the dry and cold potential vegetation groups and an average of 2 snags per acre of this size in the cool potential vegetation group, (3) retain an average of 10 pieces of down woody material greater than 20 inches diameter in harvest unit in the dry potential vegetation groups and 15 pieces of this size in the cool and cold potential vegetation groups; and (4) provide habitat connectivity and patch sizes on NFS lands similar to historical levels (see section 3.3.6 and 3.3.7 for more details). This management direction provides benefits to species associated with old growth, very large snags, and downed woody material.

A key difference of this alternative when compared to the action alternatives is related to the forest plan direction associated with both forest size class and the very large live tree component. The 1986 forest plan does not explicitly describe desired conditions for forest size class and includes very little if any specific direction related to the very large live tree component outside of old-growth forest. It does incorporate an ecologically based approach to the management of vegetation, including managing for vegetation composition, structures, and patterns that would be expected to occur under natural succession and disturbance regimes; reducing the risk of undesirable fire and insect and pathogen disturbances; and providing for long-term recruitment of forest structural elements such as snags and downed wood. Most of this direction is located in the 1986 forest plan under forestwide objectives in section A(6)-Vegetation (p. II-8) and forestwide standards under (H)-Vegetation (p. II-47).

Alternatives B modified, C, and D

The standards in alternative A have been in effect since 1999, but monitoring indicates old-growth forest has continued to decline, primarily due to the effects of stand-replacing wildfire. This trend is anticipated to continue with projected future climate and associated levels of stand-replacing wildfire, insects, and disease. As a result, the action alternatives include additional plan components to increase the patch size of existing old-growth forest, to retain very large live trees and snags in forest stands of smaller size

classes, and to retain larger snags and downed woody material in harvest units, particularly those species that are able to survive fire and/or drought.

Plan components include desired conditions to increase the amount, patch size, and connectivity of old-growth forest in the future in order to create habitat for old-growth-associated wildlife species, especially in the warm-dry and warm-moist potential vegetation types where it is currently lowest (see FW-DC-TE&V-11 and 12). Desired conditions recognize that forestwide and within individual watersheds, the distribution, patch size, and amount of the very large size class and very large individual trees varies over time, depending upon the forest's development stage and the influence of climate and natural disturbances. For all forest size classes, there is an expectation that there will be wide fluctuation over the short and long terms because of the complex interrelationships between ecological processes (such as succession) and disturbances (such as fire, insects, and disease) and the influence of other desired conditions and objectives in different management areas of the Forest. As a result, desired conditions are most appropriately assessed at the project level, where forestwide standards will apply.

Forestwide standard FW-STD-TE&V-01 protects old-growth forest and associated species:

> In old-growth forest, vegetation management activities must not modify the characteristics of the stand to the extent that stand density (basal area) and trees per acre above a specific size and age class are reduced to below the minimum criteria in Green et al. [2011]. Vegetation management within old-growth forest (see glossary) shall be limited to actions that
>
> - maintain or promote old-growth forest characteristics and ecosystem processes;
> - increase resistance and resilience of old-growth forest to disturbances or stressors that may have negative impacts on old-growth characteristics (such as severe drought, high-severity fire, or epidemic bark beetle infestations);
> - reduce fuel hazards in the wildland-urban interface; or
> - address human safety.

At the site-specific level, other associated characteristics important to old-growth-associated species would be maintained or promoted under these alternatives, such as the amount of dead or broken tops and decayed trees, amount and size of downed wood, and number of canopy layers (canopy layer diversity). Green et al. (2011) provide direction on the use and application of the old-growth forest definitions at the project level, including the associated characteristics (see pp. 11-12).

Standard FW-STD-TE&V-03 states the following:

> Within timber harvest areas, snags and/or live snag replacement trees shall be retained at minimum levels that vary depending upon the geographic area and whether the harvest is within a riparian management zone. Refer to snag retention standards located under each geographic area in chapter 4 of the plan. Refer to FW-GDL-RMZ-10 for additional snag management direction for harvest areas within riparian management zones.

Standards for each geographic area specify the total minimum number of snags or live replacement trees greater than or equal to 20 inches d.b.h. and greater than 10 feet tall that must be retained in timber harvest areas, as well as desirable species (see geographic area standards in the forest plan and sections 3.3.6 and 3.3.7 in the final EIS for more details). These standards also state that all snags of western larch, ponderosa pine, and black cottonwood trees greater than 20 inches shall be retained. Standards for snags greater than or equal to 20 inches d.b.h. are provided forestwide because these are the larger snags with

the highest longevity and are the most valued for their contribution to snag habitat by adding to present and future forest structural diversity (including old-growth forest while they stand and after they fall). The minimum numbers are greater than or equal to those specified for alternative A.

Guideline FW-GDL-TE&V-06 would help to increase the future patch size of old growth in areas where timber harvest and other vegetation treatments occur. It states:

> To increase the patch size of old-growth forest in the future, if managing vegetation within 300 feet of existing old-growth forest, treatment prescriptions that would promote the development of old-growth forest in the future should be considered. At a minimum, the following structural and composition components associated with old-growth forest should be retained if present within at least 300 feet of the old-growth forest patch:
>
> - larger live trees (e.g., greater than 17 inches d.b.h.) of species and condition that will persist over time (such as western larch, ponderosa pine, Douglas-fir) and not cause unacceptable impacts to future stand conditions (e.g., dwarf mistletoe infection or potential dysgenic seed source);
> - large downed wood (greater than 9 inches diameter); and/or
> - snags and decayed, decadent trees greater than 15 inches d.b.h.
>
> Exceptions to this guideline may occur to protect human health and safety and within portions of the wildland-urban interface where decreased fuels are determined necessary to protect values at risk.

Retention of snags of all sizes large enough to be used by wildlife for nesting, feeding, and resting is also emphasized in riparian management zones, recognizing that these areas naturally have higher levels of these components and are important areas for wildlife habitat. In riparian management zones, guideline FW-GDL-RMZ-10 would benefit wildlife species associated with old-growth forest and its key ecosystem characteristics.

In summary, plan components for old-growth forest and very large live trees and snags benefits wildlife by retaining old-growth forest, increasing its patch size and distribution, retaining very large snags with high wildlife value wherever present, and, if snags are not available, leaving replacement trees at levels that would have the potential to provide for snags in the future, after existing snags have fallen. For additional information on existing conditions and effects related to old-growth forest, snags, and downed wood, refer to sections 3.3.6 and 3.3.7 as well as Trechsel (2017c).

Cumulative effects

This section summarizes activities and effects that are common to most species associated with old-growth forest and very large live and dead trees. See also the individual cumulative consequences sections for specific species.

On all managed lands within the cumulative effects analysis area, past management actions, particularly timber harvest and fire suppression, have altered stand structure, composition, function, and connectivity, particularly in valley-bottom areas that were readily accessible, historically had low- and moderate-severity fire regimes, and are now in the wildland-urban interface (see figure 1-13). Prior to the 1986 forest plan, contract utilization standards required many dead trees to be removed in harvest units, resulting in a lack of snags and downed wood. Timber harvest prescriptions and timber sale contracts now include direction to retain snags in harvest units and also require the retention of large downed wood.

On all lands, fire suppression is likely to be most successful in the valley bottoms where people live (primarily the warm-dry and warm-moist potential vegetation types). This could result in better retention of the very large tree size class and very large trees. In the wildland-urban interface, precommercial thinning, timber harvest, and prescribed burning would reduce stand densities, would increase survival of retained trees, and could increase the rate at which very large trees develop. On managed lands, active vegetation restoration actions could mimic natural disturbances in areas where natural disturbances are not compatible with multiple-use objectives of the forest plan or the objectives of other landowners. In these areas, a century of fire exclusion, coupled with timber harvest, has changed historically open forests into more closed, dense forests that are often dominated by smaller Douglas-fir. In western forests where fire is a dominant disturbance process, restoring a more open understory while maintaining a cohort of trees of large and very large diameter in perpetuity may be an appropriate method for achieving objectives related to wildlife and fire resiliency (J. R. Franklin et al., 1997; J. R. Habeck, 1990).

Outside the wildland-urban interface, particularly in the cool-moist or cold potential vegetation types, vegetation management standards promote the development of forests in the large and vary large size classes containing spruce and subalpine fir in multistoried stands with a dense understory. These forests would be more susceptible to wildfire and would be likely to have higher levels of mortality due to insects and disease (especially for very large Douglas-fir and spruce). The trend of loss of old-growth forest and the very large size class due to wildfire is likely to continue on all lands in these forest types in the future.

In the future, drought may also affect very large trees on all lands. Douglas-fir and ponderosa pine tolerate drought better than nearly all other species and so may be favored by expected changes in climate, whereas western larch is a species that is highly susceptible to climate warming. Western larch and ponderosa pine have the ability to survive fire, provided they can get large enough between fires and the fuel loading is not too great (Robert E. Keane et al., in press). Most climate change studies predict major losses of live western larch throughout the northern Rockies, which could create an abundance of habitat for cavity-nesting species but would also reduce canopy cover. Where accessible on State and private timber lands, many dead trees are likely to be salvaged.

Because response to anticipated changes in climate will vary by tree species and structure, responses by associated wildlife species will also vary. The most important tree species for a variety of wildlife species associated with old-growth habitats on the Forest are western larch, ponderosa pine, and black cottonwood because these species are key for primary cavity excavators that make nesting and denning cavities required by many other wildlife species. Large Douglas-fir provide important feeding habitat and also provide cavity nesting and denning habitat for a variety of wildlife species, but these snags do not persist as long as western larch or ponderosa pine.

When very large live trees are killed, the number of very large dead trees (snags and downed woody material) goes up. This would be beneficial to wildlife species that depend upon very large snags and downed wood provided that reductions in canopy cover created by the loss of live trees do not become limiting. On NFS lands, modeled trends in very large snag numbers increase over the next five decades under all alternatives. The increase in very large snags (greater than or equal to 20 inches d.b.h.), especially in the “4+ snags per acre” density category, corresponds to the decrease in the very large live tree component. The analysis displayed in table 51 shows very large snags across the Western Montana Zone of the Northern Region, which includes the Flathead, Kootenai, and Lolo National Forests. The numbers are based upon Forest Inventory and Analysis data, which accounts for the cumulative effects of snags lost due to timber harvest, post-fire salvage, and firewood gathering. If the current trend in wildfires continues, snag numbers would be anticipated to remain within the natural range of variation in the future. These snags would provide abundant downed wood in the future, providing feeding, denning, and resting habitat for wildlife as well as deep duff and litter as trees decompose.

Table 51. Snag densities (snags per acre equal to or greater than 20 inches d.b.h) for the Western Montana Zone, which is comprised of the Flathead, Kootenai, and Lolo National Forests combined (Trechsel, 2017c)

Snag Analysis Group (potential vegetation type)	Mean	Lower Bound	Upper Bound
Lodgepole pine	0.6	0.3	0.9
Warm-Dry	1.6	1.1	2.0
Warm-Moist	1.3	0.8	1.7
Cool-Moist	1.8	1.3	2.3
Cold	1.7	1.1	2.3

Within the boundaries of the Forest are three state forests as well as scattered parcels managed by Montana Department of Natural Resources and Conservation. This agency manages old growth according to the administrative rules of Montana for forest management (36.11.418 biodiversity—old-growth management), which directs the department to manage old growth to meet biodiversity and fiduciary objectives. The department considers the role of all stand age classes, consistent with the range of natural disturbances, when designing harvests and other activities to maintain biodiversity. Old growth is constrained in Montana Department of Natural Resources and Conservation's 2015 sustainable yield calculation; 8 percent of forest stands on lands managed by their Northwestern and Southwestern land offices are to meet the minimum quantifiable definitions of old growth by Green et al. (2011). The project-level considerations of Montana Department of Natural Resources and Conservation complement those of the Forest.

On all lands, if the size, severity, and/or frequency of wildfires increases in the future it could cause widespread declines in the availability of late-successional or old-growth forests because it can take 100 years or more for trees to reach diameters of 20 inches. If species that are adapted to surviving wildfire (such as western larch, ponderosa pine, and Douglas-fir) reach a large enough size between wildfires, the value of these trees for providing wildlife habitat would be retained. However, if they do not grow large enough between wildfires, forest dominance types could be changed to species such as lodgepole pine, which rarely reaches diameters of 20 inches d.b.h. and which is easily killed by fire but is able to regenerate from seed earlier than other species. This would be detrimental to most species associated with old-growth forest.

An increase in private residences or an increase in people who burn firewood can result in the loss of very large snags on all lands, particularly the largest, most desirable wildlife snags such as very large western larch. This effect is most likely to occur within 200 feet of open roads. Past road building on Federal, State, and private lands has likely impacted the number and distribution of very large snags, but road influences have decreased over time. Access management has resulted in fewer routes open to motor vehicle use on Federal, State, and private lands, helping to protect very large snags from removal for firewood.

In summary, proposed management direction on the Forest, in the context of all lands of the larger landscape, would contribute to old-growth forest and habitat and to very large live and dead trees. This would be accomplished by plan components to maintain all existing old-growth forest, retain very large live, decayed, and dead trees, and promote development of very large trees. Although the Forest Service does not have authority over all the stressors, the ecological conditions of old-growth forest and habitat and very large live and dead tree communities and the processes that maintain them would be provided on NFS lands. Coarse-filter plan components provide for biodiversity and the ecological conditions that

support the long-term persistence of the majority of species associated with these habitats. Old-growth forest, habitat, and very large live and dead trees are distributed across all Forest geographic areas.

In addition to effects on most species associated with old-growth forest and very large live and dead trees, the following sections describe species-specific effects.

Fisher

Because translocated fisher were known to occur on the Forest in the past and because the Forest contains potential habitat modeled by Olson and others (2014), this final EIS analyzes effects to fisher. On January 13, 2017, the USFWS initiated a status review for the distinct population segment of Northern Rocky Mountain fisher to determine whether this population meets the definition of an endangered or threatened species under the Endangered Species Act. In October 2017, the USFWS found that the fisher in the northern Rocky Mountains is not warranted for listing under the Endangered Species Act (USFWS, 2017a).

Affected environment

Fisher are distributed across portions of Canada, the Rocky Mountains, the Cascade Mountains, the Great Lakes region, and portions of the Pacific Coast region. Fishers are patchily distributed in the northern Rockies. Some of the lands of eight national forests are within the expected range of fisher in the Northern Region (Cushman, McKelvey, Flather, & McGarigal, 2008; L. E. Olson et al., 2014; Sauder & Rachlow, 2014; M. K. Schwartz, 2007; Michael K. Schwartz, DeCesare, Jimenez, Copeland, & Melquist, 2013). Fisher are found almost exclusively in the inland maritime ecosystem in Idaho and in areas where that ecosystem extends eastward into western Montana (McKelvey & Buotte, in press). The historical distribution of fisher and fisher habitat in Montana is uncertain, but Weckwerth and Wright (1968) reported that the fisher once occurred in western Montana; a few animals were trapped in what is now Glacier National Park prior to 1911. Due to a lack of trapping records in Montana from 1929-1959, many biologists believed the fisher had been extirpated (Ray S. Vinkey, 2003). Trapping, as well as large regional fire events in 1910 and 1934, likely contributed to regional fisher population declines in the early 1900s (J. L. Jones, 1991).

Fisher occur at extremely low densities and are difficult to detect. Vinkey (2003) reviewed historical records as well as carnivore research in Montana and concluded that the fisher is one of the lowest-density carnivores in the State. In high-quality habitats in British Columbia, fisher densities were between 0.03 and 0.04 per square mile or approximately 1 per 21,000 acres (USFWS, 2010). Information is lacking on the survival rates and reproductive success of fisher in the northern Rockies (Sauder, 2014; Sauder & Rachlow, 2014).

Fisher were not known to occur in the plan area until they were translocated from Minnesota and British Columbia to the Forest and nearby portions of the northern Rocky Mountains beginning in 1959 (R. S. Vinkey et al., 2006; Weckwerth & Wright, 1968). Translocations placed 78 British Columbia fishers into various portions of the Rocky Mountains of Montana and Idaho between 1959 and 1963, and another 110 fishers from Minnesota and Wisconsin were translocated into the Cabinet Range in northwestern Montana between 1989 and 1991. Vinkey and others (2006) concluded that the Selway–Bitterroot Mountains of Montana and Idaho likely functioned as a refuge for native fishers in west-central Montana. In northwestern Montana), however, current evidence suggests the translocations resulted in the establishment of fisher populations with non-native genetic haplotypes consistent with British Columbia and Midwestern source populations; to date, no individuals with the native haplotype have been discovered on the Forest. Vinkey and others (2006) stated their belief that fishers in northwestern Montana are descended from both the 1959 and 1989-1991 translocations rather than from a relic fisher population (p. 270).

The sole translocation site on the Forest was near Holland Lake, where 15 fishers were marked and released in 1959 and 1960. Nine fishers were marked and translocated to the Kootenai National Forest, adjacent to the Forest, also in 1959 and 1960. From 1960-1968, 11 of the fishers translocated to the Flathead or Kootenai National Forests were subsequently recaptured (eight were killed by trapping, one was shot, one was found dead, and one was released alive). Four fishers that were released on the Kootenai National Forest dispersed to the Forest and were later retrapped and released (Weckwerth & Wright, 1968, figure 1, tables 1 and 2). From 1982-1993, a minimum of 12 fishers were trapped on the Forest (Giddings, 2012). Most of the trapped animals were listed as animals translocated in 1959 or 1960 (Weckwerth & Wright, 1968, figure 1, tables 1 and 2) or were animals believed to be their offspring. In Montana, the fisher is legally trapped under a limited quota system. In 2015, regulations allowed for the take of two individuals in trapping district 1, located in northwest Montana (MTFWP, 2017).

Fishers are not currently known to occur on the Forest. Detections have been reported based upon tracks or visual sightings but are not considered reliable because marten can be mistaken for fisher. The Montana Natural Heritage Program database (MNHP-MTFWP, 2013) includes observations of fisher that have not been verified with DNA evidence (Kuennen, 2013c). DNA has been collected during noninvasive surveys for mesocarnivores on the Forest from 2006-2014 and also in Glacier National Park. The DNA collection methods (hair snares and bait stations) were developed by researchers with the Rocky Mountain Research Station. These methods established a 5-by-5-mile systematic survey grid overlaid on the entire Southwest Crown of the Continent landscape (including the southern portion of the Forest). From 2012-2014, 82 of 129 grid cells were surveyed and no fishers were detected on the Forest (SWCC, 2014). Some uncertainty remains because grid cells in the remote Bob Marshall, Great Bear, and Scapegoat Wildernesses have not been surveyed, however, there is little modeled habitat there. Surveys in Glacier National Park have also been unsuccessful in detecting fisher (Curry et al., 2016; Pilgrim & Schwartz, 2015; Swanson, 2017; SWCC, 2014, 2015) (J. Waller, Glacier National Park Supervisory Wildlife Biologist, personal communication, 2015; K. Pilgrim, USFS Rocky Mountain Research Station, personal communication, 2016).

Many factors likely contribute to the current distribution of fishers. Interactions with other species in diverse ecosystems (e.g., mountain lions, wolves, coyotes, wolverines, and lynx) may affect fisher distribution and competition for prey, or these species may prey upon fishers (Fisher, Anholt, Bradbury, Wheatley, & Volpe, 2013). In the Cabinet Mountains of the Kootenai National Forest, at least 9 of 32 fishers transplanted from Wisconsin were known to have been killed by other predators (Roy, 1991). Fishers also appear to be restricted to areas with relatively low snow accumulation (J. L. Jones, 1991). According to Raine (1983) and Krohn et al. in 1994, Aubry and Houston in 1992, Arthur et al. in 1989, and Heinemeyer in 1993 (as cited in Ruggiero et al., 1994), deep, fluffy snow (which occurs on much of the Forest) negatively affects habitat use by fishers and may affect fisher distribution, population expansion, and colonization of unoccupied habitat. Powell and Zielinski note that if trapping seasons are regulated carefully in Montana to prevent overtrapping, fisher populations may slowly expand, but if fisher populations are limited by deep snow, fishers may never reach high densities (as cited in Ruggiero et al., 1994). It is possible that differences in habitat, topography, prey, and predators made transplanted fishers vulnerable (Roy, 1991). Olson and others (2014) stated that fishers were more likely to occur in areas with wetter, milder climates characterized by higher mean annual precipitation, mid-range winter temperatures, and topography in the form of drainages or valleys. Raine (1983) found that movements of fisher were restricted by the soft, thick snow cover that is present during midwinter, whereas marten did not appear to be hindered by soft snow cover to the degree that fisher are. Marten are known to be distributed across most of the Forest, so deep, fluffy snow conditions may be a factor in limiting the distribution of fisher and their potential habitat. Additionally, the northern Rocky Mountain region has a history of periodic regional wildfires, and habitat in the northern Rockies is likely suboptimal for fishers (Lofroth et al., 2011; Michael K. Schwartz et al., 2013). A period of fewer fires occurred from the 1940s

to the 1980s, at the same time that fisher were being reintroduced in parts of Idaho and Montana, and more fisher were detected during this time period. Since the late 1980s, the northern Rockies has experienced more frequent fires (Westerling, Hidalgo, Cayan, & Swetnam, 2006). Stand-replacing wildfires have increased substantially on the Forest since 1988 (see section 3.8 for more details).

Olson and others (2014) modeled fisher habitat for an area in the northern Rockies spanning western and northern Idaho. This model was used by the USFWS in their species status assessment (USFWS, 2017d). On the Forest, there are few patches of modeled fisher habitat large enough to support a home range, and most of the habitat modeled by Olson and others (2014) occurs as riparian stringers rather than the large home range-sized patches that occurs in areas with current reproductive populations of fisher (USDA, 2014a, figure 64; USFWS, 2017d). The distribution of modeled fisher habitat on the Forest is likely due to natural environmental conditions accounted for in the modeling. The Forest is at the eastern edge of the range for the western red cedar and hemlock forest types that are characteristic of the moist, maritime-influenced ecosystems. Habitat types in areas of the northern Rockies known to be used by fisher, including all western red cedar and western hemlock habitat types, are within this setting. These potential vegetation types are the least common on the Forest. The warm-moist potential vegetation type that provides larger blocks of potential fisher habitat on the Forest includes moist sites that are largely limited to lower elevations and relatively productive, deep ash-capped soils. The Forest does not support a broad distribution of very large western red cedar, a species that is thought to provide (through heart rot) large enough cavities for fisher denning and resting.

Recent efforts by Olson et al. (2014) to model the expected future distribution of fisher suggests that habitat distribution will change. Conditions that support fisher habitat in the U.S. northern Rocky Mountains are expected to slowly shift north and east toward mountainous areas near Glacier National Park and south of Kalispell in response to a warmer, winter climate with more precipitation (and more that may fall as rain at lower elevations) over the next 70 years.

Schwartz and others (2013) reported on habitat characteristics of fisher in the northern Rockies at multiple, nested scales. They described the landscape scale as features within a 0.62 mile radius surrounding known fisher locations. At a landscape scale, they found that fisher use was highest where large trees (greater than about 15 inches d.b.h.) made up about 50 percent of the landscape but began to decline when the proportion was higher. Sauder and Rachlow (2014) reported that fisher select landscapes managed for multiple use. They modeled fisher habitat selection at the landscape scale and reported that both forest configuration and forest composition were important. Fishers selected landscapes for home ranges with larger, more contiguous, patches of mature forest (defined as trees exceeding about 80 feet canopy height) and reduced amounts of open areas (defined as the 0–9.9% canopy cover class). They found that the percentage of mature forest was not the best supported variable for predicting fisher occupancy, nor was the percentage of high canopy cover. These authors characterized fisher habitat as a variety of habitat patches that support prey species within a matrix of mature forest arranged in connected, complex shapes and with few isolated patches (Sauder & Rachlow, 2014).

In the Rocky Mountains, there are times of the year when fishers prefer young to medium-age conifer forests (J. L. Jones, 1991; Roy, 1991), but they avoid large open areas with very low canopy closure, which may limit their population expansion (Ruggiero et al., 1994). Sauder (2014) found that at the home range scale of about 12,355-24,710 acres in size, fishers select areas for core use zones that have relatively high fine-scale habitat heterogeneity, supporting the hypothesis that fishers establish home ranges that provide access to a greater diversity and abundance of prey species as well as access to habitat features that are important for reproduction and thermoregulation.

At a stand scale, Schwartz and others (2013) suggested that mature forest stands most used by fisher have both large and smaller trees, consistent with evidence that fishers need cover for hunting efficiency or

predator escape purposes. Schwartz and others (2013) found that locations used by fisher at the stand scale were closely correlated with the maximum d.b.h. of trees. There is no known threshold for minimum number and size of trees needed by fisher, but they are known to use the largest trees available for denning. In a northern Idaho study, fisher selected for stands containing western red cedar and grand fir and avoided ponderosa pine and lodgepole pine stands (Michael K. Schwartz et al., 2013). On the Forest, western red cedar and most grand fir habitat types are included in the warm-moist potential vegetation type and can be found at suitable elevations for use by fisher, so this forest type is considered potential fisher habitat.

Schwartz and others (2013) stated that managers can maintain fisher resting habitat by retaining large trees and using forest management practices that aid in the recruitment of trees that achieve the largest sizes. They also recommend increasing structural diversity at these sites. Components of structural diversity needed by fisher include very large trees, snags, fallen logs, and stumps, as well as seedlings, shrubs, and herbaceous cover (Meyer, 2011; Ruggiero et al., 1994). According to Roy (1991), snowshoe hares are the most common prey for fishers. For fishers in the Cabinet Mountains of Montana, 50 percent of the prey remains found in 80 scats were from snowshoe hares. Mice and other small rodents constituted the next most common prey (Ruggiero et al., 1994).

In north-central Idaho and west-central Montana, preferred resting habitat and prey were likely more available along drainage courses, which were the most commonly traveled by fishers, based on observations. The importance of riparian areas for fisher has been shown in studies conducted in British Columbia, the southern Sierra Nevada in California, and northwest Montana (Raley, Lofroth, Truex, Yaeger, & Higley, 2012; Weir, Lofroth, & Phinney, 2011; Zielinski, Thompson, Purcell, & Garner, 2013; Zielinski et al., 2004a, 2004b). While riparian corridors have been identified as being important for connectivity (J. L. Jones, 1991), the minimum width is unknown. As summarized by the USFWS, "Though capable of long-distance movements, fisher generally have small dispersal distances. Small dispersal distances may be a factor of fishers' reluctance to move through areas with no cover (Buskirk and Powell 1994, p. 286). Thus, where habitat is fragmented it is more difficult to locate and occupy distant yet suitable habitat, and fishers may be aggregated into smaller interrelated groups on the landscape (Carroll et al. 2001, p. 974)" (USFWS, 2011a). In a review of key findings from fisher habitat studies in the western U.S. and Canada, Lofroth and others (2011) stated that the presence of human activity appears to have little influence on fisher movements.

Key stressors

Land management

On all land ownerships, fisher habitat quantity and quality can be reduced by activities that reduce habitat structural diversity, (e.g., very large live trees, snags, or downed logs) or eliminate connectivity of forests with at least 40 percent canopy cover. Timber harvest can temporarily remove elements of old-growth habitat that are important for fisher (J. F. Franklin et al., 2002; Green et al., 2011; Hann et al., 1997; Wisdom & Bate, 2008). This can have negative effects on fisher through displacement, change in behavioral patterns, or decreased reproductive rates. Timber harvest may mimic natural disturbance if it maintains sufficient canopy cover, creates heterogeneous habitat and edges, and snags are retained. Fisher do not avoid areas adjacent to state highways, and road density is not a significant variable in describing suitable fisher habitat in the northern Rocky Mountains (USFWS, 2017d). Motorized access can indirectly affect accessibility for trapping or firewood gathering.

Changing climate

Some climate models project that the lower elevations of northwest Montana will have less snowfall in the future, with more precipitation falling as rain. This could be beneficial to fisher, but downscaled

model projections for winter precipitation are uncertain. Extensive stand-replacing wildfires can temporarily reduce fisher habitat by decreasing cover over large areas but can have positive effects by increasing prey (USFWS, 2017d).

Key indicator for analysis

The following indicator applies:

- Key ecosystem characteristics for fisher habitat

In addition, refer to the indicators and effects described in sections 3.3.6, through 3.3.9 and section 3.7.4, subsections "Old-growth forest, very large live tree habitat, and very large dead tree habitat," "Aquatic, wetland, and riparian habitats," and "Coniferous forest habitats."

Environmental consequences

Alternative A

The 1986 forest plan does not have management direction specific to fisher but does provide for fisher habitat because it has direction for management of old-growth, snags, and downed wood, as described above. Riparian habitat conservation areas also have management direction that promotes habitat conditions that would support fisher and provide connectivity. Routes or areas open to motorized over-snow vehicle use during the winter trapping season may indirectly affect accessibility for trapping, but there are limitations in areas where motorized over-snow vehicle use is allowed (see figure 1-42) that reduce this risk. Alternative A would further reduce public access firewood gathering.

Alternatives B modified, C, and D

Coarse-filter plan components for coniferous forests included in all action alternatives, as detailed in section 3.7.4, subsection "Old-growth habitat, very large live tree habitat, and very large dead tree habitat," and in section 3.3, would provide for the key ecosystem characteristics for fisher described in the "Affected environment" section. Desired condition FW-DC-WL DIV-01 specifically addresses key ecosystem characteristics for fisher in potential habitats, including mixed coniferous forests of the warm-moist potential vegetation type that have the potential to grow very large western red cedar, western larch, and western white pine, and in riparian areas of the cool-moist potential vegetation type. Vegetation standards for the Canada lynx would also benefit fisher by retaining multistoried forest with a dense understory providing hare habitat. Other plan components for vegetation would promote a landscape mosaic of different size classes and successional stages, providing habitat diversity and fisher prey species. Other key plan components for riparian management zones would provide for fisher habitat connectivity (see also section 3.7.4, subsection "Aquatic, wetland, and riparian habitats," and section 3.7.6)

Forestwide standard FW-STD-TE&V-01 protects old-growth forest and associated species by stating that vegetation management activities must not modify the characteristics of the stand to the extent that stand density (basal area) and trees per acre above a specific size and age class are reduced to below the minimum criteria in Green et al. (2011). Guideline FW-GDL-TE&V-06 provides direction for vegetation treatments in stands within 300 feet of existing old-growth forest with the intent of promoting development of old-growth forest in larger patch sizes over time, which would be beneficial to fisher habitat.

In the cool-moist potential vegetation type, modeled fisher habitat is primarily associated with riparian areas. Riparian management zones are abundant and interconnected on the Forest (see figure 1-07). Desired conditions for fisher are integrated with forestwide desired conditions FW-DC-RMZ-01 through

06 for riparian management zones. These desired conditions would provide for ecological conditions that support fisher because they emphasize the natural composition of flora and fauna, natural processes, and relatively more diverse structure and composition than areas outside riparian management zones. Some standards and guidelines apply to the entire riparian management zone and some apply only to the inner riparian management zone, as defined in FW-STD-RMZ-01. Forestwide standards FW-STD-RMZ-02 through 05 and guidelines FW-GDL-RMZ-01 through 13 apply to the entire riparian management zone. These guidelines benefit fisher habitat diversity because they state that the clearcut harvest method should not be used, and they emphasize retention of downed trees and live reserve trees. Forestwide standard FW-STD-RMZ-06 states that vegetation management shall only occur in the inner riparian management zone to restore or enhance aquatic and riparian-associated resources, but exceptions for prescribed fire, sapling thinning, and fuels reduction treatments, as well as for human safety considerations, may occur after site-specific analysis as long as these resources are maintained. Standard FW-STD-RMZ-06 would benefit fisher habitat because it would allow activities such as noncommercial thinning to stimulate the diameter growth of conifers and the removal of ladder-fuels to reduce the risk of mortality of large, live trees, as long as fish and wildlife habitat is maintained. Forestwide guidelines FW-GDL-RMZ-12, 14, and 15 benefit habitat connectivity by promoting the retention of understory vegetation and limiting the construction of new roads, temporary roads, and landings in riparian management zones. Forestwide guideline FW-GDL-RMZ-09, which applies to the entire riparian management zone defined by FW-STD-RMZ-01, provides for habitat connectivity by stating that the distance to cover for created openings should not exceed 350 feet.

Routes or areas open to motorized over-snow use during the winter trapping season may indirectly affect accessibility for trapping, but there are limitations in areas suitable for motorized over-snow vehicle use (figures 1-42 through 1-45) that reduce this risk. Road access standards and objectives (FW-STD-IFS-02, GA-SM-STD-01, GA-SV-OBJ-04) would limit accessibility for firewood gathering. Motorized access by the public would not increase, but some roads outside of grizzly bear secure core areas could be opened temporarily for public firewood gathering (see “Grizzly bear” subsection of section 3.7.5 for more details). Public motorized road access could indirectly affect retention of very large snags and down trees in areas where firewood removal is allowed.

Summary of modeled alternative consequences

Ecosystem Research Group modeled the effects of the alternatives (appendix 3). The natural range of variation was modeled going back about 1,000 years, and the effects of alternatives were projected for the next 50 years, including anticipated changes in climate. Ecosystem Research Group modeled fisher habitat based on Olson’s characteristics (L. E. Olson et al., 2014). Fisher denning and resting habitat was modeled as forests with an average d.b.h. class greater than 10 inches, since trees in this class on the mesic habitats of the Forest generally have an average height greater than 65 feet tall (consistent with the Olson models). Cover types in the moist habitat type groups with presence of western larch, Douglas-fir, western hemlock, western red cedar, and cottonwood, which may provide cavities used for resting and denning, were included (see appendix 3).

The Ecosystem Research Group model indicates that historically there was a wide range of natural variation of modeled fisher habitat of about 350,000 acres (resulting largely from wildfire). The results show that the number of acres of modeled fisher habitat initially increases by the end of the first decade and then declines back to near current levels by decade 5 under all alternatives. Vegetation modeling results show that the acreage in this size class is likely to increase in the warm-moist potential vegetation type but not in the cool-moist. Model results indicate that natural disturbances have a substantially greater impact on reducing this size class than timber harvest amounts, with fire, insects, and disease the primary disturbances. Very large trees killed by insects or disease would provide potential resting habitat and increase the diverse structure that fisher are associated with, increasing fisher habitat quality, provided

that the canopy cover provided by live trees does not decrease too much. Stand-replacing wildfires are likely to reduce canopy cover to levels below that which fishers require, but stand-replacing wildfires are not as likely to occur in the warm-moist potential vegetation type that provides potential fisher habitat as they are in the cool-moist potential vegetation types. Large regional fires dramatically change the landscape but for short periods of time until 10 percent canopy cover is reestablished. Female fisher used high-severity fire areas just as much as adjacent unburned areas 10-11 years post burn (USFWS, 2017d).

Under alternative B modified, modeled fisher habitat declines a little more than under the other alternatives, likely because modeled outputs for this alternative regenerate more acres during the first decade to reduce stand densities in the wildland-urban interface portions of the warm-moist potential vegetation type. The model predicts that all alternatives would stay within the minimum and maximum range of variation over the five-decade time period. None of the alternatives model timber harvest in riparian habitat conservation areas or riparian management zones, where much of the modeled fisher habitat in the cool-moist potential vegetation type occurs, so these portions of the Forest would be likely to continue to contribute to connectivity. Under all the alternatives, access management for no net increase in open roads would help to maintain habitat connectivity, large snags, and downed wood and would reduce trapping access. Patch size, patch distribution, and distance between patches would be analyzed at the project level, as would the presence of very large snags, live trees with heart rot, and downed woody material.

Cumulative effects

In the past, timber harvest removed very large trees in portions of the warm-moist potential vegetation type that provides fisher habitat. According to the preliminary Northern Region Adaptation Partnership risk assessment for fisher (NRAP, 2015), fisher habitat is anticipated to shift in the future. “Fishers are found in the relatively warm and wet conditions associated with the inland maritime ecosystem. Fisher habitat quality is projected to decline in virtually all areas where fishers currently exist, coupled with increased habitat quality in areas to the east and south. However, the old forest structures that fishers are currently associated with require significant time to form; it is unknown whether similar climate will equate to similar habitats in the short term” (p. 62). This risk assessment for fisher (NRAP, 2015) estimated that the magnitude of effects would be low in 2030 and moderate in 2050 (consistent with Ecosystem Research Group’s modeling results), with a high likelihood of effects across all time periods. This may mean that climatic conditions on portions of the Forest may become more suitable for fisher towards the middle or end of the century. Under Olson’s various models of future fisher habitat with respect to climate change, there is a gain of suitable habitat in the mountainous areas of Glacier National Park and areas south of Kalispell. However, there are uncertainties associated with these models because fisher must also be able to disperse if their habitat shifts. If fishers are unable to achieve regular dispersal distances greater than about a mile through unsuitable farmland or developed valley habitat, Olson and others predict that the total area of available habitat would actually decline over time (L. E. Olson et al., 2014). Riparian areas on all lands may help to provide dispersal routes.

Most of the current modeled fisher habitat is in portions of the warm-moist potential vegetation type at low elevations capable of growing mixed species forest, including very large western red cedar, very large western larch, and very large white pine. These forest types are located in the Swan Valley geographic area, along the reservoir in the Hungry Horse geographic area, in portions of the Salish Mountains geographic area, and in the southern portion of the North Fork geographic area (USDA, 2014a). Some areas that provide potential fisher habitat have private and/or State lands intermingled with Forest lands. Montana Department of Natural Resources and Conservation manages old growth according to the administrative rules of Montana for forest management (biodiversity—old-growth management), which direct the department to manage old growth to meet biodiversity and fiduciary objectives. The department considers the role of all stand age classes, consistent with the range of natural disturbances, when

designing harvests and other activities to maintain biodiversity. Old growth is constrained in Montana Department of Natural Resources and Conservation’s 2015 sustainable yield calculation such that 8 percent of forest stands on lands managed by their Northwestern and Southwestern land offices are to meet the minimum quantifiable definitions of old growth by Green et al. (2011). The project-level considerations of Montana Department of Natural Resources and Conservation complement those of the Forest with respect to maintenance of old-growth habitat and very large live and dead trees to support wildlife. Whether patch size and connectivity of fisher habitat would increase depends upon specific locations of existing old growth as well as locations of future treatments, which is difficult to predict. How changing climate and stand-replacing wildfires will affect fisher habitat in the future is also difficult to predict (see also cumulative consequences on old-growth forest and very large live and dead trees on all lands, discussed above).

Timber harvest does not occur in Glacier National Park, but extensive wildfires have occurred there since the 1980s. Fisher have not been detected in the Park during non-invasive sampling efforts in in recent years (John Waller, personal communication, 2016), indicating that factors other than timber harvest or trapping may be primarily responsible for low fisher numbers or the absence of fisher on all lands. Glacier National Park, encompassing about a million acres adjacent to the Forest, is closed to trapping.

Montana Fish, Wildlife and Parks adopts trapping regulations, adjusting regulations to meet population and harvest objectives for fisher. In Montana the potential for over-trapping of female fisher appears to be negligible based upon current trapping regulations (USFWS, 2017d).

Pileated woodpecker

Affected environment

The pileated woodpecker is distributed across portions of southern Canada, most of the eastern United States, the northern Rocky Mountains, and the West Coast. The pileated is the largest woodpecker in northwest Montana and is easy to detect. Pileated woodpeckers are regularly detected on annual surveys of the Forest for “integrated monitoring in bird conservation regions,” but they have large home ranges and occur in relatively low numbers and density compared to many other bird species (Kuennen, 2013n; C. M. White et al., 2015), so there are no statistically reliable trends available. There have been numerous observations of this species across all geographic areas on the Forest in the last decade (MNHP, 2013b).

Pileated woodpeckers are primary excavators, drilling large cavities in very large snags or live trees with heart rot for nesting and creating cavities that are used as habitat by numerous other species for nesting, denning, roosting, and resting once they are abandoned by the pileated woodpecker. Pileated woodpecker habitat occurs at a wide range of elevations, and they occur in all forested potential vegetation types of the Forest except cold. Pileated woodpeckers have a relatively large home range of 100-1,000 acres, incorporating diverse forest structure and composition. In Montana, pileated woodpeckers select larch for nesting more frequently than other tree species, followed by ponderosa pine, black cottonwood, aspen, western white pine, grand fir, and ,lastly, Douglas-fir (McClelland and McClelland 1999). Snags selected for nesting are very large diameter (≥ 20 inches d.b.h.) and ≥ 40 feet tall (Bull 1987; McClelland 1977). Bull and Holthausen (1993) found that pileated woodpecker abundance increased as the amount of forest with > 60 percent canopy closure and large old trees increased. Nest trees averaged 28.7 inches d.b.h. and often had broken tops. Large trees, logs, snags, carpenter ants, and heartwood decay (which may enter the tree through deep fire scars) are components of forests that sustain pileated woodpeckers. Thomas (1979) estimated a maximum pair density of 0.3 pairs per 100 acres with a requirement for 14 snags greater than 20 inches d.b.h. per 100 acres for the Blue Mountains of Oregon and Washington.

In recent decades, many forests inhabited by pileated woodpeckers have changed considerably from large continuous areas of mature and old forests with dense canopy cover (Bull & Holthausen, 1993) to relatively open canopies (< 30 percent closure) and an increasing number of snags and logs as a result of increased levels of insect infestation (Bull, Nielsen-Pincus, Wales, & Hayes, 2007). Bull and others (2007) studied the density of nesting pairs and traditional home ranges of pileated woodpeckers in two study areas over a 30-year period and in five additional study areas over 15 years after extensive insect-caused tree mortality and timber harvest during the 1990s. Although canopy closure declined due to tree mortality in five of the seven areas they studied and some of the forests were no longer classified as old growth, they continued to function as habitat for woodpeckers because of the nesting, roosting, and foraging habitat provided.

Key stressors

Key stressors are the same as those listed under section 3.7.4, subsection "Old-growth forest, very large live tree habitat, and very large dead tree habitat," because pileated woodpeckers occur across the full range of these habitats on the Forest.

Key indicator for analysis

There are no species-specific plan components for pileated woodpeckers because key ecosystem characteristics described in the "Affected environment" section would be provided by the implementation of coarse-filter plan components discussed in sections 3.3.3 through 3.3.8 and in section 3.7.4, subsections "Coniferous forest habitats," "Old-growth forest, very large live tree habitat, and very large dead tree habitat," and "Burned forest and dead tree habitats." The following section discusses how these plan components support key ecosystem characteristics for the pileated woodpecker

Environmental consequences

Summary of modeled alternative consequences

In order to assess key aspects of pileated woodpecker habitat, the Ecosystem Research Group modeled the effects of alternatives on the natural range of variation, current conditions, and effects of alternatives (appendix 3). The natural range of variation was modeled going back about 1,000 years, and the effects of the alternatives were projected for the next 50 years, including anticipated changes in climate and the fire suppression logic of the model. Modeled habitat included forests with average VMap diameter classes greater than 15 inches d.b.h. and greater than 15 percent canopy cover, with species mixes including western larch, ponderosa pine, black cottonwood, and Douglas-fir for nesting. Forests with an average diameter of 15 inches d.b.h. may have very large trees. Although pileated woodpeckers use very large-diameter snags and live trees with heart rot for nesting, the SIMPPLLE model is dependent upon R1 VMap and did not allow the incorporation of very large snag densities. The Forest used Forest Inventory and Analysis summary data to determine the number of acres with at least 8 or 10 large (15-19.9-inch d.b.h.) and very large (greater than or equal to 20 inches d.b.h.) trees per acre (depending on habitat type group). A VMap texture file was then used to spatially map those acres. Forest Inventory and Analysis data were also evaluated to ensure that sufficient large snags exist at the forest scale to provide nesting habitat, assuming random distribution. Forest Inventory and Analysis summary data suggests that snags 15-20 inches d.b.h. (used primarily for feeding) occur at approximately four per acre, and snags greater than or equal to 20 inches d.b.h. (used primarily for nesting) occur at approximately one per acre.

The model predicts that all alternatives would stay within the minimum and maximum range of the natural range of variation over the five-decade time period. Future acres of modeled habitat vary little between alternatives and remain close to current levels, which are at the middle of the range of the natural range of variation. The combined modeled acreage of large trees used for feeding and very large trees

used for nesting increases slightly through the five-decade period, likely because forest succession outpaces stand-replacing wildfire in modeled pileated woodpecker habitat. Since pileated woodpeckers can utilize forests that are relatively open, fires, insects, and disease have little negative effect as long as stands retain large and a few very large trees. Changes in the distribution of cover types for suitable nest trees, which include western larch, ponderosa pine, Douglas-fir and western red cedar, suggest those preferred nest trees will also increase slightly through the period (for black cottonwood, see the section on hardwood trees above). The amount of modeled fire, insects, and disease contributes to both nesting snags and foraging snags that would increase habitat suitability for pileated woodpeckers by the end of decade 5, regardless of alternative selected.

Alternative A

The 1986 forest plan does not have management direction specific to pileated woodpecker but does provide direction for management of old growth, snags, and downed wood, as described in section 3.7.4, subsection “Old-growth habitat, very large live tree habitat, and very large dead tree habitat.”

Alternatives B modified, C, and D

Coarse-filter plan components for coniferous forests included in all action alternatives, as detailed in section 3.7.4, subsection “Old-growth habitat, very large live tree habitat, and very large dead tree habitat,” provide for key ecosystem characteristics for pileated woodpeckers described in the “Affected environment” section. Forestwide standard FW-STD-TE&V-03 requires retention of a minimum of two or three very large snags or live replacement trees per acre in timber harvest areas in the warm-dry, warm-moist, and cool-moist potential vegetation types (which provide pileated woodpecker habitat). These numbers exceed the minimum of 14 per 100 acres (1.4/acre) discussed in the “Affected environment” section. The standards for each geographic area state that all snags of western larch, ponderosa pine, and black cottonwood trees greater than 20 inches shall be retained, and these are the species of highest value for the pileated woodpecker. Nest holes excavated by the pileated woodpecker would provide habitat for many other species that use them for nesting, denning, and resting. The snag analysis shows that the percentage of the Forest with at least one snag per acre greater than 20 inches d.b.h. increases by the fifth decade under all the alternatives (see section 3.3.7 for more details).

Cumulative effects

In the past, very large snags and defective live trees providing pileated woodpecker habitat were removed by timber harvest on all managed lands. In the future, all alternatives have plan components that would provide for key ecosystem characteristics for the pileated woodpecker because of forestwide standards to retain all existing old growth and provide the very large snags and live trees with the heart rot that pileated woodpeckers need for nesting. In addition, other successional stages may provide lower densities of very large trees, snags, and downed woody material over time. Alternatives vary with respect to plan components to increase future old growth and its patch size and the resilience of very large trees. See cumulative effects in section 3.7.4, subsection “Old-growth habitat, very large live tree habitat, and very large dead tree habitat,” for more details.

Burned forest and dead tree habitats

Introduction

This section discusses habitat for species associated with burned forests and dead trees (snags, downed wood) less than 20 inches d.b.h. Species that require snags 20 inches or more are discussed in section 3.7.4, “Old-growth forest; very large live habitat; and very large dead tree habitat.” Many animal species have evolved with and use burned forests, and some have close association with those that burn with high intensity or severity (R. L. Hutto et al., 2016) (see appendix 6). This section assesses effects to most

species associated with burned forest habitat and snags. Following the general discussion, two species are discussed as examples in order to help display differences in effects of alternatives. The two species are the black-backed woodpecker and olive-sided flycatcher.

Examples of key ecosystem characteristics of burned forests are very high densities of dead trees for nesting, an enhanced insect prey base following fire-induced tree mortality, and open canopy and understory conditions when compared to unburned coniferous forests. The black-backed woodpecker, American three-toed woodpecker, hairy woodpecker, northern flicker, and olive-sided flycatcher are all more abundant in intensively burned than in unburned mixed-conifer forest because of an abundance of food (beetle larvae and ants) and potential nest sites associated with large numbers of standing dead trees (Richard L. Hutto, Bond, & DellaSala, 2015; Richard L. Hutto & Young, 1999). A reduction of nest predators after high-severity fire is also a plausible and likely reason for high survival of cavity nesters and other wildlife species in burns (Saab, Dudley, & Thompson, 2004; Saab, Russell, & Dudley, 2007), especially small mammals (Fisher & Wilkinson, 2005). Desired vegetation characteristics of recently burned forest are discussed in sections 3.3.6 and 3.3.7.

In burned conifer forests, the most valuable wildlife snags are more likely to be thick-barked species such as ponderosa pine, western larch, and Douglas-fir rather than thin-barked Engelmann spruce, true firs, and lodgepole pine tree species (Richard L. Hutto, 1995; Saab & Dudley, 1998). Thick-barked snags in burned forests provide feeding opportunities as well as nesting opportunities for birds. Woodpeckers feed extensively on wood-boring beetle larvae in the snags (Richard L. Hutto & Gallo, 2006). Some seed-eating bird species also increase after fires due to the increased availability of seed resources. Species such as the Cassin’s finch, red crossbill, and pine siskin take advantage of seeds that are released or made available in cones that open after severe fires. Cassin’s finches are one of the more abundant birds in early post-fire conifer forests (Kuennen, 2013g), where their numbers can increase significantly regardless of fire severity (Dan Casey, Altman, & Stringer, 2013).

Secondary cavity-nesting species such as the northern hawk owl, mountain bluebird, western bluebird, house wren, and tree swallow benefit from new forest openings in a complex of snags of many diameters within burned forest (Richard L. Hutto et al., 2015). Insects and disease can also create high densities of snags used by cavity-nesting species. About 25 percent of all bird species nesting in the northern Rocky Mountains are cavity nesters and are dependent upon disturbances such as fire, insects, and disease to create habitat (McClelland, Frissell, Fischer, & Halvorson, 1979).

As described in the old-growth section, snag densities used for standards or guidelines in the forest plan are based upon information used in the development of amendment 21, which came from a comprehensive publication on managed forests (Thomas, 1979). Table 52 displays the number and preferred species of snags per 100 acres needed to support 100 percent of the maximum population of two example woodpecker species that are found on the Forest, which Thomas based upon their territory size.

Table 52. Snags per hundred acres by d.b.h. class to meet the needs of key primary excavators in the mixed conifer community (Thomas, 1979)

Species	Maximum Pair Density/100 Acres	Preferred Snag Species	Average Number of Snags
Northern flicker	2.5	Aspen, western larch, ponderosa pine	38 per hundred acres > 12” d.b.h. (3.8/acre)
Black-backed woodpecker	1.3	Engelmann spruce, western larch, aspen	59 per hundred acres > 12” d.b.h. in clumps (5.9/acre)

Although the snag numbers listed by Thomas may be adequate for nest sites, subsequent studies have stressed the importance of leaving many more dead trees in burn areas to provide food for species that feed on insects in dead trees in close proximity to nest sites.

Saab and others (2007) studied the effects of salvage logging and time since fire on cavity-nesting birds. For most species, the time since fire and type of postfire treatment (partially logged vs. unlogged) had little influence on nesting survival. However, some species had higher nest densities in unlogged areas, and two species had higher nest densities in logged areas. Nest densities of wood-foraging species and mountain bluebirds were significantly higher in unlogged burn areas, whereas Lewis's woodpeckers and kestrels had significantly higher nest densities in partially logged burn areas. Western bluebird nest densities were nearly equal in both logged and unlogged burned areas (Saab et al., 2007). In the study by Saab and others, salvage logging was designed to retain more than half of the snags over 9 inches d.b.h., and these remaining trees provided suitable nesting habitat for open-space foragers during the decade following fire. With respect to time since fire, Saab and others (2007) found that nest densities of northern flickers generally increased with time since fire, whereas nest densities of black-backed and hairy woodpeckers peaked four to five years postfire.

Hutto and Gallo (2006) studied the effects of post-fire salvage logging on cavity-nesting birds in northwest Montana. Based upon a study of 563 active nests of 18 cavity-nesting birds, Hutto and Gallo found that all species nested in uncut burned forest plots, but only eight nested in forest plots that were salvage logged after burning. Half of the species studied were significantly more abundant in the unlogged plots, even though salvage-logged plots had more potential nest snags per acre than the minimum number needed to support maximum densities of primary cavity nesters. Based upon these findings, the authors suggested that woodpecker densities in post-fire areas are more related to food availability (wood-boring beetle larvae) than to nest-site availability. Areas that are salvage logged would not be expected to support endemic levels of many cavity-nesting birds unless sufficient snags remain for both nesting and feeding at a home range scale. Hutto and Gallo found that there were 8 species that nested in severely burned areas with salvage logging but that there were 10 species where nesting was only detected in areas without salvage harvest (Richard L. Hutto & Gallo, 2006).

Affected environment

On the Forest, snags of all sizes and downed woody material provide essential habitat features for about 60 species of birds, mammals, and amphibians. Of these 60 species, about 15 species on the Forest are strongly associated with a variety of environmental conditions that occur with snags or burned forests (see appendix 6). Research specific to the Forest looked at a stratified random sample of 49 stands and analyzed 10 variables that might be related to snag density and distribution (Wisdom & Bate, 2008). Mean snag density for all species was found to be 19 times higher in unharvested stands compared to clearcuts and 3 times higher than in stands that had undergone partial harvest (Wisdom & Bate, 2008). This study found that factors that significantly affecting snag density included seral stage, timber harvest, distance to the nearest town, proximity to open roads, and whether the stand was uphill or downhill from the nearest road.

The acreage burned by wildfire on the Forest has increased a great deal in recent decades compared to previous decades (table 53) and is now in a pattern similar to that seen from 1890-1930 (see section 3.8.2). Recent wildfires have created abundant habitat for species associated with burned forests (see section 3.8 and USDA, 2014a for more details). Table 53 shows the acres burned on Forest lands from 1980-2015. About 90,000 of these acres burned more than once. In comparison, from 1889-1920, about 1.2 million acres were mapped as being burned (with a huge spike in 1910), but the amount of unburned area within burned perimeters is unknown and mapping at that time was at a much coarser scale.

Table 53. Approximate acres burned by wildfire on the Forest from 1980-2015

1980-1989	1990-1999	2000-2009	2010-2015
16,400 acres	42,450 acres	338,700 acres	146,600 acres

Most of the acreage on the Forest burned at moderate to high severity, but the exact acreage is unknown. Of the total acres burned, about 60 percent was in wilderness and about 40 percent was outside of wilderness. Over 1 million acres of the Forest are within designated wilderness, distributed across the Hungry Horse, Swan Valley, South Fork, and Middle Fork geographic areas. Human influence on vegetation conditions is minimal in wilderness, so the relative abundance and variation in size of snags within this area is very high. In the areas that were burned between 1990 and 2013 on the Flathead National Forest, salvage of burned trees occurred on about 4 percent of the area; considering only the areas outside wilderness that burned during that time period, salvage of burned trees occurred on about 10 percent of this area. Therefore, abundant habitat has been available for use by a wide variety of wildlife species associated with burned forest and dead tree habitats. Refer to section 3.3.7 and to Trechsel (2014) for greater detail on the existing conditions and natural range of variation analysis for snags.

Burned forests provide a very high density of snags, but snags also occur at high density in unburned areas with high levels of insects and disease. Modeling of the natural range of variation across the Forest shows that insect and disease levels have also fluctuated over time and across the landscape (Trechsel, 2017b). The current condition for snags in potential vegetation types on the Forest is summarized in table 54 and table 55 (see forest plan figure B-03). Detailed information on recent past and current snag conditions for the Forest can be found in section 3.3.7. The current proportion from this data set is expressed as an estimated mean percent, with a lower and upper bound estimate provided at a 90 percent confidence interval.

Table 54. Snag densities (snags per acre) for the Flathead National Forest, 2017 (Trechsel, 2017c)

2017 Report	≥ 10" d.b.h.	≥ 10" d.b.h.	≥ 10" d.b.h.	≥ 15" d.b.h.	≥ 15" d.b.h.	≥ 15" d.b.h.
Snag Analysis Group	**Mean**	**Lower Bound**	**Upper Bound**	**Mean**	**Lower Bound**	**Upper Bound**
Lodgepole pine	8.6	4.8	13.0	1.0	0.3	1.9
Warm-Dry	11.0	6.3	16.3	4.2	2.0	6.9
Warm-Moist	11.1	5.2	18.0	5.4	2.5	8.6
Cool-Moist	18.6	15.3	22.3	5.8	4.4	7.3
Cold	17.2	12.2	22.8	4.5	2.6	6.7

Table 55. Snag densities (snags per acre) for the Western Montana Zone, which includes the Flathead, Kootenai, and Lolo National Forests combined, 2017 (Trechsel, 2017c)

2017 Report	≥ 10" d.b.h.	≥ 10" d.b.h.	≥ 10" d.b.h.	≥ 15" d.b.h.	≥ 15" d.b.h.	≥ 15" d.b.h.
Snag Analysis Group	**Mean**	**Lower Bound**	**Upper Bound**	**Mean**	**Lower Bound**	**Upper Bound**
Lodgepole pine	13.0	10.3	15.8	1.9	1.3	2.6
Warm-Dry	10.4	8.9	12.1	4.3	3.6	5.1
Warm-Moist	13.9	11.9	16.1	4.9	3.9	6.0
Cool-Moist	17.7	15.6	19.9	5.2	4.3	6.1
Cold	21.7	17.8	25.8	5.8	4.4	7.4

The analysis shows the Forest is currently at the upper end of the modeled natural range of variation across the Forest and the Western Montana Zone. The numbers above are based upon Forest Inventory and Analysis data, which accounts for snags lost due to fire and other natural disturbances, timber harvest, post-fire salvage, and firewood gathering.

Key stressors

Land management

On all lands, fire policy affects decisions on suppression of wildfires. The availability of firefighters and firefighting equipment has a large impact on fire suppression, especially during years when wildfires are abundant across the nation (see section 3.8 for more details). Vegetation management on NFS lands affects the intensity and extent of insect and disease outbreaks that create snags and downed woody material, the ability to manage wildfire spread, snags remaining in timber harvest areas, and snags remaining in wildfire areas (see section 3.3.7 for more details). Public firewood gathering, indirectly affected by road access, also affects the size and species of snags removed.

Changing climate

A warmer, drier summer climate is expected to increase stand-replacement wildfires and insects and disease.

Key indicator for analysis of most species associated with burned forest habitat and snags

In addition to the key indicators addressed in section 3.3 and section 3.7.4, subsection “Coniferous forest habitats,” the following indicator is important for the wide variety of wildlife species associated with burned forests and snags. The indicator was developed after considering key stressors, public comments, and issues identified during scoping.

- Plan components to support key ecosystem characteristics for species associated with burned forest snags < 20 inches d.b.h. and burned forest

Environmental consequences

Summary of modeled alternative consequences

Evidence from fire history studies suggests that a complex mosaic of severely burned conifer patches was common historically in the West (R. L. Hutto et al., 2016). Modeling of the natural range of variation across the Forest shows that stand-replacing wildfire has fluctuated greatly over the last 1,000 years due to cycles of warm, dry climate vs. cool, moist climate (see sections 3.3, 3.8, and appendices 2 and 3 for more details). Because over 60 percent of the Forest is in the cool-moist to cold potential vegetation types, the greatest acreage of stand-replacing wildfires has been in these potential vegetation types. Wildlife species that use burned forest habitats may experience population fluctuations that correspond to habitat fluctuations, but they are adapted to these wide fluctuations in habitat availability.

The effects of the alternatives were modeled using the Spectrum model. Modeling estimated the proportion of the Forest with snags in the 10 to 20-inch d.b.h. size class and the density of snags in this size class. Modeling indicated that all alternatives have a similar trend in the densities of snags over the five-decade future model period. Although the percentage of the Forest with at least 10 snags per acre in the 10 to 20-inch d.b.h. size class would be highest under alternative A in the first decade, this pattern does not continue in later decades. Under all alternatives, the proportion of the Forest with a density of 10 or more snags per acre increases by the fifth decade. By the fifth decade, modeling suggests that the proportion of the Forest with greater than 10 snags per acre in the 10-inch and larger size class would be about 30 percent of the Forest. Refer to Trechsel (2017c, attachment 2) for more details on these results.

In summary, model results suggest that snag amounts would increase over time, in response mainly to fire and other natural disturbances, and it does not appear that there would be a decline or a shortage of this ecosystem component under any alternative. Desired conditions for snags and downed wood are expected to be met forestwide under all alternatives, and there would be abundant habitat for cavity-nesting and cavity-denning wildlife species at the forestwide scale. All alternatives have standards and guidelines for snag retention (see section 3.3.7 and section 3.7.4, subsection “Coniferous forest habitats.” See also the individual cumulative consequences sections for specific species below.

Alternative A

With alternative A, management direction for snags is provided for potential vegetation groupings that are different than the groupings used for alternatives B modified, C, and D. The plan specifies retention of an average of 2 snags per acre in the 12-20 inch size class in the dry potential vegetation group and an average of 6 per acre of this size in the moist and cold potential vegetation groups (in areas more than 200 feet from open roads). This average number for the moist and cold potential vegetation groups would meet the needs of species such as flickers. In the dry potential vegetation group, the specified number would be lower than the desired average of 3.8 per acre indicated for maximum populations of species such as the flicker. If existing snag densities are below the specified numbers, live trees are to be substituted where available. The forest plan does not have management direction for burned forests, so dead and dying trees could be salvaged if in suitable management areas. Timber harvest would not occur in wilderness or recommended wilderness areas, so snag densities are anticipated to be higher in these management areas. Alternative A has more recommended wilderness than alternative D but less than alternative B modified or C.

The plan also specifies that an average of 15 pieces of down woody material in the 9-20 inch size class be retained per acre in the dry potential vegetation group and 30-32 in the moist or cold potential vegetation groups. This management direction provides habitat to support wildlife species associated with down woody material.

Alternatives B modified, C, and D

Under the action alternatives, there is more flexibility to use fire for habitat restoration and maintenance (see section 3.8 for more details).

The standards and guidelines related to snags or live decayed/decadent tree retention in the forest plan are intended to retain a certain level of snags distributed across the Forest to contribute to wildlife habitat and for other ecosystem benefits—not just within wilderness and inventoried roadless areas but also within areas that are more intensively managed. Allowing for the fact that most snags with high quality for wildlife do not last long, direction is provided in the plan for leaving live trees as well in order to contribute to future snag habitat (Harris, 1999). The forest plan direction sets different minimum levels of snag retention depending on geographic area, recognizing differences in past and future human and natural disturbance patterns and in the current number and distribution of snags (see section 3.3.7 for details). Standard FW-STD-TE&V-03 gives the following direction: “Within timber harvest areas, snags and/or live snag replacement trees shall be retained at minimum levels that vary depending upon the geographic area and whether the harvest is within a riparian management zone.” Standards for each geographic area specify the minimum number of snags or live replacement trees greater than 10 inches d.b.h. or greater than 15 inches d.b.h. The standards also specify that live replacement trees shall be of the largest size present above 10 inches d.b.h., shall be decayed or decadent trees if present, and one of the following species if present: western larch, ponderosa pine, Douglas-fir, cottonwood, aspen, birch, or western red cedar. The minimum numbers specified in the tables associated with the standards exceed the minimum requirements for woodpecker species (primary excavators that make cavities for many other species) given in the introduction to this section.

Snag and downed wood densities are anticipated to be higher in riparian management zones, wilderness, and recommended wilderness areas, which are distributed across the North Fork, South Fork, and Middle Fork, Hungry Horse, and Swan Valley geographic areas. Alternative C has the most acreage in wilderness and recommended wilderness management area allocations and alternative D has the least, with alternative B modified in between. These areas are anticipated to provide high densities of snags and downed wood of all sizes and species, providing nesting and feeding habitat for most species associated with snags, downed wood, and burned forest.

The snag analysis shows that densities are currently lower in the Salish Mountains and Swan Valley geographic areas of the Forest (Trechsel, 2017c). These two geographic areas also have more area suitable for timber production (figures 1-10, 1-11, and 1-12) and more area in the wildland-urban interface (figure 1-13), where vegetation treatments would be more abundant and wildfires would generally be suppressed, resulting in a lower density of snags. With the exception of existing old growth, lands suitable for timber production would generally be managed in a way that improves their growth and vigor and limits losses due to insects and diseases, where possible. As a result, future snag retention numbers are higher and the diameter range of retained snags are lowered to 10 inches d.b.h. for these two geographic areas in order to retain those trees that do die from insects and disease. The specified numbers are based upon updated data about snag distribution across the Forest and would exceed the desired average of 3.8 snags per acre greater than 12 inches d.b.h. indicated for maximum populations of species such as the flicker, except in the lodgepole pine type. Lodgepole pine is not a key species for cavity nesting. If snags are not present, the standards include direction for leaving live replacement trees of at least 10 inches d.b.h. to substitute for each unavailable snag. A forestwide guideline for live tree retention in all regeneration harvest units (FW-GDL-TE&V-09) and within any harvesting that occurs in riparian management zones (FW-GDL-RMZ-08) also serves to contribute to the long-term snag habitat need and biodiversity for species associated with snags and downed wood. The intent of live tree replacements is to extend the period when snags may be available to provide structure and wildlife habitat, after existing snags have fallen (see section 3.3.7 for more details). Because some species associated with snags are territorial, these plan components would help to ensure the distribution of snags and downed wood to provide habitat across the landscape, within Forest Service authority and the capability of the lands.

As snags fall, they would provide abundant downed woody material over time. The distribution of downed woody material would be variable, as it is influenced by the pattern of insects, disease, fire, and harvest. Like snags, the highest amounts are expected to occur in riparian management zones, unroaded areas such as backcountry management areas, and designated and recommended wilderness areas. Lower amounts of downed wood are expected to occur on lands identified as suitable for timber production (see section 3.21 for more details). In combination with the mix of management areas across the Forest, guideline FW-GDL-TE&V-08 for downed wood retention is anticipated to be sufficient to meet desired conditions for wildlife.

Cumulative effects

This section summarizes activities and effects that are common to most species associated with burned forest, dead trees (snags), and downed wood habitats. See also the individual cumulative consequences sections for specific species.

Past management actions on all lands, particularly timber harvest and fuels reduction, have altered coniferous forest stand structure and reduced the density of dead trees, removing trees killed by insects, disease, or fire and decreasing forest diversity (see section 3.3 for more details). Within the boundaries of the plan area, there are three state forests, as well as scattered parcels, managed by Montana Department of Natural Resources and Conservation. This agency manages snags according to the administrative rules of Montana for forest management (36.11.411 biodiversity—snags and snag recruits). This management

direction specifies the number of snags per acre that are to be retained in harvest units, by habitat type group and in consideration of the wildland-urban interface (see figure 1-13). On State lands, administrative regulations require retention of a minimum of two snags per acre on wet habitat types and one snag per acre on dry habitat types ≥ 21 inches d.b.h. or the next largest size class available. If snags are lacking, large live trees can be substituted. The project-level considerations of the Montana Department of Natural Resources and Conservation complement those of the Forest with respect to retention of snags in harvest units to support wildlife.

Past fire suppression (followed by salvage logging when fires or insect and disease outbreaks did occur) altered the availability and pattern of habitat for species that nest, roost, and/or den in cavities in snags and feed on snags or downed logs. Continued fire suppression is anticipated in the wildland-urban interface on all lands. On Montana Department of Natural Resources and Conservation forest trust lands in the Swan Valley geographic area, the Stillwater State Forest in the Salish Mountains geographic area, and Coal Creek State Forest lands in the North Fork geographic area, wildfires are likely to be suppressed. Stand-replacing wildfires, high snag densities, and widespread or high levels of insects and disease are likely to be much lower in much of the warm-dry and warm-moist potential vegetation types (which has the most area of overlap with the wildland-urban interface) than in the cool-moist and cold potential vegetation types that are dominant outside the wildland-urban interface. Timber harvest, prescribed burning, and precommercial thinning would restore or maintain stand density conditions closer to historic conditions and would make forests more sustainable and resilient to large-scale disturbance, but these activities might not restore snag levels to historic conditions. On State and private timber lands managed for timber production, many of the dead trees are likely to be salvaged if they have economic value. On all lands, forest restoration actions can mimic natural disturbances in areas where natural disturbances are not compatible with objectives.

Past road building on Federal, State, and private lands likely impacted the distribution and number of snags, especially within 200 feet of open roads, but road influences have decreased over time. Access management has resulted in fewer roads open to motor vehicle use on Federal, State, and private lands, helping to protect snags and burned forest.

Increases in insects, disease, and wildfire are likely to affect all lands if the climate becomes warmer and drier in the future. On the Flathead National Forest and in Glacier National Park, the number of snags and acreage of forest burned with stand-replacing wildfire has increased since 1988, and this trend is likely to continue. On the Forest's wilderness lands and in Glacier National Park, there is virtually no salvage of burned forest or snags killed by insects and disease and no public firewood gathering on a combined area of over 2 million acres, so diverse forests with a large number of snags will continue to provide high-quality habitat for species associated with these key ecosystem characteristics.

In summary, proposed management direction on the Forest, in the context of all lands of the larger landscape, contributes to burned forest and snag habitat. This would be accomplished by plan components to use prescribed fire as a management tool and to allow wildfire as a natural ecosystem process where and when it contributes to desired conditions (see sections 3.3 and 3.8 for more details). Although the Forest does not have authority over all the stressors, the ecological conditions of burned forest/snag communities and the processes that maintain them would be provided on NFS lands. Snag habitats (including but not limited to those that burn periodically) are distributed across all Forest geographic areas. Coarse-filter plan components provide for biodiversity and the ecological conditions that support the long-term persistence of the majority of species associated with these habitats.

Black-backed woodpecker

Affected environment

The black-backed woodpecker is distributed across most of Alaska, southern Canada, the Great Lakes region, and the mountain ranges of the northwest United States and California. Black-backed woodpeckers are associated with boreal and montane coniferous forests that have experienced recent burns or large-scale bark beetle outbreaks. Black-backed woodpeckers are distributed across the Forest (Kuennen, 2013b) in three types of forested habitat: (1) post-fire areas that have burned within the past one to six years, (2) areas with extensive bark beetle outbreaks causing widespread tree mortality, and (3) areas of smaller disturbances scattered throughout the Forest caused by windthrow, ice damage, or other occurrences that produce small patches of dead trees.

Successful breeding is known to be closely tied to fires that kill large numbers of trees to provide nest sites for this cavity-nesting species and the subsequent presence of wood-boring beetles for feeding (Dixon & Saab, 2000; Richard L. Hutto & Gallo, 2006). In an Oregon study, Goggans and others found that black-backed woodpeckers had an eighteenfold increase in breeding density in burned forest relative to densities in forests with an epidemic mountain pine beetle outbreak (Fayt, Machmer, & Steeger, 2005). In the forests with a bark beetle epidemic, overall nesting success averaged 68.5 percent. In contrast, nest success was 100 percent and 78.6 percent for nests monitored in burned forests of western Idaho and central Oregon, respectively (Forristal, 2009; Saab & Dudley, 1998). Populations of this species are known to increase for up to a decade following stand-replacing fires and to decrease but persist during periods with fewer stand-replacing fires (Nappi & Drapeau, 2009).

At the landscape scale, moderate to intensively burned forest patches that have trees at least 9 inches d.b.h. and at least 50 percent crown closure prior to burning provide key nesting habitat for black-backed woodpeckers (Forristal, 2009). Following wildfires, some trees are instantly killed, others die slowly over a decade or so, and others are able to survive fire. Similarly, the use of burned areas by black-backed woodpeckers changes over time (Forristal, 2009). Forristal found that black-backed woodpecker populations peaked two to three years following wildfire. Hutto (personal communication, 2012) stated that burned forest habitat is valuable for black-backed woodpeckers for up to a 10-year period following stand-replacing wildfires if trees continue to die over time.

In northwest Montana, it is likely that black-backed woodpecker populations have increased since 2003 due to the large number of acres that experienced high-intensity burns during this period. Black-backed woodpeckers are highly mobile and appear to migrate at least 30 miles to recent burns (Hoyt, 2000), so they are able to locate suitable habitat as burned areas change over time. Dudley and Saab (2007) estimated an average home range size of about 511 acres of high-quality habitat per nesting pair.

Key stressors

Key stressors are the same as those listed in section 3.7.4, subsection “Burned forest and dead tree habitats,” because black-backed woodpeckers occur across the full range of these habitats on the Forest.

Key indicator for analysis

The habitat needs of black-backed woodpeckers are largely addressed by coarse-filter plan components for vegetation. In addition to the plan components, indicators, and effects described in section 3.7.4., subsections “Old-growth habitat, very large live tree habitat, and very large dead tree habitat,” “Coniferous forest habitats,” and “Burned forest and snag habitats,” described above, a key indicator is

- Key ecosystem characteristics for the black-backed woodpecker

Environmental consequences

Alternative A

The 1986 forest plan does not have management direction specific to black-backed woodpeckers but does provide direction for management of old growth, snags, and downed wood, discussed in section 3.7.4, subsection “Burned forest and dead tree habitats.” On the Forest, there are over 1 million acres of existing wilderness where natural ecosystem processes will prevail, including wildfire. Within wilderness, about 835,000 acres are in potential vegetation types capable of providing black-backed woodpecker habitat. There would be no salvage harvest in wilderness, so abundant high-quality habitat would be available following wildfires.

Alternatives B modified, C, and D

Desired conditions for black-backed woodpeckers are described in FW-DC-WL DIV-01. Key ecosystem characteristics described in the “Affected environment” section would be supported by implementation of coarse-filter plan components. Within wilderness, about 835,000 acres are in potential vegetation types capable of providing black-backed woodpecker habitat. There would be no salvage harvest in wilderness, so abundant high-quality habitat would be available following wildfires under all action alternatives. The alternatives vary with respect to the amount of recommended wilderness, but modeling predicts all alternatives would stay with the natural range of variation.

Outside wilderness, wildfires are likely to be suppressed in the wildland-urban interface, resulting in lower acreages or lower-quality habitat for black-backed woodpeckers on about 400,000 acres of NFS lands. The mix of management areas suitable for salvage harvest varies by alternative, as described below, but all alternatives have plan components to support key ecosystem characteristics for the black-backed woodpecker, including retention of snags, as discussed in section 3.7.4., subsection “Burned forest and dead tree habitats.”

Salvage within burned forests to meet desired conditions may occur in certain circumstances, as described in other sections of this forest plan (see section 3.21, Forest Products—Timber of the final EIS and chapter 3 of the forest plan, suitability for timber production by management area). Generally, as indicated by recent experience, most area burned by wildfire is not salvage harvested, usually because areas are inaccessible (i.e., no roads or too far from existing roads), there is little or no economic value in the burned trees, or harvesting would not meet other forest plan direction (such as protecting soils) (see Trechsel, 2014). FW-GDL-TIMB-02 and 03 would help to retain black-backed woodpecker habitat in salvage harvest areas to achieve distribution across all Forest geographic areas because they specify that clusters of burned trees with a variety of sizes should be retained to provide habitat for wildlife species in areas burned by mixed- or high-severity wildfire and to retain western larch, ponderosa pine, or black cottonwood trees greater than 20 inches d.b.h. in stands that were old-growth forest prior to wildfire. These guidelines would help to provide nesting and feeding habitat for black-backed woodpeckers in areas where timber harvest is suitable or allowable.

Summary of modeled alternative consequences

In order to assess key aspects of black-backed woodpecker habitat, Ecosystem Research Group modeled the effects of the alternatives (appendix 3). The natural range of variation was modeled going back about 1,000 years, and the effects of the alternatives were projected for the next 50 years, including anticipated changes in climate and the fire suppression logic of the model. Modeling of black-backed woodpecker habitat included tree size classes 10 inches d.b.h. or greater for all forested habitat groups and cover types except high-elevation subalpine cover types, including whitebark pine.

The model predicts that all alternatives would stay within the minimum and maximum natural range of variation over the five-decade time period. The natural range of variation of modeled habitat for black-backed woodpeckers historically ranged from about 10,000 to 270,000 acres out of approximately 2.4 million acres on the Forest, a moderate range. High-quality habitat lasts for no more than a decade and this was accounted for in the modeling. The current level of habitat is about 130,000 acres—near the middle of the range.

In the future, modeled acres of habitat increase somewhat and then decline back to current levels by decade 5. Even though the mean number of acres of black-backed woodpecker habitat increases, the level of habitat never reaches the maximum range or even the acres burned in the 2003-2012 time period, due to the modeled effects of fire suppression. However, the fire suppression logic of the model may not be realistic given anticipated future climate conditions; more acres may actually be burned by stand-replacing fire than the model predicts.

Cumulative effects

Black-backed woodpeckers have persisted on the Forest and on other land ownerships within and adjacent to the Forest even though there were very few acres of stand-replacing wildfire from the 1940s to the 1980s. Their populations may occur at low levels during these time periods and increase greatly during periods when the acres burned by wildfire are at a high level. Black-backed woodpeckers readily cross Forest boundaries to exploit burns (Hoyt 2000).

Fires have been active on the Flathead and adjacent lands in the last two decades. Black-backed woodpeckers are likely to find high-quality habitat as they move from place to place to inhabit areas burned with mixed- and high-severity fire on all lands. As stated above in section 3.7.4., subsection "Burned forest and dead tree habitats," some of the areas burned by wildfire are accessible by road on all land ownerships and are likely to continue to have salvage harvest of dead trees, as well as firewood cutting, except within Glacier National Park. Glacier National Park, combined with the Forest's wilderness, inventoried roadless areas (see figure 1-73), and backcountry areas, would continue to provide high-quality habitat for black-backed woodpeckers if these areas burn. Although forests with insect infestations do not provide as high-quality habitat as areas with stand-replacing fires, the acres of forest with high levels of insect infestations are anticipated to increase with a warmer and drier climate, so even if forests do not burn, they are likely to support black-backed woodpecker populations at lower densities.

Olive-sided flycatcher

Affected environment

The breeding range of the olive-sided flycatcher is across most of Alaska, southern Canada, the western and eastern United States, and the Great Lakes region. It is a small neotropical migratory bird that breeds in western Montana (Kuennen, 2013m) and winters in Mexico and South America. Olive-sided flycatchers are generally restricted to coniferous or mixed-coniferous forests that include a juxtaposition of forest openings and mature forest providing edge and snags (although they are not cavity nesters). They can be found in dry to moist sites across a range of elevations. The occurrence of olive-sided flycatchers is influenced by relatively open canopies and the presence of tall trees for aerial flycatching and foraging and perches for singing (Altman and Sallabanks 2012). In mixed conifer forests and in red cedar-western hemlock forests in Idaho, olive-sided flycatchers were found to be significantly more abundant in a matrix of clearcuts than in landscapes of old-growth forest (Evans and Finch 1994; Hejl and Paige 1994). Hutto and Young (1999) found that olive-sided flycatchers were more abundant in early post-fire habitats than in any other major cover type, although they had a similar occurrence in seed tree cover types and were only slightly less common in clearcut and shelterwood cover types, occurring more

frequently in disturbed than in undisturbed forest in the northern Rocky Mountains. Intermediate successional stages are generally not suitable (Kotliar, 2007).

Key stressors

These are the same as those listed in section 3.7.4., subsection "Burned forest and dead tree habitats."

Key indicators

In addition to the key indicators addressed in section 3.7.4, subsection "Coniferous forest habitats," the key indicator for species generally associated with burned forests, where openings are created, applies to the olive-sided flycatcher.

- Key ecosystem characteristics for species associated with burned forest conditions

Environmental consequences

Summary of modeled alternative consequences

In order to assess key aspects of olive-sided flycatcher habitat, Ecosystem Research Group modeled the effects of the alternatives on the natural range of variation and effects of alternatives (see appendix 3 for more details). The natural range of variation was modeled going back about 1,000 years, and the effects of the alternatives were projected for the next 50 years, including anticipated changes in climate and the fire suppression logic of the model. Two distinct tree size classes were examined:

- the 0-5-inch d.b.h. size class: all canopy covers 15-100 percent were modeled as openings
- the > 9-inch d.b.h. size class: 15-69.9 percent canopy cover was modeled as mature

Olive-sided flycatchers require edges between openings and stands of mature forest. Modeling of olive-sided flycatcher habitat predicts that all alternatives will stay within the minimum and maximum range of the natural range of vegetation over the five-decade time period and that acreages of modeled habitat will increase continuously through decade 5. The range between maximum and minimum levels of habitat is relatively large, which parallels the maximum levels of modeled fire through the five-decade period. The natural range of variation of modeled habitat ranges from about 450,000 to 1.3 million acres out of approximately 2.4 million acres on the Forest, a large range. There are minor differences in alternatives because wildfire, prescribed fire, commercial thinning, and timber harvest can all create the habitat conditions this species requires. Consequently, even considering some uncertainty in the degree to which forests will burn rather than succumb to insects and disease in the future, modeled habitat for olive-sided flycatchers would be abundant on the Forest (see appendices 2 and 3 for more details).

Effects common to all alternatives

All action alternatives have over 1 million acres of wilderness as well as standards or guidelines for retention of live trees and snags outside of wilderness, which provides habitat quality for olive-sided flycatchers.

Cumulative effects

In the future, areas outside the wildland-urban interface in the cool-moist and cold potential vegetation types are likely to have stand-replacing wildfires that would create high-quality habitat for wildlife such as the olive-sided flycatcher. However, habitat acres are likely to be highly variable from decade to decade because forests in these potential vegetation types have a tendency to burn with high severity on a median fire return interval of 100 years or more (Sneck, 1977). Because olive-sided flycatchers feed on insects in the air, more open canopy conditions after fire or timber harvest could facilitate feeding.

Because birds adapted to post-fire conditions are generally mobile species, they are able to move to new locations as vegetation changes with changes in climate and fire (USDA, 2010c).

3.7.5 Threatened, endangered, proposed, and candidate wildlife species

The consequences of alternatives for the wolverine, grizzly bear, Canada lynx, and Canada lynx critical habitat are addressed in this section of the final EIS. On the Forest, federally listed threatened or endangered species and their critical habitat would continue to be managed and protected in accordance with requirements of the Endangered Species Act, Forest Service policy, and all applicable State and Federal laws. Four alternatives, A-D, are analyzed. Alternative A is the 1986 forest plan, as amended, and accounts for current laws, regulations, and nondiscretionary terms and conditions included in programmatic USFWS biological opinions. Consultation with the USFWS on listed species plan components takes place at the programmatic level, whereas consultation on implementation will take place at the project level.

Grizzly bear

Introduction

The grizzly bear was listed as a threatened species under the Endangered Species Act in the lower 48 States in 1975. The Grizzly Bear Recovery Plan (USFWS, 1993) identified recovery goals, objectives, and tasks necessary for recovery of the species. In 2011, USFWS completed a five-year status review and estimated that the overall population size had increased to about 1,500 grizzly bears in the lower 48 States (USFWS, 2011c). Grizzly bears are known to exist in four identified recovery zones: the Northern Continental Divide, Greater Yellowstone, Cabinet-Yaak, and Selkirk Ecosystems. Of these, the Northern Continental Divide Ecosystem provides for the largest grizzly bear population.

The Grizzly Bear Recovery Plan (USFWS, 1993) specifically called for development of a conservation strategy so that continuity and consistency of management would be provided following delisting. The USFWS began working with multiple agencies in the NCDE in 2009 to develop a habitat management strategy to support a viable population of grizzly bears in the NCDE. Although NFS lands provide a majority of the habitat for grizzly bears in portions of the NCDE area, grizzlies are a wide-ranging species affected by activities on private and other agency lands that can have impacts on their populations. Representatives of MFWP, the Montana Department of Natural Resources and Conservation, the Blackfeet Nation, the Confederated Salish and Kootenai Tribes, Glacier National Park, the USFS, the USFWS, the U.S. Geological Survey, and the Bureau of Land Management were appointed as members of the Interagency Conservation Strategy Team. Their goal was to describe the management and monitoring programs that would maintain a recovered grizzly bear population in the NCDE.

In 2013, USFWS announced the availability of the draft Northern Continental Divide Ecosystem Grizzly Bear Conservation Strategy (hereafter “draft Grizzly Bear Conservation Strategy”) for public review and comment. In preparation for delisting, a conservation strategy often is developed to ensure that appropriate protections will be in place to maintain the recovered population into the future. When finalized, the conservation strategy will not change the legal status of grizzly bears in the NCDE. The intent is to support delisting under the Endangered Species Act by demonstrating the agencies’ ongoing commitment to conserve the species. The grizzly bear recovery plan acknowledges that maintenance of a healthy, recovered grizzly bear population will depend on effective, coordinated management. Each of the signatories to the final Grizzly Bear Conservation Strategy will contribute to and cooperate as appropriate with its mission and jurisdiction. It is intended to provide a cohesive umbrella for all signatories to operate under, but each signatory has its own legal process and authority to implement the conservation strategy (USFWS, 2013c).

The draft Grizzly Bear Conservation Strategy is intended to provide the regulatory framework for conservation of the grizzly bear and contains habitat-related management direction that pertains to the portions of the Flathead, Helena-Lewis and Clark, Kootenai, and Lolo National Forests that are located within the NCDE (see figures B-10 and 1-74 through 1-78). Alternatives B modified, C, and D of the Flathead's revised forest plan incorporate habitat-related elements of the draft Grizzly Bear Conservation Strategy that are relevant to the management of NFS lands. The USFS coordinated and consulted with the USFWS throughout the process of developing plan alternatives and will continue to do so throughout the NEPA process (USDA, 2014b, 2015a, 2015b, 2016b). The alternatives incorporate a management framework to contributed to recovery of the NCDE grizzly bear population, within the inherent capability of the plan area and USFS authority (36 CFR § 219.1(g)). The Forest Service is using the best available scientific information at this time.

The USFWS gathered public comments on the draft Grizzly Bear Conservation Strategy, with the public comment period beginning on May 2, 2013. In addition, a notice was published in the Federal Register on May 11, 2016 notifying scientists and other interested parties that they would have the opportunity to submit oral or written comments on habitat-based recovery criteria for the NCDE grizzly bear population. On July 7, 2016, the USFWS conducted a workshop with oral presentations by the public and also accepted written comments. The USFWS is currently working on the draft habitat-based recovery criteria and Grizzly Bear Conservation Strategy for the NCDE. When the USFWS finalizes its documents for the NCDE, the Forest Service will assess them to determine whether there are substantive differences from the Flathead's revised forest plan or amended forest plans and, if so, will follow established procedures to make any needed changes.

The grizzly bear is a conservation-reliant species (J. M. Scott et al., 2005), and the expectation is that the Grizzly Bear Conservation Strategy would remain in effect beyond recovery, delisting, and the five-year monitoring period required by the Endangered Species Act. The agencies signing the conservation strategy would be committed to be responsive to the needs of the grizzly bear through adaptive management actions based on the results of annual population and habitat monitoring. Forest Service responsibilities for monitoring are specified in chapter 5 of the forest plan for the Flathead National Forest and the monitoring sections for the amendment forests. Monitoring would help to determine whether plans need to be adjusted in the future.

Forest plan components such as standards and guidelines apply only to those lands under Forest Service jurisdiction. USFS plan components are written to conform to requirements of the 2012 planning rule. All alternatives consider Forest ecosystems, key ecosystem characteristics, and ecological conditions to support the NCDE grizzly bear population. All alternatives were developed and analyzed consistent with the NEPA. Alternatives are based upon public and agency comments, differing in the range of future actions that could occur and the extent of their application.

Methodology and analysis process

The diversity of habitats for grizzly bears on the Forest are discussed in sections 3.2, 3.3, and 3.7. In section 3.7.4, plan alternatives are assessed in terms of differences in key terrestrial ecosystem characteristics (vegetation composition, structure, function, pattern, and connectivity) as well as key characteristics of aquatic, wetland, and riparian habitats. Coarse-filter plan components addressed in section 3.7.4 provide for habitat diversity that benefits grizzly bears. Appendix C of the forest plan also includes possible strategies and management approaches to promote grizzly bear foods and other diverse habitat conditions at the project level. Key indicators for analysis specific to the grizzly bear are listed in the section below on consequences of alternatives.

Spatial and temporal analysis

The anticipated life of the forest plan is about 15 years. However, because management actions have the potential to affect wildlife species and their habitats for many decades, the temporal analysis for modeled vegetation change (discussed throughout the final EIS) considers changes that may occur over the next 50 years as environmental conditions change and vegetation moves from one successional stage to another.

The analysis area for indirect effects of the forest plan is the area comprised of the geographic areas of the Flathead National Forest, encompassing the Forest's portions of the grizzly bear management zones identified in the draft Grizzly Bear Conservation Strategy. The Forest includes portions of the recovery zone/primary conservation area and zone 1 (see figure B-10). The recovery zone/primary conservation area and the Forest's portion of zone 1 (including the Salish demographic connectivity area) encompasses the basic area of the current, known grizzly bear population and its distribution on the Forest (Costello, Mace, & Roberts, 2016). Each of the management zones has its own grizzly bear management goals.

Because grizzly bears are wide-ranging and the decision to be made encompasses multiple national forests, the analysis area for grizzly bear cumulative effects encompasses the NCDE management zones for multiple national forests (see figures B-10, 1-74 through 1-78) (USFWS, 2013c). The number of acres in each management zone for each national forest in the NCDE cumulative effects analysis area is displayed in table 56. The cumulative effects analysis can be found in chapter 6 of the final EIS.

Table 56. Acres of NFS land included within the NCDE recovery zone/primary conservation area (PCA); zone 1, including the demographic connectivity areas (DCAs), zone 2, and zone 3. The percent of total acres across all ownerships in each management zone is shown in parentheses.

National Forest	Recovery zone/PCA acres (percent)	Zone 1 including DCAs (percent)	Zone 2 acres (percent)	Zone 3 acres (percent)
Flathead	2,136,536 (37%)	231,548 (5%)	—	—
Helena	183,758 (3%)	149,207 (3%)	642,786 (14%)	5,792 (< 1%)
Kootenai	118,770 (2%)	283,302 (6%)	—	—
Lewis and Clark	777,963 (14%)	6 (< 1%)	2 (< 1%)	972,612 (8%)
Lolo	268,390 (5%)	386,274 (8%)	38 (< 1%)	—

Lands managed by the USFS make up approximately 60.9 percent (3,840,415 acres) of the grizzly bear recovery zone/primary conservation area within the NCDE, which is further divided into areas called bear management units (see figure 1-71) that are in turn divided into bear management subunits (see figures 1-74). Some plan components apply to management zones, some apply to bear management units, and some apply to bear management subunits. Grizzly bear subunits were designated across the national forests in the NCDE to approximate an average female home range size. Bear management subunits are not intended to represent actual female home ranges.

Information sources and incomplete or unavailable information

Since the draft Grizzly Bear Conservation Strategy was published, information on the amount and distribution of secure core habitat, motorized route densities, developed recreation sites, and livestock allotments was updated by the NCDE GIS specialist, based upon input from multiple land managers within the NCDE. Some updated data reflects new on-the-ground conditions, but some data has changed due to factors such as better knowledge or realignment of GIS data layers, even though no actual change has occurred on the ground.

Some members of the public commented on incomplete information about roads, trails, and dispersed recreation sites. The Forest acknowledges that information about roads and trails is incomplete. The

Forest is over 2 million acres, and the Forest continues to learn about user-created trails, both motorized and nonmotorized, as well as roads that have not had recent field surveys. Additionally, the Forest does not have complete knowledge of all roads on lands it acquired in the Swan Valley through the Montana Legacy Project. The inventory used for calculations of the Forest road and trail densities is based upon the USFS INFRA database. The USFS periodically updates the INFRA database as new aerial images and field data, such as the type or location of road closures or stream-aligned culverts, become available. The Forest also acknowledges that information on dispersed recreation sites is incomplete. Most of the Forest is open to dispersed recreation, so the sites receiving dispersed use, as well as the amount of use or season of use, are always changing.

Information on the Flathead National Forest (such as potential for mineral and energy development, fire, timber harvest, fuels reduction, thinning, planting), was obtained from a variety of sources, as explained throughout the final EIS. Grizzly bear population ecology, biology, habitat descriptions, and relationships identified by research are described in detail in the biological assessment (Kuennen, Van Eimeren, & Trechsel, 2017) and USFWS biological opinion (USFWS, 2017b), which are available on the Flathead National Forest's forest plan revision website (www.fs.usda.gov/goto/flathead/fpr). The biological assessment, the final EIS and its appendices, the reference sections of the plan's set of documents, and the planning record all document the Forest's consideration of the breadth of relevant scientific information and use of the best available scientific information.

Affected environment

The following description of the affected environment provides a summary of scientific information in the context of the NCDE, focusing on the Flathead National Forest and information needed to respond to public comments and understand the consequences of the alternatives.

NCDE grizzly bear population, distribution, and status

The Grizzly Bear Recovery Plan (USFWS, 1993) established minimum goals for a population of grizzly bears that is (1) adequately distributed throughout the recovery zone, (2) reproducing, and (3) able to sustain existing levels of human-caused mortality (p. 26). To facilitate the assessment of the grizzly bear population recovery goals and objectives, 23 bear management units were delineated in the NCDE, of which 12 are located on or partially on the Flathead National Forest.

The population subgoals for the NCDE grizzly bear recovery zone are listed in the Grizzly Bear Recovery Plan (USFWS, 1993, p. 59) as follows:

10 females with cubs inside Glacier National Park and 12 females with cubs outside Glacier National Park over a 6-year running average both inside the recovery zone and within a 10-mile area immediately surrounding the recovery zone;

21 of 23 bear management units occupied by females with young from a running 6-year sum of observations, with no two adjacent bear management units unoccupied;

Known human-caused mortality not to exceed 4 percent of the population estimates based on the most recent 3-year sum of females with cubs, and no more than 30 percent of the 4 percent mortality limit shall be females;

These mortality limits cannot be exceeded during any 2 consecutive years for recovery to be achieved;

Occupancy in the Mission Mountains portion of the ecosystem.

However, as described in the five-year status review of the grizzly bear (USFWS, 2011c, p. 16), sightability of females with young has always been a challenge in this heavily forested ecosystem. In addition, there was a lack of consistency in data collection and survey effort (Costello et al., 2016). For these reasons, the USFWS discontinued recording the number of females with cubs and their distribution in the NCDE as of 2004. Instead, the USFWS has relied on new science and techniques developed through an extensive DNA-based population estimate (Katherine C. Kendall et al., 2009) and a study of radio-collared bears sampled proportionately to relative population density, enabling calculation of reproductive rates, survival rates, and population trend (R. D. Mace et al., 2012). Subsequent work by Costello et al. (2016) has further refined the methods used for monitoring and reporting population distribution and vital rates, including an estimate of unreported mortalities, and population trend. The following summarizes the findings of these and related studies of population trend, distribution, survival, and mortality in the NCDE.

The Grizzly Bear Recovery Plan identified a minimum NCDE-wide grizzly bear population of 391 bears. In 2004, Kendall and others (2009) conducted a genetic capture/recapture study that encompassed the entire NCDE recovery zone/primary conservation area as well as adjacent areas thought to be inhabited by bears. The mean population estimate was 765 bears (95 percent confidence interval = 715-831), including all age classes. The male population estimate was 295 individuals (95 percent confidence interval = 276-324), and the female population estimate was 471 individuals (95 percent confidence interval = 427-531). The estimated population exceeded the recovery goal. In 2014, the population estimate for the NCDE was 960 grizzly bears (Costello et al., 2016). All population estimates for the NCDE (Costello et al., 2016; Katherine C. Kendall et al., 2009) indicate the grizzly bear population is above the minimum thresholds needed for population persistence (see Kuennen et al., 2017 for more details).

Multiple methods and estimates indicate that the NCDE grizzly bear population is growing. Costello's analyses resulted in estimates that differ slightly from Mace and others (2012) and led to a slightly lower estimate of the annual rate of population growth ($\lambda = 1.023$, or about 2 percent) for the NCDE grizzly bear population than that previously reported ($\lambda = 1.031$, or about 3 percent) (R. D. Mace et al., 2012). Costello and others (2016) stated, "We do not believe the observed difference in the two estimates is a result of actual population change. Our current models include a covariate for trend, and no negative trend was observed in any of the vital rates. Rather, we believe that the differences between Mace et al. (2012) and this report can be attributed to: (1) an increase in sample sizes for estimation of all vital rates; (2) better representation of conflict females in the estimation of vital rates; and (3) subtle but significant differences in methods of analysis" (p. 101).

To maintain a healthy grizzly bear population in the NCDE, it is necessary to have a balance between reproduction and mortality (USFWS, 2013c). Grizzly bear reproduction and survival in the NCDE is monitored within the recovery zone/primary conservation area and zone 1. It is influenced by age, sex, reproductive status, and management history (i.e., years since last management action). Costello and others (2016) estimated the number of annual grizzly bear mortalities during 2004-2014 as the sum of (1) management removals, (2) radio-marked losses, and (3) estimated total reported and unreported losses of non-radio-collared bears. Mortalities have a variety of causes and fluctuate from year to year, but despite mortalities, the survival rate for adult females (the most important group affecting population trend) is high, at 0.947 with a 95 percent confidence interval of 0.919-0.972 (Costello et al., 2016). During the 11-year study period, estimated mortality thresholds, consistent with population stability or growth, were not exceeded during any two consecutive years within the Recovery Zone/Principal Conservation Area and Zone 1 (Costello et al., 2016).

The trend in grizzly bear mortalities on NFS lands is downward, but the trend on private lands is upward. Within the Forest's geographic areas, the number of grizzly bear mortalities on NFS lands per decade declined from about 100 in the decade from 1976-1985 to 28 in the most recent decade (2006-2015). Within the Forest's geographic areas, the number of grizzly bear mortalities per decade on lands other than NFS lands has increased from about 20 in the decade from 1976-1985 to 55 in the most recent decade from 2006-2015. These totals do not include bears that were determined to have died of natural causes or those that were counted as mortalities because they were trapped by professional bear managers for purposes such as augmentation of the Cabinet-Yaak grizzly bear ecosystem.

In the NCDE, the most frequent known causes of documented human-caused mortalities of independent-aged grizzly bears during 2004–2014 were listed as management removals, poaching/malicious kills, and defense of life. Accounting for the fact that management removals are documented with 100 percent accuracy whereas other deaths often go unreported, Costello and others (2016) estimated that poaching/malicious kills likely accounted for the highest proportion of total independent-aged bear mortality (27 percent), followed by management removals (16 percent), illegal defense of property (11 percent), and natural causes (9 percent). The majority of management removals result from conflicts at sites associated with frequent or permanent human presence (USFWS, 2013c). Unsecured grizzly bear attractants at sites associated with frequent or permanent human presence include attractants such as chicken coops, garbage, human foods, pet/livestock foods, bird food, livestock carcasses, wildlife carcasses, barbeque grills, compost piles, orchard fruits, or vegetable gardens, found mostly on private lands.

Walters and Holling (1990) stated that managing human-caused mortality, monitoring both population and habitat parameters (e.g., road access), and responding when necessary with adaptive management are the best ways to ensure a healthy grizzly population. Management of human-caused mortality is ongoing, as is population and habitat monitoring (see chapter 5, which includes monitoring of habitat parameters on the Flathead National Forest).

Mace and Roberts (2011) mapped the distribution of grizzly bears in the NCDE. The grizzly bear population has now expanded well beyond the recovery zone/primary conservation area, another indication of population growth (see the biological assessments for the revised Flathead National Forest plan and for the amendment forests for more details: Kuennen, Van Eimeren, and Trechsel (2017) and Warren, Van Eimeren, and Trechsel (2017)). The current distribution is about 21,313 square miles, covering the entire recovery zone/primary conservation area, most of zone 1, and parts of zones 2 and 3 (Costello et al., 2016).The mapped distribution of NCDE grizzly bears now encompasses the Salish demographic connectivity area and about 63 percent of the Ninemile demographic connectivity area. Using all of the verified grizzly bear locations from 2004-2014 (*N* = 210,126), Costello and others (2016) estimated that the total distribution area for grizzly bears had increased 139 percent from the area of the recovery zone/primary conservation where bear distribution was estimated prior to 1993 (USFWS, 1993). Grizzly bears are also distributed across the NCDE bear management units (Katherine C. Kendall et al., 2009; R. D. Mace & Roberts, 2011). Costello and others evaluated occupancy of the 23 bear management units in the NCDE by females with offspring during 2004-2014. They documented full occupancy of the recovery zone/primary conservation area starting in 2009 (Costello et al., 2016). On the Forest, grizzly bears occupy an area of the recovery zone/primary conservation area totaling over 2.1 million acres and an area outside the recovery zone/primary conservation area totaling about 231,000 acres (see table 56), including the Salish demographic connectivity area in zone 1 (see figure B-10 in the forest plan).

Grizzly bear densities and home range sizes are variable across the NCDE. Grizzly bear home ranges overlap and change seasonally and annually and based on reproductive status. Grizzly bear densities within the NCDE are generally highest in Glacier National Park and on adjacent national forest lands

(including the Flathead National Forest) and decrease toward the southern portion of the ecosystem (Katherine C. Kendall et al., 2009). Mace and Roberts (2012) evaluated the home ranges of 34 female grizzly bears that lived in or adjacent to Glacier Park, based upon data collected from 2004-2011. Most home ranges (59 percent) straddled the Park boundary, overlapping lands managed by the Flathead National Forest, the Helena-Lewis and Clark National Forest, and the Blackfeet Tribe. Home ranges were, on average, smallest for bears that lived 100 percent within the Park and larger for females that straddled the Park boundary.

In summary, available information documents increases in grizzly bear distribution and population size. The estimated population size was 765 bears in 2004 (Katherine C. Kendall et al., 2009), nearly double the target of 391 bears that was based on sightings of females with cubs (USFWS, 1993). Mortality has been at an acceptable level based on ongoing research and monitoring, showing that the NCDE grizzly bear population has been stable to increasing and expanding its distribution (Costello et al., 2016). Montana Fish, Wildlife and Parks will monitor grizzly bear populations, including grizzly bear-human conflicts, reproduction, mortality, and population trend. Triggers will be established in the final conservation strategy. As stated in the draft Grizzly Bear Conservation Strategy (USFWS, 2013c):

> Intensive information has been generated in the NCDE about the status of the grizzly bear population. These data indicate that the demographic and distribution criteria, as outlined in the *Revised Grizzly Bear Recovery Plan* (USFWS 1993) have been greatly surpassed. Agencies responsible for management will continue their commitment to careful population monitoring and data collection to demonstrate that a healthy and biologically viable population is being maintained. (p. 34).

NCDE—Genetic and demographic connectivity

The draft Grizzly Bear Conservation Strategy includes demographic criteria aimed at maintaining a healthy, widely distributed, and genetically diverse grizzly bear population, with high adult female survival and sustainable mortality limits. The draft Grizzly Bear Conservation Strategy also addresses demographic connectivity between U.S. grizzly bear ecosystems. The Flathead National Forest contains a portion of the Salish demographic connectivity area. The Salish demographic connectivity area has an objective of providing genetic connectivity between the NCDE and the Cabinet-Yaak Grizzly Bear Ecosystem to the west, through occupancy by female grizzly bears, but at a lower bear density than in the primary conservation area. The Salish demographic connectivity area is currently occupied by female grizzly bears (Costello et al., 2016).

Connectivity of grizzly bear populations has been examined at multiple scales. At an international scale, Proctor and others (2015) studied connectivity between the United States and Canada using genetic testing and movement data from radio-collared grizzly bears, with data gathered between 1979 and 2007. Both male and female grizzlies moved freely across the United States/Canada border on the northern edge of the NCDE (including the Forest). The authors concluded there is currently little risk of significant reduction in the present high levels of genetic diversity in the NCDE grizzly bear population. Within the NCDE, few barriers to grizzly bear genetic exchange appear to exist. Both male and female movements have been documented across existing highway corridors. Researchers concluded that habitat connectivity is within levels that ensure both demographic and genetic connectivity (C. R. Miller & Waits, 2003; Waller & Servheen, 2005). Well-connected populations improve the probability of persistence for small populations (M. F. Proctor et al., 2015) and also help to mitigate the potential impacts on the grizzly bear from a changing climate, increasing resiliency to demographic and environmental variation (USFWS, 2011c).

Grizzly bear habitat introduction

In order to put the affected environment in context, the grizzly bear management zones in the draft Grizzly Bear Conservation Strategy are used to describe the affected environment. In total, grizzly bear habitat on the Flathead National Forest comprises nearly 40 percent of the NCDE grizzly bear recovery zone/primary conservation area ((USFWS, 2013c), Table 57 displays the approximate acreage in each geographic area on the Flathead National Forest within NCDE grizzly bear management zones, totaling about 2.4 million acres.

Table 57. Grizzly management zones within geographic areas (GAs) on the Flathead National Forest

Grizzly Habitat Classification	North Fork GA	Middle Fork GA	South Fork GA	Hungry Horse GA	Salish Mountains GA	Swan Valley GA	Total Forest
Recovery zone/primary conservation area	319,998	370,156	789,074	286,229	6,781	490,824	2,136,534 (90%)
Zone 1: Salish demographic connectivity area	0	0	0	0	95,840	0	95,840 (4%)
Zone 1 outside Salish demographic connectivity area	43	0	0	5	135,516	143	135,702 (6%)

Grizzly bear habitat on the Flathead National Forest and elsewhere in the NCDE provides a high diversity of habitat, including diverse potential vegetation types distributed across the six geographic areas (see figures B-04 through 09). Grizzly bear habitat includes coniferous forests, deciduous forests, wetland and riparian areas, talus, and grass/forb/shrub patches found in areas such as meadows, avalanche chutes, burned areas, and logged areas. The natural range of variation for grizzly bear habitat has been affected by ecological processes in the past (e.g., fire, floods, avalanches, insects, and disease) and will continue to be affected by these processes in the future. For example, wildfire and avalanches are ecosystem processes that create habitats with abundant bear foods. In northwest Montana, Zager and others (1983) found that grizzly bears foraged in fruit-producing shrubfields in post-fire habitats disproportionately in the summer and autumn. Hamer and Herrero (1987) suggested that forest disturbance created conditions for diverse early-successional plant communities that benefited grizzly bear foraging in Alberta. The quantity and quality of grizzly bear habitat within the Forest and elsewhere in the NCDE consists of a diverse, ever-changing vegetation and landscape mosaic providing a variety of foods, cover conditions, denning habitat, habitat security, habitat connectivity, and vast areas of space for this wide-ranging species.

Grizzly bear habitat—Foods and cover

Grizzly bears are an omnivorous and opportunistic species that has adapted to the natural range of variation in foods, and they are not reliant on any one food (USFWS, 2013c). High-energy food items used by grizzly bears occur across a range of habitats, so if ecosystem processes or changes in climate make one food item less available, other food items are likely to be used. Grizzly bears are known to switch foods according to which foods are available (Aune & Kasworm, 1989, p. in USFWS 2013; Katherine C Kendall, 1986; LeFranc Jr., Moss, Patnode, & Sugg III, 1987; R. D. Mace & Jonkel, 1986; Martinka & Kendall, 1986; Servheen, 1981). Grizzly bears will consume almost any food available, including living or dead mammals or fish, insects, worms, plants, berries, human-related foods, and garbage (Knight, Blanchard, & Mattson, 1988; D. J. Mattson, Blanchard, & Knight, 1991; C. C. Schwartz, Miller, & Haroldson, 2003). The search for energy-rich food appears to be a driving force in grizzly bear behavior and habitat selection. Grizzly bears are large animals with high metabolic demands

during the non-denning season. Adequate nutritional quality and quantity are important factors for successful reproduction (USFWS, 1993, as amended). Habitat diversity on the Forest provides a wide variety of vegetation types and bear foods that meet the needs of grizzly bears as the seasons and available foods change.

Food production and grizzly bear use of foods changes seasonally. Upon den emergence in the spring, bears may remain at higher elevations and search avalanche chutes for animal carcasses buried by the snow before descending to lower elevations to seek newly emerging vegetation such as grasses, forbs, and sedges (Aune & Kasworm, 1989; Katherine C Kendall, 1986; LeFranc Jr. et al., 1987; R. D. Mace & Jonkel, 1986; Martinka & Kendall, 1986; Servheen, 1981). As snow melts, grizzly habitat use extends to higher elevations. In the western portion of the NCDE, including the Flathead National Forest, riparian and wetland habitats (Ruby, 2014) and avalanche chutes are important to bears during summer and autumn (R. D. Mace & Waller, 1997). Avalanche chutes are widely distributed and abundant in the NCDE, with the majority of acres occurring in Glacier National Park as well as in the adjacent Flathead and Helena-Lewis and Clark National Forests. During the summer, grizzlies also feed on army cutworm moths and ladybird beetles on the rocky talus areas at high elevations of the Forest, as well as on the adjacent Helena-Lewis and Clark National Forest, tribal lands of the Confederated Salish and Kootenai Tribes, and Glacier National Park lands (Aune & Kasworm, 1989; Craighead & Mitchell, 1982; Klaver et al., 1986; Servheen, 1983; Sumner & Craighead, 1973; J. White, Don, Kendall, & Picton, 1998). Once berries become available in the summer, grizzlies consume a wide variety of berries found on the Forest and elsewhere in the NCDE, including huckleberries, buffaloberries, serviceberries, hawthorn berries, chokecherries, and, to a lesser degree, alderleaf buckthorn berries and mountain ash (Katherine C Kendall, 1986; LeFranc Jr. et al., 1987; R. D. Mace & Jonkel, 1986; Martinka & Kendall, 1986; Bruce N. McLellan & Hovey, 1995; Servheen, 1981). These diverse berry-producing shrubs provide ripe fruit at various times throughout the summer and fall months, ripening at lower elevations first and progressing upslope. The amount and species of berries in bear diets vary annually based on annual fruit production and distribution (Bruce N. McLellan & Hovey, 1995), which are influenced by environmental variables (Simonin, 2000). In northwest Montana, the production of berries is affected by forest canopy cover, temperature, and soil moisture conditions, which can vary considerably from low to high elevations and from year to year.

Prior to the spread of white pine blister rust, grizzlies in the NCDE fed on whitebark pine seeds from late summer through fall when and where they were available (Aune & Kasworm, 1989; Katherine C. Kendall & Arno, 1990; R. D. Mace & Jonkel, 1986; Shaffer, 1971). However, data on whitebark pine mortality rates from the early to mid-1990s indicated that 42–58 percent of all whitebark pine trees surveyed within the NCDE were dead (Katherine C. Kendall & Keane, 2001) and were no longer producing seeds. Recent remeasurement showed that mortality of whitebark pine trees has more than doubled in the past two decades (Halofsky et al., in press). Despite this loss, the NCDE grizzly bear population is healthy, illustrating the flexibility of grizzly bear diets and high habitat diversity in the NCDE (USFWS, 2013c).

Grizzly bears are also known to feed on animal matter, especially in the fall. Teisberg and others found that fall diets of NCDE grizzly bears consist of higher amounts of meat, such as portions of carcasses left by hunters (32 percent for adult males, 21 percent for adult females) (Teisberg, Madel, Mace, Servheen, & Robbins, 2015). Mace and Roberts (2013) found that grizzly bear diets include more animal matter towards the southern and eastern periphery of the NCDE and more plant matter in the northern and western portions of the NCDE. This pattern is presumed to reflect, at least in part, natural environmental gradients across the NCDE that influence habitat productivity (R. D. Mace & Roberts, 2013).

Because most of the Forest is heavily forested, processes such as wildfire or timber harvest (and other vegetation management activities that affect canopy cover) affect grizzly bear food production over time.

Large areas burned by wildfire in recent decades are widely distributed across the NCDE, including the Flathead National Forest, and generally provide high-quality habitat for grizzly bear foraging for a few decades until a coniferous tree canopy reduces light that can, in turn, reduce food production (Kuennen et al., 2017).

Some members of the public have expressed a concern that the amount of high-energy bear foods needed to support a recovered population of grizzly bears in the NCDE has not been quantified. A mosaic of forest successional stages and vegetation providing foods and cover is desirable, but it is difficult to quantify a desired landscape composition. Grizzly bear access to food resources and foraging efficiency is influenced by the ever-changing landscape as well as by increasing bear density, and thus bear populations are likely limited by social factors of the grizzly bear population more than by any limitation of food biomass itself (Bruce N. McLellan, 1994). Available foods, roads, and human activities can also interact in their effects on grizzly bears. McLellan (2015a) studied the interaction of roads, human activities, and food sources for grizzly bears over a 30-year time period in a multiple-use landscape in British Columbia that had high levels of human activity (including logging, gas exploration, and grizzly bear hunting). McClellan stated that a significant implication of his study is that the abundance of a high-energy food source growing in undisturbed portions of his study area enabled the grizzly bear population to increase in spite of intense industrial development and the highest density of hunter-killed grizzly bears in British Columbia. Once the high-energy food source declined, the grizzly bear population declined because of reduced reproduction (either directly or indirectly). He stressed that managers should identify which high-energy foods are important in various ecosystems and try to maintain or enhance these foods while reducing human access into habitats where they are abundant. High-energy foods have been identified for the NCDE, and human access has been reduced in many areas where diverse habitats providing grizzly bear foods are abundant (Kuennen et al., 2017; N. Warren et al., 2017).

To examine grizzly bear abundance in relation to bear foods and other habitat factors (such as mesic habitats), Graves and others (2012) studied an area spanning the NCDE that was centered over Glacier National Park. Bear abundance was determined based upon genetic detection using rub trees and hair traps. Graves and others (2012) found that amounts of mesic habitat, historical presence of bears, and bear management level (as defined by experts) were most closely associated with both male and female grizzly bear abundance. In addition, the amount of meadow and shrub habitat was closely associated with female grizzly bear abundance (see table 3 in T. A. Graves et al., 2012). The analysis by Graves and others indicates that habitat types rich in bear foods are widespread across the NCDE. See the biological assessments for more details (Kuennen et al., 2017; N. Warren et al., 2017).

Because of the complexity of factors influencing grizzly bear use of high-energy foods, the draft Grizzly Bear Conservation Strategy proposes to monitor grizzly bear body condition to assess any changes in the overall assimilated diet of grizzly bears.(USFWS, 2013c, pp. 78-79). Body condition data would be collected by MFWP and would provide insight into possible changes in food availability over time. Teisberg and others studied current grizzly bear population health and body condition, finding that adult females across all ecoregions of the NCDE enter dens at mean fat levels above those thought to be critical for cub production. They stated that there is no evidence to conclude that the widely varying food resources across the NCDE are inadequate to meet the needs of reproductively active adult females. As truly opportunistic omnivores, grizzly bears in all regions of the NCDE exploit diverse combinations of food items to arrive at productive body conditions (Teisberg et al., 2015). Although some bears seek foods associated with humans, monitoring of grizzly bear body condition, reproduction, and mortality indicates that the overall availability of diverse, high-energy bear foods is supportive of grizzly bear population recovery in the NCDE.

Cover is another component of habitat that is important to grizzly bears. Cover provides grizzly bears with shade on hot days, reduces potential disturbance from noise and human activity, and contributes to habitat connectivity (B. N. McLellan & Shackleton, 1989). On the heavily-forested Flathead National Forest, cover is quickly re-established after most disturbances and is generally not limiting. The greatest temporary impact on forest cover and its connectivity in the Flathead National Forest geographic areas, considering all land ownerships, is wildfire (for more details on cover, see USDA, 2014a, figures 34 and 53, pp. 139-143). Beginning in the 1980s, there was an increase in stand-replacing wildfires on the Forest, with sizes ranging up to about 50,000 acres. A high percentage of the South Fork and North Fork geographic areas have been burned by wildfire (about 20 percent of all land ownerships), whereas a low percentage of the Swan Valley and Salish Mountains geographic areas has been burned by wildfire (about 3 percent of all land ownerships). Timber harvest also has temporary impacts on cover but has affected much smaller patches than wildfire. As of 2000, the most recent year for which LANDFIRE data was available, the Salish Mountains geographic area had the highest percentage of area recently harvested (about 9 percent of all land ownerships), the Swan Valley geographic area had a moderate amount (about 6 percent of all land ownerships), and the Middle Fork geographic area had the lowest (less than 1 percent of all land ownerships). On the Hungry Horse and North Fork geographic areas, about 2 percent of all land ownerships had recently been harvested.

Grizzly bear habitat and human developments

Human developments (the developed human footprint) can affect habitat for grizzly bears as well as the risk of human disturbance and/or human-caused mortality. For grizzly bears, areas with higher levels of permanent human development may be associated with avoidance during certain seasons or times of day or higher grizzly bear mortality due to conflicts with humans. Schwartz and others (2010) found that grizzly bear survival in the Greater Yellowstone Ecosystem declined as road density, number of homes, and site developments increased. Habitat connectivity can affect grizzly bears at multiple scales—between grizzly bear ecosystems, within ecosystems, and within a home range.

Permeability refers to the degree to which whole landscapes, encompassing a variety of natural, semi-natural, and developed land cover types, are compatible with wildlife needs and sustain ecological processes. At the landscape scale, effects to grizzly bears occur with respect to permeability and the developed human footprint on other land ownerships, including communities, highways, land converted to agriculture, and other factors (Kuennen, 2017b; TNC, 2016). The Nature Conservancy mapped landscape permeability for the Pacific Northwest (McRae et al., 2016), including the area from the NCDE to the Greater Yellowstone Ecosystem. Overall, the network of Federal lands in northwest Montana provides a moderate to high degree of landscape permeability for grizzly bears (Kuennen, 2015b). See biological assessments for more details (Kuennen et al., 2017; N. Warren et al., 2017).

In the Forest's analysis area, the developed human footprint ranges from less than 1 percent of the South Fork and Middle Fork geographic areas up to about 17 percent of the Salish Mountains geographic area. The Swan Valley geographic area has a moderate but more dispersed human development footprint compared to the Salish Mountains geographic area. In other words, 83-99 percent of each geographic area on the Forest is largely uninhabited by people (for more details on human developments, see USDA, 2014a, pp. 141-143). Grizzly bears generally avoid the developed human footprint in and around the city of Kalispell but may be drawn to residences in smaller rural communities and valley bottoms if attractants are present.

Maintaining large areas of secure habitat is important to the survival and reproductive success of grizzly bears, especially females (R. D. Mace, Waller, Manley, Ake, & Wittinger, 1999; C. C. Schwartz et al., 2010), and is a major goal of the draft NCDE grizzly bear conservation strategy. Throughout the NCDE, large acreages of congressionally designated wilderness provides a high degree of habitat security for

grizzly bears. The Wilderness Act of 1964 precludes a variety of activities, including construction of developments such as roads, powerlines, or airstrips; motorized use or mechanized transport; and permanent human habitation (except as specifically allowed by the enabling legislation). New livestock allotments, new mining claims, new oil and gas leases, and other developments that would impair wilderness character are also prohibited (subject to valid existing rights). The NCDE also contains substantial acreage of inventoried roadless areas as well as other lands that have little or no permanent human presence or road development, contributing to secure habitat at a landscape scale. The Mission Mountains Tribal Wilderness is adjacent to the USFS Mission Mountains Wilderness and provides high grizzly bear habitat security and connectivity; Glacier National Park lies in close proximity to the Bob Marshall Wilderness Complex, providing connectivity from Canada to the southern end of the Swan Mountain Range (see figure 1-73). On the Flathead National Forest, a total of about 1.5 million acres inside the recovery zone/primary conservation area is currently designated as wilderness, inventoried roadless area, or other backcountry management area that contributes to high levels of habitat security for grizzly bears (see figures 1-38, 1-01).

Proctor and others (2015) and Weaver (2014) modeled and mapped preferred "linkage habitats" for grizzly bears along highways within the Flathead National Forest and adjacent areas (including Canada) in order to inform management; see also Proctor (2015). Their models and maps were based upon resource selection functions that indicate relative habitat importance. Waller and Servheen studied grizzly bear habitat use along the Highway 2 corridor between Glacier National Park and the Flathead National Forest, evaluating transhighway movements of 42 grizzly bears and relating them to highway and railroad traffic volumes as well as other corridor attributes (Waller & Servheen, 2005). They found that grizzly bears strongly avoided areas within 0.31 mile of the highway and that highway crossing frequency was negatively related to highway traffic volume. Most highway crossings occurred at night when highway traffic volume was lowest (Waller & Servheen, 2005). Waller and Miller also found that traffic volumes had increased when they compared the 1999-2001 study periods and the 2012-2013 periods (Waller & Miller, 2015). Traffic volume increases were most dramatic during the hours in which grizzly bears were most likely to cross the highway; thus, they concluded that suitable highway crossing opportunities have declined along the Highway 2 corridor between Glacier National Park and the Flathead National Forest. Northrup and others studied grizzly bear response to traffic levels in southwestern Alberta. Bears selected areas near roads traveled by fewer than 20 vehicles per day and were more likely to cross these roads. Bears avoided roads receiving moderate traffic (20–100 vehicles per day) and strongly avoided high-use roads (> 100 vehicles per day) at all times (Northrup, Stenhouse, & Boyce, 2012). Similar to Waller and Miller, they also found that traffic patterns caused a behavioral shift in grizzly bears— with increased use of areas near roads and movement across roads during the night when traffic was low. Federal agencies have been cooperating to improve habitat security, connectivity, linkage, and to mitigate impacts of highways and other developments that increase mortality risk and may impede movement by wildlife, including grizzly bears.

Grizzly bear habitat and security

Forest roads can affect grizzly bear habitat security. Grizzly bear habitat security has been modeled and mapped using a variety of methods at a variety of scales (Kuennen & Warren, 2015). Numerous studies using various methods have documented that excessive road density in grizzly bear habitat affects behavior, habitat use, and can lower bears' survival rate during the non-denning season (Boulanger & Stenhouse, 2014; D. J. Mattson, Knight, & Blanchard, 1987; W. J. Mattson, Niemelä, & Rousi, 1996; Bruce N. McLellan & Shackleton, 1988; Waller & Mace, 1997). Some older studies looked at motorized road use based upon data obtained with weekly telemetry flights, and some newer studies used satellite technology to track a bear's location each half hour or hour. Some studies assessed effects to grizzly bears of all sex, age, and reproductive classes, and others assessed effects on each class. In the Swan Mountain

Range on the Forest, Mace and Waller (1996) determined that bears underutilized areas within 500 meters (0.3 mile) of open forest roads with use levels greater than 10 vehicles per day. Based on these findings, security core or secure core habitat in the NCDE is defined as those areas more than 500 meters (0.3 mile) from a motorized access route during the non-denning period and at least 2,500 acres in size. The effects of motorized and nonmotorized trail use on grizzly bears were not part of the Swan Mountain Range study by Mace and others (R. D. Mace, Waller, Manley, Lyon, & Zuuring, 1996) and have not been well studied. Nevertheless, the moving window analysis considers the effects of roads as well as both motorized and high-use nonmotorized trails in the recovery zone/primary conservation area.

Motorized access in the recovery zone/primary conservation area

Research findings from the Swan Mountain Range of the Flathead National Forest have been used to evaluate the effects of motorized access on grizzly bears in the NCDE recovery zone/primary conservation area. In the NCDE recovery zone/primary conservation area, a moving window analysis (see glossary) has been used to assess effects of roads and trails (Kuennen et al., 2017). Mace and others (1996) converted a linear road map to a total road density map using a 1 square kilometer (0.39 square mile) moving window analysis and reported the following relationships to road density:

- road density was lower within the composite of the multi-annual home ranges of 14 adult and subadult female grizzly bears (0.95 mile/square mile) than was road density outside the composite home range (1.7 mile/square mile);
- as total road density increased, the probability of habitat selection by grizzly bears declined;
- 56 percent of the composite female home range was unroaded compared to 30 percent outside the composite home range;
- within seasonal ranges, grizzly bears were more likely to use areas with higher road densities during spring than during other seasons; and
- selection for habitats within a 0.5-kilometer buffer around roads decreased as traffic volume increased.

Based on these and related findings, the Interagency Grizzly Bear Committee established definitions and procedures for analyzing the effects of motorized use, delineating analysis areas that were equivalent to the average size of a female grizzly bear home range. In the NCDE, these were called bear management subunits. The Interagency Grizzly Bear Committee recommended criteria for open and total road densities as well as core habitat within a grizzly bear subunit to support the conservation and recovery of grizzly bears (IGBC, 1998). These recommendations were used as the basis for the percentages for open and total road density and security core for the Flathead forest plan amendment 19, adopted in the 1995 decision notice (USDA, 1995b).

On the Forest, there are 12 bear management units in the recovery zone/primary conservation area that are further subdivided into 73 subunits (see figure 1-31). Of the 73 total grizzly bear subunits on the Forest, 16 are primarily in wilderness, where wheeled motorized vehicle use and mechanized transport are not allowed. The amendment 19 decision applied management direction to 54 of the 73 subunits. Flathead National Forest Plan amendment 19 established a standard for no net increase in total motorized access density or open motorized access density and no net decrease in security core for 54 grizzly bear management subunits. It also established numeric objectives (often referred to as "19-19-68") to limit high-density (greater than 1 mile/square mile) open motorized access, to limit high-density (greater than 2 miles/square mile) total motorized access, and to provide security core areas that equal or exceed 68 percent of a bear management subunit for subunits with more than 75 percent NFS lands (USDA, 1995b, p. 4). These objectives were to be achieved within ten years. Subsequent consultation with the USFWS

identified these objectives as necessary to minimize incidental take, with reasonable and prudent measures to implement a road and motorized trail management program that regulated open and total route density. Incidental take was provided based upon a proposed implementation schedule to achieve the numeric objectives, which was revised in subsequent biological opinions in 2005 and 2014 (USFWS, 2005a, 2014c).

In 1998, after amendment 19 had been adopted for the Flathead National Forest, the NCDE access task group, a group of grizzly bear experts, suggested that (1) the basic premise of managing open and total road densities as well as security core areas during the non-denning period is valid, (2) although amendment 19 is considered effective for managing access in grizzly bear habitat to support recovery of the species, other strategies may also be effective, and (3) seasonal road closures to protect seasonally important grizzly bear habitat can be useful and effective. Since 1998, many other studies of grizzly bear habitat use in relation to roads have been conducted, using a variety of definitions, methods, and statistical techniques.

Between 1995 and 2016, there has been an improved trend in habitat conditions for grizzly bears on the Flathead National Forest. Across the Forest, there are about 3,570 miles of NFS roads. Of this total, the Forest has about 1,580 miles of roads closed with gates (seasonally or yearlong) and about 970 miles of roads closed with barriers. About 730 miles of road have been decommissioned (INFRA database 2016). The availability of secure grizzly bear habitat as well as its connectivity, has greatly increased, benefiting the grizzly bear population. In 1995, 16 of the Forest’s 40 subunits met or exceeded 68 percent security core habitat and by 2016, the number of subunits had greatly increased (USDA, 2016a).

After amendment 19 was adopted, reporting of percentages changed for a variety of reasons. At the time amendment 19 was adopted, 14 subunits had less than 75 percent NFS lands (USDA, 1995a; 1995b, p. 6). These 14 subunits did not have numeric objectives to meet 19 percent open motorized access density, 19 percent total motorized access density, and were not required to meet or exceed 68 percent security core. The number of subunits with greater than or equal to 75 percent NFS lands has now changed because the Forest has acquired more than 45,000 acres of former Plum Creek Timber Company lands through the Montana Legacy Project and other land acquisitions (Kuennen et al., 2017; see figures B-42 and B-43). As a result of land acquisitions and a district court decision related to the Glacier Loon and Buck Holland subunits (USDC-Missoula, 2014), the Forest is now reporting conditions in relation to amendment 19 numeric objectives for 47 rather than 40 subunits (USFWS, 2016b). In these subunits, roads on acquired lands are now classified as NFS roads in the INFRA database, which increases the miles of roads managed by the Flathead National Forest.

The status of these 47 grizzly bear subunits on the Forest which now have at least 75 percent NFS lands is as follows (USDA, 2016a) (see figure 1-37 and table 58; numbers in parentheses are those which would result from decisions that are anticipated to be implemented but have not yet been fully implemented):

> Thirty-seven (37) of 47 subunits meet or are less than 19 percent open motorized route density (32 subunits) or meet site-specifically amended standards (5 subunits),
>
> Thirty-two (32) of 47 subunits meet or are less than 19 percent total motorized route density (31 subunits) or meet site-specifically amended standards (2 subunits),
>
> Thirty-one (31) of 47 subunits meet or are over 68 percent security core (27 subunits) or meet site-specifically amended standards (4 subunits).

Table 58. Access management status of bear management subunits on the Flathead National Forest where NFS lands > 75% (based upon Ake (2017c))

Bear Management Subunit[1]	Percent Open Motorized Access Density—OMAD	Percent Total Motorized Access Density—TMAD	Percent Security Core
Frozen Lake	10	4	80
Ketchikan	14	3	73
Upper Trail	14	4	88
Lower Whale (amended to 37-19-47)	36	17	50
Upper Whale Shorty	12	11	86
Red Meadow Moose	25	17	68
Hay Creek	25	16	55
Coal and South Coal	15	19	73
Werner Creek (amended to 29-19-63)	29	20	63
Lower Big Creek	18	19	71
Canyon McGinnis (amended to 19-33-53)	19	32	50
Peters Ridge	52	25	34
Swan Lake	39	26	45
Lion Creek	18	47	41
Meadow Smith	20 (18)	53	42
Buck Holland	24	41	40
Crane Mountain	31	58	25
Piper Creek	19	45 (43)	55
Cold Jim	18	57 (54)	43
Hemlock Elk	6	30 (29)	64
Glacier Loon	22	41	48
Beaver Creek	6	26 (25)	66
Doris Lost Johnny (amended to 57-19-36)	57	19	36
Wounded Buck Clayton (amended to 27-30-65)	27	30	65
Emery Firefighter	19	20 (19)	58 (68)
Riverside Paint	18	16	71
Jewel Basin Graves	19	19	68
Wheeler Quintonkon (amended to 25-19-68)	25	19	68
Logan Dry Park	30	36	51
Lower Twin	9	2	92
Twin Creek	0	0	100
Moccasin Crystal	8	1	81
Stanton Paola	8	3	81
Dickey Java	9	0	81
Long Dirtyface	0	0	100
Tranquil Geifer	0	2	85

Bear Management Subunit[1]	Percent Open Motorized Access Density—OMAD	Percent Total Motorized Access Density—TMAD	Percent Security Core
Skyland Challenge	20	17	65
Plume Mountain Lodgepole	0	0	97
Flotilla Capitol	0	0	99
Ball Branch	7	12	84
Kah Soldier	19	19	68
Spotted Bear Mountain	19	18	68
Big Bill Shelf	11	6	80
Jungle Addition	19	19	68
Bunker Creek	5	3	92
Gorge Creek	0	0	90
Harrison Mid	1	0	95

[1]There are 16 subunits with > 75 percent NFS lands that are completely within the wilderness and not included in amendment 19. The seven subunits within Montana Legacy Project acquired lands are Buck Holland, Cold Jim, Glacier Loon, Hemlock Elk, Lion Creek, Meadow Smith, and Piper Creek.

Amendment 19 appendix TT defines restricted roads, reclaimed roads, and security core (see glossary) and explains how road status is used in calculating percentages. Some members of the public expressed concern about the Forest's assumptions in calculating the total motorized access density percentages because the Forest does not have complete knowledge of its road system and is uncertain whether stream-aligned culverts remain on some roads. As a result, table 59 shows the total motorized access density for 18 out of 47 amendment 19 subunits where these assumptions could make a difference in the percentages. Although the difference in assumptions makes a difference in the percentages, it does not change the on-the-ground condition with respect to grizzly bear habitat security.

Table 59. Total motorized access route density (TMAD) percentages that change based upon assumptions (Kuennen et al., 2017, table 18)

Subunit Name	TMAD percentage assuming no stream-aligned culverts	TMAD percentage assuming stream-aligned culverts present
Ball Branch	12	14
Buck Holland	41	42
Bunker Creek	3	10
Canyon McGuinness	32	38
Cedar Teakettle (< 75% NFS lands)	27	30
Coal and South Coal	19	27
Cold Jim	55	56
Crane Mountain	58	61
Doris Lost Johnny	20	27
Frozen Lake	4	5
Jewel Basin Graves	19	20
Lower Whale	17	18
Meadow Smith	53	54
Porcupine Woodward (< 75% NFS lands)	73	75
Red Meadow Moose	17	19
South Fork Lost Soup (< 75% NFS lands)	47	50

Subunit Name	TMAD percentage assuming no stream-aligned culverts	TMAD percentage assuming stream-aligned culverts present
State Coal Cyclone (< 75% NFS lands)	25	27
Wounded Buck Clayton	30	31

In addition to amendment 19, there is other direction which has contributed to management in portions of the recovery zone/primary conservation area in the Swan Valley, where the acreage of lands with intermingled ownership was high prior to land acquisitions by the Forest Service. The Swan Valley Grizzly Bear Conservation Agreement is a collaborative document that has guided the management of multiple-use lands in the Swan Valley managed by the Forest Service, Montana Department of Natural Resources and Conservation, and lands formerly owned and managed by Plum Creek Timber Company (Plum Creek et al., 1997). At the time the agreement was adopted, it was recognized that Swan Valley subunits with multiple land ownerships and road jurisdictions would require additional coordination to provide habitat security for grizzly bears. The stated purpose of the agreement is to “establish an ecosystem-based management plan throughout the Conservation Area which allows affected Parties to realize economic and recreational benefits of their ownership while helping conserve the bear and other species.” The Swan Valley Grizzly Bear Conservation Agreement has provided guidance such as managing activities in linkage areas, maintaining visual screening along open forest roads, maintaining hiding cover in the subunit area, and harvesting timber according to an agreed-upon time schedule, including subunits that can be “active” during specific years. See Plum Creek et al. (1997) for more details.

During the two decades from 1996-2015, Plum Creek Timber Company harvested a large portion of its lands in the agreement area (Ruby, Baty, & Kloetzel, 2016). Table 60 displays the approximate acres of timber harvest in the 11 Swan Valley grizzly bear subunits that have been managed under the Swan Valley Grizzly Bear Conservation Agreement.

Table 60. Acres of timber harvest from 1996 to 2015 in the Swan Valley agreement area by landowner[1]

Swan Valley Grizzly Bear Management Subunit	Timber Harvest DNRC 1996-2005 (acres)	Timber Harvest DNRC 2006-2015 (acres)	Timber Harvest PCTC/TNC 1996-2005 (acres)	Timber Harvest PCTC/TNC 2006-2015 (acres)	Timber Harvest USFS 1996-2005 (acres)	Timber Harvest USFS 2006-2015 (acres)	Total Timber Harvest 1996-2015 (acres)
Beaver Creek			1,044	546	303	5	1,898
Buck Holland			110	984	450	2,247	3,791
Cold Jim			1,045	4,459	149	0	5,653
Glacier Loon			1,543	376	717	104	2,740
Goat Creek	1,345	501	4,369	0	0	10	6,215
Hemlock Elk			1,007	1,843	252	523	3,625
Lion Creek	778		1,249	524	0	796	3,347
Meadow Smith			518	2,631	256	2,262	5,667
Piper Creek		120	2,620	2,141	16	19	4,786
Porcupine Woodward	485	2,000	3,690	0	0	0	6,175
South Fork Lost Soup	1,587	3,097	66	0	0	0	4,750

1. PCTC/TNC = Plum Creek Timber Company/The Nature Conservancy; DNRC = Montana Department of Natural Resources and Conservation.

The Montana Department of Natural Resources and Conservation data has the following important qualifiers:

- Harvested acres were sorted by sale date, not actual harvest date. Harvest dates are unknown.
- DNRC data does not include Plum Creek lands acquired in the Swan Valley through the Montana Legacy Project.
- The data does not include most small-volume timber permits or small-scale thinning/salvage projects.

About 66,000 acres of former Plum Creek Timber Company lands have recently been acquired by State and Federal agencies under the Montana Legacy Project (see figures B-42 and B-43 in Kuennen et al., 2017 for more details). Because there are many acres of young forest in past harvest units that will not be suitable for additional harvest for many decades, the level of harvest and harvest-related activities (including road use) is likely to be much lower in some Swan Valley subunits in the future. Cover is becoming established in the areas that were harvested in the past. Land acquisition has also reduced permanent habitat loss and the risk of grizzly bear food conditioning and habituation associated with private land development (had those lands been sold and subdivided as some other Plum Creek Timber Company lands have been). Both the Montana Department of Natural Resources and Conservation and the Forest Service have closed roads in the Swan Valley grizzly bear subunits to benefit wildlife, including grizzly bears, as displayed in table 61. (Miles of roads closed on former Plum Creek Timber Company lands are unknown. Road inventory is ongoing).

Table 61. Road management on Montana Department of Natural Resources and Conservation (DNRC) and USFS lands located in the Swan Valley

Subunit Name	DNRC Gated	DNRC Physical Barrier	DNRC Historical/ Reclaimed	USFS Gated[1]	USFS Physical Barrier[2]	USFS Historical/ Reclaimed[3]
Beaver Creek	—	—	—	52	5	8
Buck Holland	—	—	—	38	20	1
Cold Jim	—	—	—	81	42	10
Glacier Loon	—	—	—	46	28	6
Goat Creek	86	21	9	0	9	9
Hemlock Elk	—	—	—	54	18	2
Lion Creek	17	7	0	32	18	3
Meadow Smith	—	—	—	63	48	1
Piper Creek	0	0	0	48	30	0
Porcupine Woodward	117	29	13	12	23	32
South Fork Lost Soup	44	28	8	6	4	5

1. Roads are closed by a locked gate and considered available for administrative use; these are considered restricted roads.
2. Roads are closed by various types of physical barriers and generally are not available for motorized administrative use; these are considered restricted roads.
3. Historical or reclaimed roads are not being used by the cooperator, no longer exist, or are not on the cooperator's road system.

Note: approximate mileages as of 2015 excluding public highways, county roads, and roads on small private lands.

The acquisition of the Montana Legacy Project lands has also reduced the need for coordination of timber harvest activities because the only remaining parties to the Swan Valley Grizzly Bear Conservation Agreement are the USFS and the Montana Department of Natural Resources and Conservation. The latter agency manages a large block of lands in four grizzly bear subunits: Goat Creek, Lion Creek, Porcupine Woodward, and South Fork Lost Soup (about 47 percent). The Forest manages less than 75 percent of the acreage in three of these subunits (Goat Creek, Porcupine Woodward, and South Fork Lost Soup), and

therefore “no net increase” in open or total motorized route densities and “no net decrease” in security core apply (see table 62).

Table 62. Access management status of bear management subunits included in the Swan Valley Grizzly Bear Conservation Agreement where NFS lands total < 75% (source: Ake (2017c))

Bear Management Subunit	Open Motorized Access Density	Total Motorized Access Density	Security Core
Goat Creek	23	59	39
Porcupine Woodward	28	73	15
South Fork Lost Soup	25	47*	37

In four of the Forest’s 73 subunits that are *not* included in the Swan Valley Grizzly Bear Conservation Agreement, the Forest Service manages less than 75 percent of the acreage, and therefore “no net increase” in open or total motorized route densities and “no net decrease” in security core apply (see table 63).

Table 63. Access management status of bear management subunits that are not included in the Swan Valley Grizzly Bear Conservation Agreement where NFS lands total < 75% (source: Ake (2017c)).

Bear Management Subunit	Open Motorized Access Density	Total Motorized Access Density	Security Core
State Coal Cyclone	29	25	58
Cedar Teakettle	25	27	24
Noisy Red Owl	20	17	52
Coram Lake Five	26	46	14

In their biological opinion on the effects of the revised implementation schedule for the Flathead National Forest’s amendment 19 (USFWS, 2014c), the USFWS concluded the existing access management conditions are good to very good for grizzly bears in the NCDE (with a few site-specific exceptions) and that motorized access is managed across the NCDE at levels that are evidently conducive to grizzly bear population growth and conserve grizzly bear habitat.

Amendment 19 of the 1986 forest plan also addresses motorized administrative use of restricted routes (see glossary) in the grizzly bear recovery zone/primary conservation area. Temporary administrative use occurs in the recovery zone/primary conservation area in accordance with the provisions of amendment 19. Motorized administrative use of restricted routes is not limited outside the recovery zone/primary conservation area.

Motorized access in zone 1

Amendment 19 does not apply in zone 1. Zone 1 has been managed in accordance with biological opinions provided by the USFWS once grizzly bears began to occupy the area outside the recovery zone/primary conservation area now called zone 1 (USFWS, 2012c, 2012d). Although a moving-window analysis of motorized access is used in the recovery zone/primary conservation area, a different method based upon the linear density of roads or routes open to public motorized use is applied in zone 1. To put habitat security for grizzly bears in zone 1 in context, research by Boulanger and Stenhouse (2014) is used because it is the best available science on the effects of linear open road density on grizzly bears of different sex and age classes (C. Servheen, USFWS, personal communication to R. Kuennen, 2015).

Boulanger and Stenhouse (2014) studied 142 grizzly bears monitored in Alberta from 1999-2012. The roads in the Alberta study area were almost entirely (96.5 percent) gravel secondary roads associated with settlements and industrial resource-extraction activities, such as oil and gas development and/or timber harvest. In Alberta, for the most part, these roads are open for public use year-round (Stenhouse & Boulanger, 2016). These roads would meet the Forest's definition of a road open for public use during the non-denning season. More recently, there have been efforts to gate roads in Alberta, but these have not yet formed part of Boulanger and Stenhouse's ongoing research. They are now looking at how effective these access control measures may be in terms of both human and grizzly bear behavior.

In the Alberta study, modeling found strong spatial gradients in the grizzly bear population trend based upon linear road density. Boulanger and Stenhouse (2014) found that sex and age class survival was related to road density. Threshold values for the road density needed to ensure population stability were estimated in order to refine targets for the population recovery of grizzly bears in Alberta. A summary of the threshold values and how they relate to objectives of the NCDE grizzly bear management zones is shown in table 64.

Table 64. Linear road density threshold values based on Boulanger and Stenhouse (2014).

Objective described in the Alberta study	Maximum reported density in kilometers/square kilometer	Converted to miles per square mile	Where applied in the NCDE analysis
Grizzly bear presence—Distribution of collared bears shows most bears occurred within road densities of 1.5 kilometers/square kilometer or less (p. 10)	1.5 kilometers/square kilometer	2.4 miles/square mile	Used to evaluate zone 1 outside the Salish demographic connectivity area (DCA), where grizzly bear presence during the non-denning season is an objective.
Grizzly bear mortality risk—Most grizzly bear mortalities occurred at road densities greater than 1.0 kilometer/square kilometer, except for adult males where mortalities occurred across all road densities (p. 10)	1.0 kilometer/square kilometer	1.6 miles/square mile	Used to evaluate grizzly bear mortality risk in the Salish demographic connectivity areas. Density calculation included both roads and trails open for public motorized use in the non-denning season on NFS lands.
Occupancy by females—If lower survival rate of females with dependent young is considered, the threshold of road density that can be tolerated is reduced (p. 15)	1.25 kilometers/square kilometer	2.0 miles/square mile	Used to evaluate the portion of zone 1 in the Salish demographic connectivity area, where occupancy by female grizzly bears during the non-denning season is an objective, but at lower density than the core area provided by the recovery zone/ primary conservation area.
Alberta core conservation area—Allows for survival rates of females with dependent offspring high enough to ensure an increasing population (p. 18)	0.75 kilometers/square kilometer	1.2 miles/square mile	Not used to evaluate zone 1. In the NCDE, the core conservation area is the recovery zone/primary conservation area (a moving window analysis method is used in the primary conservation area).

Outside the recovery zone/primary conservation area, the 1986 forest plan identifies geographic units and a range of public open road densities for each geographic unit (see also alternative A discussion of effects) (USDA, 2015g). Table 65 shows the linear density of roads open to public motorized vehicle use (during

all or a portion of the non-denning season) within the portions of zone 1 under the management authority of the Flathead National Forest.

Table 65. Density of roads open to public motorized vehicle use by geographic unit

Geographic Unit[1]	Grizzly bear management zone	Density of roads open to public motorized vehicle use (average linear miles/square mile of NFS lands)
Island Geographic Unit	Zone 1	1.7
Olney-Martin Creek Geographic Unit	Salish DCA	1.6
Upper Good Creek Geographic Unit	Salish DCA	1.3
Sylvia Lake Geographic Unit	Zone 1 partially in Salish DCA	1.0
Star Meadow-Logan Creek Geographic Unit	Zone 1 partially in Salish DCA	1.5
Tally Lake-Round Meadow Geographic Unit	Zone 1 partially in Salish DCA	1.7
Mountain Meadow-Rhodes Draw Geographic Unit	Zone 1	1.6
Upper Griffin Geographic Unit	Zone 1	0.9
Ashley Lake Geographic Unit	Zone 1	1.9

1. Table is based upon unrestricted road density by geographic unit in the 1986 forest plan, updated as of January 2017. Also see map of Salish demographic connectivity area (USDA, 2015g).

The level of public motorized access shown in table 65 has supported expansion of the grizzly bear population, including females, into zone 1, including the Salish demographic connectivity area (see forest plan figure B-10) (USFWS, 2012a).

In summary, although research, analysis methods and findings have changed over the years, numerous studies have documented that excessive open road densities in grizzly bear habitat during the non-denning season lowers their survival rate (Boulanger & Stenhouse, 2014; D. J. Mattson et al., 1987; W. J. Mattson et al., 1996; Bruce N. McLellan & Shackleton, 1988; Waller & Mace, 1997). The density of roads open during the non-denning season has declined substantially across the Forest, including zone 1, since the NCDE grizzly bear population was first listed.

Motorized access during the den emergence time period

Grizzly bears hibernate in dens during the winter months. Both males and females have a tendency to use the same general area to hibernate year after year, but the same den is rarely reused by an individual (Linnell, Swenson, Andersen, & Barnes, 2000). It has been estimated that about 47 percent of NFS lands in the primary conservation area provides potential denning habitat, based upon modeling (R. Mace, 2014). The availability of denning habitat is not likely to be a limiting factor for grizzly bears in this area (USFWS, 2013c).

The 1986 forest plan allows motorized over-snow vehicle use for recreation, as amended by the 2006 record of decision for the Forest's Winter Motorized Recreation Plan (USDA, 2006; USFWS, 2006b). This decision, known as amendment 24, identified areas and routes suitable and not suitable for motorized over-snow vehicle use. Some routes or areas are open to motorized over-snow vehicle use only during the grizzly bear denning season and some are also open during the non-denning season (snow conditions permitting). The decision also identified three late spring areas (also containing routes) and one route

corridor within the recovery zone/primary conservation area where motorized over-snow vehicle use is allowable: Sixmile until April 30, Skyland Challenge until May 15, Lost Johnny until May 31, and Canyon Creek groomed route corridor until April 15 (USDA, 2006, appendix A). Motorized over-snow vehicle routes and areas are displayed in figure B-12 (see the Forest's over-snow vehicle use maps for more details). During the denning season, about 24 percent of the primary conservation area on the Forest is suitable for motorized over-snow vehicle use.

Mace assessed the distribution of 252 verified grizzly bear dens in the NCDE. The average elevation of 252 grizzly bear dens in the NCDE ranged from 6,427 to 6,906 feet (R. Mace, 2014). Mace found that about 25 percent of the dens are in designated wilderness (19 percent of the 25 percent are female grizzly bears), 15 percent of the dens are in Glacier National Park (13 percent of the 15 percent are female grizzly bears), 31 percent of the dens are in areas open to motorized over-snow vehicle use until April 1 (27 percent of the 31 percent are female grizzly bears), 5 percent of the dens are in areas known as "late spring" areas—open to motorized over-snow vehicle use after April 1 (4 percent of the 5 percent are female grizzly bears), and 24 percent are in other areas closed to motorized over-snow vehicle use on the Forest (23 percent of the 24 percent are female grizzly bears) (Ake, 2015b; Kuennen, 2015a; R. Mace, 2014). The USFS and MFWP monitor motorized over-snow vehicle use, known den locations, and bears emerging from their dens, and this information is reported to the USFWS (A. H. Jacobs, 2013). The agencies have not detected conflicts due to over-snow vehicle use on the Flathead National Forest. The agencies have not detected grizzly bear avoidance of denning habitat in areas open to motorized over-snow vehicle use.

The impacts of winter recreation activities on denning bears have not been well studied, but there is no evidence to indicate that current levels of nonmotorized or motorized over-snow vehicle use are inhibiting the recovery of the grizzly bear population in the NCDE. In the draft Grizzly Bear Conservation Strategy, the USFWS (2013c) stated that the available data about the potential for grizzly bear disturbance or den abandonment from nearby snowmobile use is extrapolated from studies examining the impacts of other human activities, and it is identified as "anecdotal" in nature (Swenson, Sandegren, Brunberg, & Wabakken, 1997), with sample sizes so small they cannot be legitimately applied to assess population-level impacts (Harding & Nagy, 1980; Hegg, Murphy, & Bjornlie, 2010; P. E. Reynolds, Reynolds, & Follmann, 1986).There are no reports of den abandonment by grizzlies in the lower 48 states due to snowmobiling activity (Hegg et al., 2010; Servheen & Cross, 2010). The draft Grizzly Bear Conservation Strategy stated that current levels of snowmobile use are not appreciably reducing the survival or recovery of grizzly bears, but that monitoring would continue to support adaptive management decisions about denning habitat and snowmobile use (USFWS, 2013c).

Some members of the public have expressed a concern that changes in climate may cause grizzly bears to emerge from their dens earlier, increasing the potential for grizzly bear conflicts with nonmotorized or motorized over-snow vehicle use. Mace collected data on known dens in the NCDE and on the Flathead National Forest through 2014. On the Flathead National Forest, den emergence dates ranged from April 16 to May 29, with the exception of one bear emerging on April 4 of one year. In 2015, a year with lower than average snowfall overall, the earliest known bear emergence date on the Flathead National Forest was April 23 for males and April 28 for females (R. Mace, personal communication, 2015). Mace did not detect shifts in den emergence of the NCDE grizzly bear population associated with changes in climate (Costello et al., 2016). Monitoring would continue to support adaptive management decisions about den emergence dates and snowmobile use (USFWS, 2013c).

Bear research scientists and managers have suggested that in the period shortly before or after spring den emergence (see glossary), a female with cubs may be particularly vulnerable to disturbance by people because cubs have limited mobility after emerging from their dens and females with cubs have high

energetic needs (Haroldson, Ternent, Gunther, & Schwartz, 2002; R. D. Mace & Waller, 1997). However, such effects have never been documented, and there are no known scientific papers supporting this potential impact. During the non-denning season, which includes the time period when grizzly bears may be emerging from their dens, motorized over-snow vehicle use is suitable on about 3 percent of the acreage within the primary conservation area (see table 66 and table 67).

Table 66. Miles or acres suitable for motorized over-snow vehicle use within the recovery zone/primary conservation area (PCA)

Area	Motorized Over-Snow Vehicle Routes Open Dec. 1 to March 31[1]	Motorized Over-Snow Vehicle Areas Open Dec. 1 to March 31[1]	Motorized Over-Snow Vehicle Routes Open April 1 to Nov. 30)[2]	Motorized Over-Snow Vehicle Acres Open April 1 to Nov. 30)[2]
PCA	788 miles	513,654 acres	666 miles	57,178 acres

1. This includes routes and areas open during the grizzly bear denning season, snow conditions permitting.
2. This includes routes and areas open during the non-denning season (including den emergence), snow conditions permitting.
Note: numbers may be different than in the amendment 24 decision due to realignment of data layers and GIS updates.

Open and total motorized access route density and security core percentages in the recovery zone/primary conservation area for the two-month season of April-May (late spring, which overlaps with the den emergence time period) are shown in table 67.

Table 67. April-May open and total motorized access route density and security core percentages (USDA, 2016a)

Bear Management Subunit	Area	Open Motorized Access Density Late Spring	Total Motorized Access Density Late Spring	Security Core Late Spring
Werner Creek (as amended)	Canyon Creek	18	23	61
Lower Big Creek	Canyon Creek	15	19	70
Canyon McGinnis (as amended)	Canyon Creek	24	33	41
Cedar Teakettle (< 75% NFS land)	Canyon Creek	15	27	24
Doris Lost Johnny (as amended)	Lost Johnny	79	77	17
Wounded Buck Clayton (as amended)	Lost Johnny	51	62	34
Peters Ridge	Lost Johnny	14	18	66
Swan Lake	Sixmile	27	24	54
Wheeler Quintonkon (as amended)	Sixmile	20	23	64
Noisy Red Owl (< 75% NFS land)	Sixmile	13	15	60
Ball Branch	Sixmile	2	14	89
Skyland Challenge	Challenge/Skyland	51	50	31
Tranquil Geifer	Challenge/Skyland	7	7	81

In table 67, some subunits have open and/or total motorized access route density that are less in late spring than during the non-denning season as a whole. These subunits either have (1) routes closed during April-May that are open in the summer or (2) the assumption is made, based upon knowledge of local conditions, that wheeled motorized traffic does not occur in late spring due to road conditions in most years. Where security core is higher in the non-denning season than it is in late spring, it is because those subunits contain areas or routes that are open to motorized use in late spring and are deducted from security core percentages. Nonmotorized use on the Forest is not restricted during the denning or den emergence time periods.

Nonmotorized trail access

Some members of the public expressed concern about effects of nonmotorized trails on grizzly bears or grizzly bear-human conflicts. Several studies have investigated the behavioral response of bears to nonmotorized trails (Jope, 1985; Kasworm & Manley, 1990; R. D. Mace & Waller, 1996; MacHutchon, 2014; B. N. McLellan & Shackleton, 1989; D. White, Kendall, & Picton, 1999). These studies vary considerably in study design, trail use levels, grizzly bear sample sizes, and conclusions regarding the impacts of nonmotorized trails on bears. Grizzly bear response to human disturbance may differ depending upon the distance between bears and trails or between bears and off-trail foot travel. In Glacier National Park, bears located more than 500 feet away from trails generally did not respond to hikers by fleeing (Jope, 1985, p. 34), and in 45 percent of all cases bears showed no movement in response to hikers. Hiker group size did not significantly affect bear behavior. McLellan and Shackleton (1989) reported that bears showed a stronger response to people on foot than in motor vehicles in "low human-use" areas. However, less than half of bears showed any response (walked or ran away) to stimulus greater than 250 feet away. White and others (1999) documented grizzly bear displacement from feeding sites in Glacier National Park in response to hikers. Kasworm and Manley (1990) reported that grizzly bears used habitats within 100 meters (328 feet) of trails less than expected but used habitats 100-1,000 meters (3,281 feet) from trails in proportion to their availability. On the Forest in the Swan Mountains, Mace and Waller (1996) reported there were no historic or recent records of grizzly bear-human conflict in their study area, which included the heavily used Jewel Basin Hiking Area on the Forest. The authors suggested that avoidance by bears of heavily used human trails may increase grizzly bear survival.

Grizzly bear response to human disturbance may also differ between seasons or habitats. Jope (1985) noted that grizzly bears were more likely to respond to hikers by flight or charges in spring and early summer than later in the year, possibly due to habituation once human use became more common during the summer season. Kasworm and Manley (1990) found that bears used habitat within 400 feet of trails less than expected in spring and fall. Conversely, Mace and Waller (1996) found that distance to trails and/or lakes with campsites were significant variables only in summer and autumn.

Fortin and others (2016) reported that most defensive attacks by grizzly bears result from surprise encounters involving humans hiking off-trail, in the backcountry, and in areas of natural food abundance for grizzly bears. McLellan and Shackleton (1989) also reported that grizzlies fled farther in response to unexpected off-trail foot travel than to motorized use (p. 274). Similarly, Mace and Waller (1996) reported that bear response to off-trail hikers was greater than that observed for other types of disturbances.

Nonmotorized trail uses (hiking, horseback riding, mountain biking) also affect the risk of grizzly bear-human conflicts (J. Herrero & Herrero, 2000; S. Herrero & Higgins, 1999). These conflicts can pose risks to human as well as grizzly bear safety. Herrero (1985) was one of the first researchers to report on the causes of bear attacks and how to avoid them. Based upon his study of bear attacks in Canadian national parks, Herrero reported that in 68 out of 135 grizzly bear incidents in which the party's activity prior to the bear attack was known, hiking was the most common activity. Herrero reported that 75 percent of encounters he classified as "sudden" were known to involve bear mothers, with females and cubs of the

year being most dangerous. Sudden encounters are the most likely situation to result in a grizzly bear-inflicted injury (S. Herrero, 1985). Attacks by bears on humans in North America are disproportionately more frequent in national parks, most being the result of sudden encounters between hikers and grizzly bears that react defensively to protect young or a food source (S. Herrero, 1985; MacHutchon, 2014). Grizzly bear expert Chris Servheen reported that there have been eight fatal grizzly bear attacks on humans in the lower 48 states since 2001 (Servheen, 2017). Of these, six occurred in the Yellowstone Ecosystem and two occurred in the Northern Continental Divide Ecosystem. Human behaviors at the time of the attacks involved hunting, camping, hiking, and mountain biking. Five of the fatalities involved lone individuals, and four of those were lone hikers. Bear spray was not carried or used by any of the people killed in these attacks.

Table 68 shows the different types of allowable trail uses on the Forest by approximate miles and recreation type. Trails can have multiple types of use, so the miles displayed are overlapping, not additive.

Table 68. Allowed nonmotorized summer trail use on the Flathead National Forest in miles

Bicycle	Hiking	Pack and Saddle
806	2,053	2,012

In 1994 and 1998, an Interagency Grizzly Bear Committee task force recommended that the impacts of "high intensity use" *nonmotorized* trails be considered in calculations of "core" habitat in the grizzly bear recovery area (IGBC, 1998, p. 4). Because there were no data or literature available to determine the threshold number of parties defining a high-intensity-use trail or how high-use trails might relate to grizzly bear population parameters, the threshold value to be used to for a trail's influence on security core was determined by a panel of experts. The panel recommended that trails receiving > 20 parties per week for at least one month during the non-denning season be considered high-intensity use and that an influence zone be used that was the same as that for motorized routes for the purpose of estimating the reduced effectiveness of security core habitat. The Forest has about 2,041 miles of NFS trails in the primary conservation area, and about 280 miles of this total were identified as high use based on the Interagency Grizzly Bear Committee task force criteria (Kuennen et al., 2017, figure B-28). The majority of trails that have been modeled as high use in the NCDE are in Glacier National Park, where conflicts and grizzly bear mortalities have been relatively rare and related almost exclusively to campgrounds and other developed human-use areas (D. White et al., 1999).

Because of the lack of studies demonstrating population-level impacts to grizzly bears associated with nonmotorized trails, the subjective method of establishing the threshold value of 20 parties per week and their influence zone, along with the lack of available objective data for quantifying nonmotorized use levels, the NCDE conservation strategy team recommended removing consideration of high-intensity-use nonmotorized trails when defining core habitat effectiveness (USFWS, 2013d).

Although a variety of methods can be used to reduce the risk of grizzly bear-human conflicts due to nonmotorized uses, Herrero and Herrero (2000) emphasized that none of them can entirely remove the risk of hiking or mountain biking in grizzly bear habitat. Strategies recommended to reduce the risk of sudden encounters between grizzly bears and people include (1) visitor education regarding safe practices in bear country (e.g., expect to meet bears, look ahead, slow down, make lots of noise), (2) managing recreation to occur more predictably in space and time, and (3) designing or locating recreation trails to increase the distance at which bears can detect people and to avoid habitats with concentrated bear food resources (Fortin et al., 2016; J. Herrero & Herrero, 2000; Quinn & Chernoff, 2010).

Grizzly bear habitat and developed recreation sites

Conflicts between grizzly bears and people occur at developed recreation sites such as campgrounds, rental cabins, recreation residences, boat launches, picnic areas, and visitor centers. Developed recreation sites include those designed for overnight use and those designed for day use (see glossary). Those that support overnight public use and those with a higher capacity for human occupancy have a higher potential of increasing both the levels of bear attractants and grizzly bear mortality risk (USFWS, 2013c). Summarizing the findings of a number of studies, the draft Grizzly Bear Conservation Strategy stated, "Developed sites are generally associated with frequent, overnight or prolonged human use that may increase both the levels of bear attractants and grizzly bear mortality risk. Developed sites can impact bears through temporary or permanent habitat loss and displacement, but the primary concern regarding developed sites is direct bear mortality or removal from the ecosystem due to bear/human conflicts caused by unsecured bear attractants, habituation, and food conditioning" (USFWS, 2013c, pp. 24-25). The authors concluded that "securing potential attractants is the single most effective way to prevent bears from becoming food conditioned and displaying subsequent unacceptable aggressive behavior" (p. 96). Food storage orders requiring proper storage of attractants are in place on all Forest lands. Because the draft NCDE Grizzly Bear Conservation Strategy focuses on developed recreation sites with frequent, overnight, or prolonged human use, the grizzly bear analysis also focuses on these sites.

Within the recovery zone/ primary conservation area on the Forest, developed sites designed for overnight use on NFS lands are shown in table 69 and their capacity is shown in table 70.

Table 69. Number of developed recreation sites designed for overnight use in the recovery zone/primary conservation area (PCA) on the Forest

Number of developed campgrounds	Number of cabins, lodges, and lookouts with overnight use	Recreation residences
63	20	63

Table 70. Capacity of developed recreation sites designed for overnight use in the recovery zone/primary conservation area (PCA) on the Forest

Capacity of developed campgrounds	Capacity of cabins, lodges, and lookouts with overnight use	Capacity of recreation residences
552	68	63

The Forest also has one developed year-round resort on NFS lands in the recovery zone/primary conservation area—Whitefish Mountain Resort (see Big Mountain, figure B-31). The Forest has consulted with USFWS on the effects of various resort expansion projects since 1989 (USDA-USFWS, 2016; USFWS, 1989, 1995a, 2007a, 2011b, 2012b, 2013b, 2015). The Forest has one developed ski resort in zone 1 (outside the Salish demographic connectivity area) that operates during the grizzly bear denning season (see Blacktail Mountain, figure B-31). The Forest also has an unknown number of dispersed recreation sites. Food storage orders are effective at reducing the risk of grizzly bear-human conflicts at these sites.

When grizzly bear-human conflicts do occur in the NCDE (whether associated with nonmotorized trail use, off-trail backcountry use, developed or dispersed recreation sites, or private or non-Forest Service lands), MFWP, in cooperation with land management agencies and the USFWS, monitors the conflict situation and determines the appropriate conflict response based on the established Interagency Grizzly Bear Guidelines.

Grizzly bear habitat and livestock allotments

Although grizzly bears frequently coexist with large livestock (such as adult cattle) without preying on them, they will often kill smaller animals such as calves, domestic sheep, goats, or chickens (C. R. Anderson, Ternent, & Moody, 2002; Knight & Judd, 1983; Orme & Williams, 1986). Grizzly bear predation on small animals (especially chickens) is a source of grizzly bear-human conflicts on private lands. If repeated depredations occur, managers may relocate bears or remove them from the population (counted as a grizzly bear mortality). Multiple agencies and non-government organizations are making concerted efforts to reduce this source of grizzly bear mortality

Because of the increased risk to grizzly bears posed by actions taken to protect sheep and other small livestock, the 1986 Interagency Grizzly Bear Guidelines emphasized the reduction of livestock allotments on public lands. Between 1980 and 2008, there were three grizzly bear mortalities related to livestock depredations on public land in the NCDE, and none of these occurred on the Flathead National Forest. These accounted for less than 1 percent of all known grizzly bear mortalities in the NCDE during this time period. At current levels, livestock allotments on public land within the NCDE are not a threat to grizzly bears in the lower 48 states. As stated in the draft Grizzly Bear Conservation Strategy, “Current levels of grazing on permitted livestock allotments in forested environments are not displacing grizzly bears in significant ways and are not likely to affect vegetation structure enough to result in direct competition for forage species on public lands within the NCDE, as evidenced by the increasing population trend in the NCDE” (USFWS, 2013c, p. 25). As a result, the draft Grizzly Bear Conservation Strategy included measures to keep livestock grazing at or below the baseline levels.

Authorized grazing on the Flathead National Forest has declined over the last several decades. No sheep grazing and very limited cattle grazing occurs on the Flathead National Forest. The Forest currently has seven active cattle allotments—four in the Salish Mountains geographic area outside the recovery zone/primary conservation area and three in the Swan Valley geographic area inside the recovery zone/primary conservation area (see figure 1-69). Current allotment acreage represents approximately 3 percent of NFS lands, consisting of about 81,500 acres. Current animal unit months authorized for grazing totals about 1,078. Because livestock grazing has been declining, the risk of conflicts on the Forest has also declined. There have been no known livestock-related grizzly bear mortalities on the Flathead National Forest. According to the draft Grizzly Bear Conservation Strategy, “Indirect impacts on grizzly bears due to attractants associated with livestock can be effectively minimized with requirements to securely store and/or promptly remove attractants associated with livestock operations (e.g., livestock carcasses, livestock feed, etc.)” (USFWS, 2013c, p. 25) Livestock carcasses are promptly removed and proper storage of livestock feed is required by the attractant storage orders that are in place on the Forest (USDA, 2010b, 2011a).

There are permitted grazing operations on NFS lands in the NCDE for horses and mules, primarily associated with outfitter and guide operations or Forest Service administrative use. The food storage order(s) address attractants associated with horses or mules, and there is no evidence of conflicts with bears due to depredation, attractants, or forage competition related to horse and mule grazing permits. Honeybees are classified as livestock in Montana (MCA 15-24-921), and their hives can be attractants to grizzly bears. There are no permitted honeybee operations on the Forest.

Grizzly bear habitat and vegetation management

Timber harvest, wildfire, prescribed fire, and other vegetation management activities may alter the amount, quality, and arrangement of cover and forage. Grizzlies in the NCDE occupy numerous types of habitat, including those with forest cover and those without (Aune & Kasworm, 1989; R. D. Mace & Waller, 1997). Vegetation management can increase the quantity and quality of grizzly bear foods through increased growth of grasses, forbs, and berry-producing shrubs (Kerns, Alexander, & Bailey, 2004; Zager

et al., 1983). Numerous studies have found that grizzly bear use of habitat is influenced by an interaction of cover, food, and human access. Gibeau and others (2002) concluded that there were significant differences in grizzly bear response to roads, trails, and major development features based upon the bear's sex and age class, the proximity of high-quality habitat, and the time of day. Gibeau and Stevens (2005) reported that bears took advantage of high-quality habitat near development when humans were inactive by using roads, trails, and human facilities at night or when unoccupied. In a recent Alberta study, Stewart and others recommended limiting access to habitat that is heavily selected by bears during the fall ungulate hunting season when human use is extensive and grizzly bear mortality from human self-defense or illegal kills is highest (B. P. Stewart et al., 2013) (see also the "Affected environment" section on grizzly bear habitat security).

Nielsen and others (2004) studied grizzly bear use of habitats in areas with timber harvest compared to uncut forests. These authors reported the average fruit production for six fruit-bearing species used by grizzly bears and stated that there was a nonsignificant difference between clearcut and uncut forests in their study area. Two huckleberry species (*V. caespitosum* and *V. membranaceum*) had higher fruit production in clearcuts, one species had higher fruit production in uncut forests, and the remaining species had no difference in fruit production between clearcuts and uncut forests. Overall, Nielson and others found that clearcuts provided a diverse array of food resources for grizzly bears, particularly roots and tubers, herbaceous materials, and ants. They suggested that the design of timber harvest projects and silviculture prescriptions consider strategies that maximize grizzly bear food abundance while minimizing human access (S. E. Nielsen et al., 2004) (see Kuennen et al., 2017 for more details).

In the dense forests of the Flathead National Forest, the thick growth of conifers provides high levels of cover but may reduce the availability of key bear foods. Mace and Waller (1997) studied grizzly bear habitat use in the Swan Mountain Range of the Forest and found that the highest grizzly bear densities obtained over time were in those locations with ≤ 40 percent overstory tree canopy. They stated that vegetal foods used by grizzly bears (including grasses, forbs, and shrubs) were more common in these habitats (referred to as open or open timber) and that available foods in timber harvest units were used by grizzly bears provided vehicular traffic was restricted. Mace and Waller reported that grizzly bears avoided lower-elevation, more accessible areas where timber had been recently harvested. They found that grizzlies were more likely to use cutting units harvested 30-40 years ago than older or newer cutting units and that these were the most preferred habitats during summer (R. D. Mace & Waller, 1997). Mace and others (1999) also reported that lower-elevation habitats contained most of the human activities and roads, so reductions in habitat use from potential were highest during spring when grizzly bear habitat use is restricted by snow at upper elevations. Areas with a high density of high-traffic roads were strongly avoided, and no bears were observed near high-impact human activity points. These authors suggested that there is value in road closures aimed at minimizing traffic on roads within important seasonal habitats (R. D. Mace et al., 1999).

Ruby (2014) studied grizzly bear habitat use along Montana Highway 83 in the Swan Valley and found that grizzly bears exhibited little negative selection for high open road densities within the Swan Valley study area, but he also found that high open road densities may affect the risk of grizzly bear mortality. Ruby (2014) used location data from 24 grizzly bears instrumented with GPS collars using the Swan Valley of the Forest from 2000 to 2011 to characterize grizzly bear movement and habitat-use patterns. Use of the GPS collars enabled the grizzly bears to be tracked on a 24-hour basis. Ruby found that grizzly bears use high-quality habitats around human development and are not completely displaced. Instead, bears changed their movement patterns when in close proximity to open roads and homes so that they were active during the night when human activity was lowest. Although human activity associated with site development in the rural landscape of the Swan Valley did not affect habitat selection, Ruby (2014) noted that it can result in human encounters resulting in grizzly bear mortality or management-related

removals from the population, citing the work of Delibes et al. published in 2001, Mattson et al. in 1990, Neilson et al. in 2004, and C. C. Schwartz et al. in 2010. Where resources are not limiting, grizzly bear movement patterns that avoid periods of human activity may be an important strategy for limiting mortality risk to grizzly bears.

The Interagency Grizzly Bear Guidelines addressed vegetation management activities, and these guidelines were incorporated into the 1986 forest plan for timber management in grizzly bear management situations 1 and 2 (where grizzly bear habitat management is a priority), guiding management for the last 30 years. The draft Grizzly Bear Conservation Strategy (USFWS, 2013c) includes many similar strategies for vegetation management that are designed to increase grizzly bear foods, limit the impacts of road use associated with projects, and protect seasonally important habitats (see additional discussion under consequences of the action alternatives).

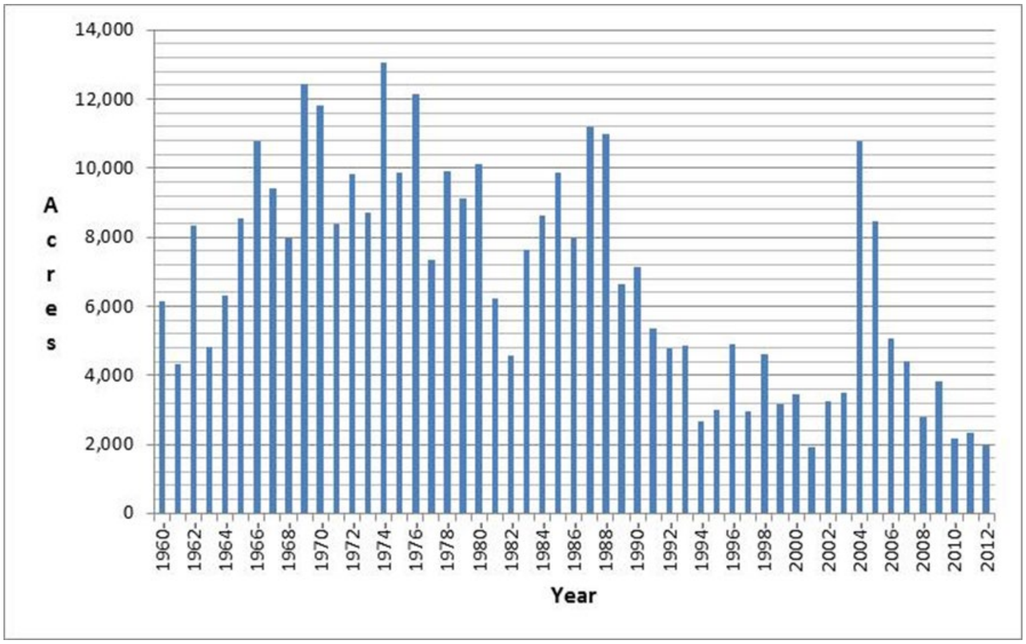

Figure 52. Approximate acres of commercial timber harvest on the Forest from 1960-2012

Figure 52 displays the approximate acres and trend of timber harvest on the Forest from 1960 through 2012 (USDA, 2014a). There were spikes in timber harvest during salvage operations in 2004-2005 after widespread wildfires in 2003, but generally the trend in timber harvest has been downward since the late 1980s. Commercial timber harvest has affected a total of approximately 17 percent of the NFS lands on the Flathead National Forest. Some of the harvested acres subsequently had prescribed burning or thinning, but precommercial thinning has been limited in Canada lynx habitat since 2007, and lynx habitat overlaps with much of the grizzly bear habitat on the Forest. See the biological assessment of the forest plan for more details (Kuennen et al., 2017).

Grizzly bear habitat and leasable, locatable, and salable mineral activities

Mineral and oil and gas development have the potential to increase grizzly bear displacement, mortality risk, habituation, permanent habitat loss, and habitat fragmentation. The management of mineral and energy resources is regulated by Federal laws, regulations, and legal decisions, with certain laws, regulations, and polices pertaining to specific mineral and energy resource types or land allocations.

There are three general types of mineral resources associated with national forests: leasable minerals, locatable minerals, and salable mineral materials. Leasable mineral development includes the production of materials such as oil and natural gas. Locatable mineral development refers to surface and underground hardrock mining of metallic minerals and nonmetallic minerals. Salable minerals include materials such as common varieties of sand, stone, and gravel. The Forest Service has management authority over the surface resource impacts resulting from locatable mineral activity and has full discretionary authority over the disposal of salable mineral material. For leasable commodities on NFS lands, the Bureau of Land Management issues all leases with Forest Service consent.

Leasable minerals

The production of oil and natural gas is conducted through a leasing process. Forest plan standards and guidelines provide guidance for authorizations and stipulations that are determined at the project level. At this time, there is no leasable mineral exploration or development on the Forest. The Bureau of Land Management suspended existing oil and gas leases in 1985 after the Conner v. Burford district court decision (Conner v. Burford, 605 F. Supp. 107 [D. Mont.1985]) (see figure 1-79). The court found the environmental effects analysis supporting lease issuance to be inadequate and specified that no activity could take place on the leases until an EIS is completed. The 9th Circuit Court of Appeals upheld the district court decision requiring an EIS prior to any post-leasing activities in a January 13, 1988, decision, as amended July 1, 1988.

Locatable minerals

Currently, there are no authorized locatable mineral development operations within the boundaries of the Flathead National Forest planning area. Based on the results of a February 2, 2014, query of the Bureau of Land Management mining claim database, one active mining claim (MMC195448) is located within the planning area. This is the Mary Dee II lode claim, which is located in the Hungry Horse geographic area.

Saleable minerals

The Forest's use of mineral material such as gravel, riprap, and crushed aggregate includes maintenance and/or new construction of roads, recreation sites, and trailheads. Other uses include Forest contract work (i.e., timber sales), culvert replacement, and repair of damage caused by fire, floods, and landslides. The mineral material utilized by the Forest is primarily derived from Forest Service pits and quarries located in the planning area. In addition, free-use permits can be issued to State or Federal agencies, municipalities, county road districts, nonprofit associations, or individuals (36 CFR § 228.57). The type, volume, and source location of saleable mineral material varies year by year according to need.

The Forest has low future potential for locatable minerals and low to high potential for leasable minerals (see figures 1-67 and 1-68). However, many NFS lands on the Forest are withdrawn from mineral entry (see figure B-29 in the forest plan).

Grizzly bears, habitat, and a changing climate

The draft Grizzly Bear Conservation Strategy states,

> Climate change may result in a number of changes to grizzly bear habitat, including a reduction in snowpack levels, shifts in denning times, shifts in the abundance and distribution of some natural food sources, and changes in fire regimes. Most grizzly bear biologists in the U.S. and Canada do not expect habitat changes predicted under climate change scenarios to directly threaten grizzly bears (Servheen and Cross 2010). These changes may even make habitat more suitable and food sources more abundant. However, these ecological changes may also affect the

> timing and frequency of grizzly bear/human interactions and conflicts (Servheen and Cross 2010). (USFWS, 2013c, p. 31).

With respect to shifts in the denning season, the draft Grizzly Bear Conservation Strategy defined denning season dates and stated that dates would be adjusted if the 10-year average den emergence data for females or females with offspring shows a shift of at least a week. Denning in the NCDE has been monitored. The analysis of the effects of alternatives on denning habitat uses modeled denning habitat provided by Mace (2014), which is currently the best available scientific information for the Forest.

On October 6-7, 2009, the Wildlife Conservation Society and the USFWS held a workshop entitled "Climate Change Impacts on Carnivores in the Northern U.S. Rockies: Strategies for Conservation." Participants included a diverse group of scientists and managers from government agencies, universities, and conservation science non-governmental organizations, including MFWP, Idaho Fish and Game, U.S. Forest Service, U.S. Geological Survey, USFWS, National Park Service, Wildlife Conservation Society, The Nature Conservancy, the National Wildlife Federation, and the University of Montana. Participants discussed the relationship between the rate of climate change, the types of change in bear foods and habitats that might result from these changes, and the ability of bears to adjust their food habits and perhaps seasonal ranges. It was hypothesized that a more rapid rate of change could challenge adaptive success but that this could vary depending on the particular food economies used by individual bears.

The group of workshop participants recommended monitoring potential effects of climate change on grizzly bears and the ever-changing availability of bear foods by monitoring grizzly bear body condition. Teisberg and others (2015) studied grizzly bear population health and body condition and concluded that grizzly bears in all regions of the NCDE exploit diverse combinations of food items to arrive at productive body conditions (Teisberg et al., 2015). The draft Grizzly Bear Conservation Strategy states that monitoring would be conducted to assess the adequacy of food production and the types of foods grizzlies use across the landscape each year by monitoring grizzly bear body condition and food habits using the most appropriate and available technology.

Nielsen and others (2013) evaluated the importance of six different factors on springtime body size patterns in grizzly bears of Alberta, Canada. The six factors they examined were (1) regional habitat productivity, (2) interannual variability in productivity, (3) habitat quality, (4) human footprint and activity, (5) rate of landscape change, and (6) density dependence. The authors stated, "Given the short season associated with high-alpine environments, such as the Rocky Mountains in Alberta, we hypothesize that individuals associated with a limited growing season and temperature-limited ecosystems, such as interior grizzly bears, might actually benefit from increases in season length associated with climate change. This prediction is largely consistent with observed body size and seasonality patterns in grizzly bears across North America, but may be dependent on sufficient snow cover during the denning period" (Scott E. Nielsen et al., 2013).

Fire frequency and severity are predicted to continue to increase in the western United States as a result of a changing climate. Large, stand-replacing wildfires that convert mature forest to an early-successional condition alter the availability of grizzly bear foods and cover, potentially changing how bears use the landscape. Decreases in forest cover associated with wildfires could benefit grizzly bears by increasing the production of shrubs, berries, and root crops in the years following large fires (Blanchard & Knight, 1996). There have been repeated, very large, stand-replacing wildfires in grizzly bear habitat on the Forest since the late 1980s, and multiple bears, including females with cubs, have been observed feeding in these areas by MFWP. As discussed in detail in appendix 2 and in section 3.7.5, subsection "Canada lynx," modeling indicates that the extent and intensity of wildfires on the Forest is within the natural range of variation.

The extent and rate at which individual plant species or plant communities will be impacted by climate change in the future is difficult to foresee with any level of confidence (Fagre, Peterson, & Hessl, 2003; Walther et al., 2002). In summary, the potential positive and negative effects of climate change would likely be variable across the ecosystem and are difficult to predict. Some climate change projections are for the end of the century (Running, 2016), extending well beyond the anticipated life of the forest plan. The degree of uncertainty associated with specific effects increases as time goes on, emphasizing the importance of monitoring of the grizzly bear population, body condition of individual grizzly bears, and grizzly bear-human conflicts so that any necessary adjustments can be made.

Environmental consequences

Introduction

The previous "Affected environment" section describes key ecosystem characteristics and conditions for the NCDE grizzly bear population. The key indicators for analysis provide a foundation for the alternative effects analysis. Stressors are activities that may impact a species and/or its habitat if not managed or mitigated. They can be activities that have occurred in the past that are not occurring presently or are not necessarily expected to occur in the future. Stressors may include activities or conditions that occur on non-NFS lands or that are not within Forest Service authority or ability to manage. For the grizzly bear, these are considered under the cumulative effects sections in chapter 6 of this final EIS.

The following sections assess the consequences of alternative A, which is continued implementation of the 1986 forest plan, as amended, and the three action alternatives (B modified, C, and D). The action alternatives include a set of plan components for the recovery zone/primary conservation area that are consistent with the amendment Forests (Kootenai, Helena-Lewis and Clark, Lolo), as applicable, but include additional plan components that are specific to the Flathead National Forest's forest plan. This section considers the programmatic effects to the NCDE grizzly bear population and its habitat as guided by plan components, applied forestwide to the recovery zone/primary conservation area, to the Salish Mountains geographic area (grizzly bear management zone 1, including the Forest's portion of the Salish demographic connectivity area) (see figure B-10), and to specific areas such as management areas (see figures 1-01 through 1-04). Monitoring items (detailed in chapter 5 of the forest plan) will help make the plan adaptive. As is typical of forest plans, this forest plan is programmatic and does not provide an analysis of site-specific actions.

Key stressors

Land management

Land management actions on all lands, including management activities related to vegetation, roads, energy and minerals, livestock grazing, and recreation, can affect the grizzly bear in ways that are positive, negative, or neutral. The draft NCDE Grizzly Bear Conservation Strategy (USFWS, 2013c) identified six key habitat features and human activities relevant to the management of NFS lands that have the greatest potential to impact grizzly bears. These are (1) the amount and distribution of secure core, (2) motorized route densities, (3) developed recreation sites, (4) livestock allotments, (5) vegetation management, and (6) mineral and energy development. The Forest Service manages these stressors on lands over which it has authority.

Fragmentation of habitat

Human-caused alterations of natural landscape patterns can reduce the total area of habitat, increase the isolation of habitat patches, and affect movement between those patches of habitat. Habitat fragmentation may be permanent (e.g., converting forest habitat for residential developments) or temporary (e.g.,

creating a forest opening through timber harvest until trees and shrubs regrow). The Forest Service manages these stressors on lands over which it has authority.

Grizzly bear-human conflicts

Actions on all lands can affect the risk of grizzly bear-human conflicts. When conflicts occur between grizzly bears and people, bear management specialists with MFWP work with agencies and the public to provide education on how to reduce conflicts, remove attractants and/or trap, move, or aversively condition the bear so that it learns to avoid people. People may also illegally kill the bear(s).

Key indicators for analysis

The analysis is focused on six aspects of grizzly bear habitat in the draft NCDE Grizzly Bear Conservation Strategy (USFWS, 2013c). The analysis of effects of the alternatives is presented here for the Flathead National Forest and in chapter 6 for the other four forests. Chapter 6 also includes discussion of the cumulative effects across the NCDE. Additionally, the framework of the grizzly bear management zones is designed to address grizzly bear-human conflicts and connectivity in the NCDE.

The key indicators used to focus the effects analysis are summarized in table 71. These were developed after considering key drivers and stressors, public comments, and issues identified during scoping.

Table 71. Overview of key indicators used to assess effects of alternatives on grizzly bears

Resource Element	Indicator
Grizzly bear habitat security in the primary conservation area	• Public motorized access during the non-denning season, the risk of human disturbance, and grizzly bear-human conflict risk; • Nonmotorized trails; and • Temporary reductions in habitat security to allow for projects, administrative use, or public use.
Risk of disturbance of females with cubs during the den emergence time period	• Areas or routes suitable for motorized over-snow vehicle use during the den emergence time period in the primary conservation area.
Grizzly bear occupancy in zone 1 and the Salish demographic connectivity area	• Density of routes open to public motorized use during the non-denning season on NFS lands in the Salish demographic connectivity area; • Density of roads open to public motorized use during the non-denning season on NFS lands in the rest of zone 1.
Recreation and grizzly bear- human conflict potential	• Number and capacity of developed recreation sites designed and managed for overnight use in the primary conservation area; and • Day-use developed recreation sites in the primary conservation area
Livestock grazing allotments	• Number of cattle allotments and potential for conflicts; and • Risk of grizzly bear-human conflicts due to livestock grazing across the forest.
Vegetation management	• Desired conditions for vegetation and habitat diversity; • Areas suitable or not-suitable for timber production, areas where timber harvest is allowable; and • Wildfire and prescribed fire
Oil, gas, and mineral development	• Areas of mineral withdrawal, mineral potential, no surface occupancy stipulations; and • Risk of habitat loss, disturbance or displacement, grizzly bear-human conflicts.

Resource Element	Indicator
Habitat connectivity	• Grizzly bear habitat connectivity on all lands within the Flathead National Forest geographic areas.
Demographic connectivity	• Motorized route density in the Salish demographic connectivity area and population connectivity to Cabinet-Yaak grizzly bear ecosystem.
Grizzly bear attractants and mortality risk	• Food/attractant storage orders across the Forest

Effects common to all alternatives

Wilderness

Congressionally designated wilderness (management area 1a) comprises about 50 percent (1,075,376 million acres) of the Flathead National Forest primary conservation area (see figure 1-01). Designated wilderness areas would provide high levels of habitat security for grizzly bears under all alternatives because these areas are not suitable for motorized vehicle use or mechanized transport.

Inventoried roadless areas

Inventoried roadless areas are the same for all alternatives and provide a high level of grizzly bear habitat security. Although alternatives vary with respect to management area allocation of inventoried roadless areas, as discussed below, none of the alternatives may conflict with the Roadless Area Conservation Rule (36 CFR § 294). This rule established prohibitions on road construction and road reconstruction within inventoried roadless areas on NFS lands. Responsible officials do not have the authority to recommend additional designated roadless areas or to modify the boundaries of designated roadless areas covered by the Roadless Area Conservation Rule. Most of the inventoried roadless areas on the Forest are in the recovery zone/primary conservation area (see table 72). Motorized trails may occur in these areas but temporary disturbance due to projects (see glossary) is less likely due to the lack of roads (see figure 1-73).

Table 72. Inventoried roadless areas by NCDE management zone

NCDE Management Zone	Inventoried roadless areas on NFS lands (acres)
Primary conservation area	473,290
Salish demographic connectivity area, zone 1	5,465
Zone 1, outside demographic connectivity area	2
Outside NCDE management zone	< 1

Minerals

Under all alternatives, some lands on the Forest are withdrawn from mineral entry or leasing in the Flathead National Forest plan area (subject to valid existing rights). These include

- administrative sites such as campgrounds;
- Forest lands within the boundaries of a ski area permit;
- the Bob Marshall, Great Bear, and Mission Mountains Wilderness Areas;
- sections of the North, South and Middle Forks of the Flathead River (based upon their wild and scenic river status); and

- portions of the Forest withdrawn from mineral development by the North Fork Watershed Protection Act of 2013 (see figure B-29).

Withdrawal of these large areas reduces the risk of grizzly bear habitat loss, disturbance, displacement, and mortality. All withdrawals are subject to valid existing rights. The Forest Service does not have the discretion to deny the exercise of an outstanding mineral right. However, the developer does not have unrestricted rights because the developer's rights are limited to using only as much of the surface as is reasonably necessary to explore, develop, and transport materials. The developer must provide an operating plan to the Forest, and the Forest has some ability to manage surface resources (for more information, see volume 2 of the Flathead National Forest assessment (USDA, 2014a), as updated by the 2015 leasing withdrawal).

With respect to leasable minerals, over 1,000,000 acres were leased or under lease application in 1984. A Federal court ruling in 1985 caused the BLM to suspend those leases until litigation is completed" (p. VI-18). Some of the current oil and gas leases are suspended because the Conner v. Burford decision requires the Forest Service to complete an oil and gas leasing EIS prior to the leases being activated. There are no plans or funding to pursue an oil and gas leasing EIS on the Flathead National Forest, so any possible affects would be highly speculative and uncertain. No activity can take place on the leases (see figure 1-36) until an EIS is completed. A leasing decision is not a part of this forest plan revision.

Because the Flathead National Forest currently has no active leasable or locatable mineral activity and because over 50 percent of the land area is withdrawn from mineral entry or leasing, the effects of leasable and locatable mineral activity are anticipated to be minor.

Ongoing grizzly bear conservation actions by the Forest Service

The draft Grizzly Bear Conservation Strategy for the NCDE states:

> For grizzly bear conservation to be successful, providing habitat on the landscape is not enough. For grizzly bears to survive, people must accept the grizzly as a cohabitant of the land. Tolerance can be maintained when the public has confidence in management agencies to respond quickly and appropriately to grizzly bear-human conflicts and the public is equipped with the knowledge to understand and avoid grizzly bear-human conflicts. The objective of conflict management is to maximize human safety and minimize property losses while maintaining a viable population of grizzly bears. (USFWS, 2013c, p. iv)

Multiple agencies, including the Forest Service, work with the public towards this end (see also section 6.5). All action alternatives include plan components for attractant storage to reduce the risk of grizzly bear-human conflicts on NFS lands. The Forest's attractant storage orders require that food, garbage, and other attractants are stored properly so that grizzly bears cannot obtain access to them. This prevents the food conditioning of bears, which usually leads to grizzly bear-human conflicts, removal of bears, and possibly human injuries or fatalities. Food storage orders have been issued and implemented in the NCDE since the mid to late 1980s. In 2010, the Flathead (as well as the Helena, Kootenai, Lewis and Clark, and Lolo National Forests) issued a food storage order that covers the portions of the Forest that is within the NCDE recovery zone/primary conservation area (USDA, 2010b). In 2011, the Forest adopted an attractant storage order covering the rest of the Forest. The Forest provides bear-resistant devices at many facilities (such as campgrounds and dispersed campsites) both within and, in some cases, outside of the recovery zone/primary conservation area.

A variety of informational and educational materials (e.g., pamphlets, brochures, signs, videos, etc.) and programs are provided to the public. Signs and brochures about proper behavior and safety procedures in bear country are placed at campgrounds, trailheads, dispersed recreation sites, picnic areas, etc. The

Forest Service has cooperated with MFWP and other cooperating institutions and individuals in giving presentations and offering workshops that address bear identification; safe camping, hiking, hunting, and working procedures to use in bear habitat; the use of electric fencing to reduce conflicts between bears and livestock (e.g., chickens, pigs, beehives, sheep, cattle); and the proper use of bear-deterrent pepper spray. Patrols by wilderness rangers and other backcountry patrols have been used to inform and educate the public on food storage orders and to check on compliance with these orders. Field patrols have been used during hunting seasons to reduce hunter-caused conflicts and grizzly bear mortalities.

Many contracts and special-use permits issued on the Forest contain provisions requiring protection of the grizzly bear and its habitat as well as proper storage of food and attractants. Timber sale prescriptions and contracts incorporate provisions to protect grizzly bear habitat. For example, silvicultural prescriptions are designed to maintain or enhance food sources, timing provisions are aimed at reducing the potential for displacement or grizzly bear-human conflicts, and specific contract provisions require proper food storage and temporary or permanent cessation of permitted activities to resolve grizzly bear-human conflicts. Existing livestock grazing permits include special provisions such as proper storage of food and attractants as well as carcass removal. Disposal of animal carcasses has been emphasized to reduce conflicts with grizzly bears.

For many years, the Forest Service has coordinated with transportation agencies and railroad companies to reduce the risk of collisions with grizzly bears. For example, in 1991, the Great Northern Environmental Stewardship Area was formed for the rail line that traverses the Middle Fork Flathead River Corridor. The agreement was signed by the Burlington Northern Santa Fe Railway and multiple State, Federal and tribal partners. The agreement established a conservation trust fund and identified several railroad operation and maintenance procedures that would be followed to minimize train-bear incidents and ensure a rapid response and removal of attractants from the railroad right-of-way.

The Forest Service also maintains the Wildlife Crossings Toolkit website (https://www.fs.fed.us/wildlifecrossings/index.php), which was developed in partnership with the National Park Service, Federal Highway Administration, and American Association of State Highway and Transportation Officials. This website provides state-of-the-art information for biologists, engineers, and transportation professionals to assist in reducing wildlife mortalities and maintaining or restoring habitat connectivity across transportation infrastructure on public lands. Additionally, important grizzly bear habitat has been acquired through land exchanges and acquisitions, such as the Montana Legacy Project land acquisition in the Swan Valley.

Management for habitat connectivity

Under all alternatives, standards for Canada lynx indirectly provide habitat connectivity for grizzly bears. Lynx habitat on the Forest encompasses an area of about 1.8 million acres that is also used by grizzly bears. All alternatives include connectivity standard ALL S1 and vegetation standards VEG S1, VEG S2, VEG S5, and VEG S6 (see appendix A). These standards limit vegetation treatments, indirectly providing cover and connectivity of cover for grizzly bears. Alternatives B modified, C, and D have one additional exception to vegetation standard VEG S6 to protect whitebark pine trees, but this would not affect habitat connectivity due to the very limited amount of cover that would be reduced (see consequences of alternatives for Canada lynx).

Alternative A

The following sections discuss key indicators to display differences in alternatives. Under the 1986 forest plan, as amended, grizzly bear management direction applies only to the NCDE recovery zone, which is further divided into areas mapped as management situations 1, 2, and 3. Management direction for each management situation is specified in the Interagency Grizzly Bear Guidelines (IGBC, 1986; USDA, 1986,

p. II-24). Under alternative A, grizzly bear management situations and guidelines applicable to each would continue to be implemented in the recovery zone/primary conservation area. About 99 percent of the acres within the recovery zone/primary conservation area on the Forest is management situation 1 or 2, which has the most stringent protection of grizzly bear habitat. About 1 percent is management situation 3, which gives more consideration to human uses and development (see table 73).

Table 73. Acres of management situations 1, 2, and 3 within and outside the NCDE recovery zones under the 1986 forest plan, as amended.

National Forest	Management Situation (MS) 1 in NCDE recovery zone	MS 2 in NCDE recovery zone	MS 3 in NCDE recovery zone
Flathead	2,022,688	99,418	12,614

As the NCDE grizzly bear population expanded outside the recovery zone/primary conservation area, the Forest consulted with the USFWS to determine appropriate management (discussed in the following sections).

Management direction adopted in the 1986 forest plan also states that management situation stratification would be refined based on current grizzly bear habitat suitability, population, and distribution trends. Changes to the management situation stratifications in the 1986 forest plan are now being proposed by revising the forest plan. The original recovery zone would be the same as the primary conservation area but no longer stratified into management situations. For comparison with the action alternatives, the consequences of alternative A will be discussed relative to the recovery zone/primary conservation area and zone 1 area (outside the recovery zone/primary conservation area).

Consequences of motorized access management direction for alternative A

Recovery zone/primary conservation area

Amendment 19 of the 1986 forest plan has standards and objectives for access management (see the “Grizzly bear, affected environment” section for more details). The terms open motorized access density, total motorized access density, and security core are based upon definitions in amendment 19 (appendix TT) of the 1986 forest plan as amended (see glossary for more on these terms). Alternative A would result in a low risk of grizzly bear disturbance or displacement (especially females with cubs) because of the expectation that additional roads and trails would have motorized use restrictions, additional roads would be reclaimed, and/or additional security core would be created (S. Anderson, 2009; USDA, 1994, 2004; USFWS, 1995b, 1995c, 2005a, 2014c, 2016b). In bear management subunits where the Forest manages more than 75 percent of the land and amendment 19 applies, there would be an expectation to achieve 19 percent or less open motorized access density, 19 percent or less total motorized access density , and 68 percent or more security core unless site-specifically amended. Table 74 and table 75 show the estimated miles of motorized routes that would need to be closed in subunits in the recovery zone/primary conservation area (see figure 1-38) to meet or exceed 68 percent security core, unless site-specifically amended. Under alternative A, the calculation of the percentage of a bear management subunit providing security core includes a deduction due to the influence zone of high-use nonmotorized trails. As explained in the “Affected environment” section, grizzly bear response to nonmotorized trails is highly variable, and the thresholds for disturbance or displacement are unknown. The risk of grizzly bear-human conflicts on nonmotorized trails is also variable depending upon the type of activity.

Table 74. Estimated miles of NFS road that would be closed if 68 percent security core is to be met in subunits where the Forest originally managed more than 75 percent of the lands

Grizzly bear subunit name	Miles of motorized routes to close
Hay Creek	11 miles roads
Canyon McGinnis	2 miles roads
Peters Ridge	27 miles wheeled motorized trails and 10 miles roads
Swan Lake	27 miles wheeled motorized trails and 9 miles roads
Crane Mountain	33 miles roads
Beaver Creek	13 miles roads
Emery Firefighter	9 miles roads
Logan Dry Park	19 miles roads
Skyland Challenge	1 mile wheeled motorized trails and 4 miles roads

Table 75. Estimated miles of NFS road that would be closed if 68 percent security core is to be met in subunits where the Forest has acquired lands

Grizzly bear subunit name	Miles of motorized routes to close
Buck Holland	40 miles roads
Cold Jim	68 miles roads
Glacier Loon	56 miles roads
Hemlock Elk	25 miles roads
Lion	36 miles roads
Meadow Smith	58 miles roads
Piper Creek	43 miles roads

In order to fully meet amendment 19 numeric objectives for all three measures of motorized access density (open motorized access density, total motorized access density, and security core), an additional 518 miles of roads would need to be reclaimed. This total includes up to about 400 miles of roads on lands acquired through the Montana Legacy Project and about 57 miles of trails where wheeled motorized use would no longer be allowed unless site-specifically amended.

The mileages are estimates based upon a programmatic assessment (Ake, 2015a). The actual number may be higher or lower depending upon changing access conditions on adjacent lands and the site-specific factors that must be considered when evaluating access and grizzly bear habitat needs. The Forest would continue to make progress toward implementation as funding allows. This alternative would provide very low risk of individual female grizzly bear displacement on NFS lands because wheeled motorized trails, high-use nonmotorized trails, and/or roads in the grizzly bear recovery zone/primary conservation area would be further restricted. It is uncertain whether additional road or trail restrictions on NFS lands would reduce female grizzly bear mortality or increase the grizzly bear population because grizzly bears are a wide-ranging species and grizzly bear mortality may still occur on private lands, especially if attractants are present, whether public lands are secure or not.

Amendment 19 (appendix TT) of the forest plan also addresses motorized administrative use of restricted routes (see glossary) in the grizzly bear recovery zone/primary conservation area. Appendix TT states that outside of security core areas, motorized administrative use is acceptable at low-intensity levels as defined by either (1) existing cumulative effects analysis models (which defined low-intensity levels as one to six vehicles/week) or (2) minor activities that do not exceed 30 days in duration. Administrative use of reclaimed roads may not occur during the non-denning season unless it is motorized over-snow

vehicle use, which can occur during the period of time when public motorized over-snow vehicle use is allowed. Based upon the findings of Northrup and others (Northrup et al., 2012) and of Mace and Waller (1996), the administrative use of roads allowed under amendment 19 would not cause avoidance or underutilization of habitat by grizzly bears.

The existing forest plan and the programmatic biological opinion do not have specific provisions for the amount of temporary decrease in security core and/or temporary increase in total or open motorized access density allowed in the recovery zone/primary conservation area. However, through project-level section 7 consultations, temporary changes have been allowed to accommodate projects such as post-fire timber salvage or culvert removal to benefit bull trout. Some minor effects to individual bears would be anticipated due to temporary increases in open and total motorized access density and temporary decreases in security core for projects.

With alternative A, it is anticipated that motorized access and timber harvest occurring during the non-denning time period would continue to be cooperatively managed in four Swan Valley grizzly bear management subunits where the Forest and the Montana Department of Natural Resources and Conservation continue to share the bulk of lands (Goat Creek, Lion Creek, Porcupine Woodward, and South Fork Lost Soup). Under alternative A, the assumption is that these subunits would be managed according to active periods outlined in the Habitat Conservation Plan adopted by the Montana Department of Natural Resources and Conservation (MTDNRC, 2011). Concentrating commercial timber harvest activities in active subunits and limiting the scope and timing of activities in the inactive subunits would reduce the risk of disturbance of grizzly bears.

Zone 1 outside the grizzly bear recovery zone/primary conservation area

Amendment 19 does not apply outside the grizzly bear recovery zone in zone 1, and therefore open motorized access density and total motorized access density have not been calculated using the moving window analysis method used for amendment 19. Instead, the 1986 forest plan adopted maximum linear road densities that apply to smaller geographic units in areas outside the recovery zone/primary conservation area in the Salish Mountains geographic area. The left column in table 76 shows the maximum linear density of roads open to public use in each geographic unit, as specified in the 1986 forest plan.

After 1986, as grizzly bears began to occupy the Salish Mountains geographic area, subsequent Endangered Species Act section 7 consultation provided direction for management of NFS lands to further reduce grizzly bear mortality risk. The USFWS issued biological opinions, incidental take statements, and terms and conditions for the Salish Mountains geographic area, focusing on access management, livestock grazing, and food/attractant storage. Under alternative A, the assumption is that the Flathead National Forest and it is anticipated that limitations would continue as long as the NCDE grizzly bear population is listed (A. Jacobs, 2005; USDA, 2011c; USFWS, 2006a, 2012a). The right column in table 76 shows the baseline density of roads open to public motorized vehicle use that now occurs as a result of road closures to meet the terms and conditions for grizzly bears and to provide elk habitat security. Current conditions are below maximum linear densities for each geographic unit specified in the 1986 forest plan. (Amendment 19's management direction for OMAD, TMAD, and security core does not apply in the geographic units listed in table 76).

Table 76. Maximum linear density of unrestricted roads by geographic unit

Geographic unit	Grizzly bear management zone	Maximum density requirement (average linear miles/square mile of NFS land[1])	Baseline density(average linear miles/square mile of NFS land)
Island geographic unit	Zone 1	2.2	1.7
Olney-Martin Creek geographic unit	Salish DCA	1.8	1.6
Upper Good Creek geographic unit	Salish DCA	1.8	1.3
Sylvia Lake geographic unit	Zone 1 partially in Salish DCA	1.8	1.0
Star Meadow-Logan Creek geographic unit	Zone 1 partially in Salish DCA	2.2	1.5
Tally Lake-Round Meadow geographic unit	Zone 1 partially in Salish DCA	2.2	1.7
Mountain Meadow-Rhodes Draw geographic unit	Zone 1	2.2	1.6
Upper Griffin geographic unit	Zone 1	3.2	0.9
Ashley Lake geographic unit	Zone 1	3.2	1.9

1. Source: 1986 forest plan, p. II-37, baseline updated as of January 2017.

Outside the recovery zone/primary conservation area in zone 1, the analysis of the effects of linear open road densities uses the findings of Boulanger and Stenhouse (2014); see also USDA (2015). These authors found that grizzly bear occupancy of habitat occurred where linear open road densities did not exceed 2.4 miles per square mile. In zone 1, linear open road densities are below the threshold of 2.4 miles per square mile that provides for grizzly bear occupancy and below the 2.0 miles per square mile threshold that supports female occupancy (but at a density lower than the core habitat provided by the recovery zone/primary conservation area). The USFWS determined in 2013 that high road densities and lack of security habitat would have impacts on individual bears in some areas outside the recovery zone/primary conservation area but that current management provides for occupancy by female bears (USFWS, 2013c). This conclusion is consistent with research from Boulanger and Stenhouse. If the NCDE grizzly bear population is delisted, incidental take limitations would no longer apply and open road densities in zone 1 would be limited by maximum density requirements of the 1986 forest plan, as displayed in table 76. The maximum open road densities in 2 geographic units are not supportive of grizzly bear occupancy and the maximum road densities in 4 additional geographic units are not supportive of female grizzly bear occupancy.

Motorized access during the den emergence time period

The current forest plan meets the requirements of a settlement agreement resulting from a lawsuit challenging over-snow motorized vehicle use on the Flathead National Forest. In 2006, when the Forest was revising its plan, the intention was stated to carry amendment 24 forward into the forest plan. However, the Forest halted plan revision due to a lawsuit on the proposed planning rule and is now revising its plan again under the 2012 planning rule. Under alternative A, the Forest would continue to implement amendment 24 (USDA, 2006). Based upon new public input on its forest plan, the action alternatives would change some of the areas suitable for motorized and nonmotorized over-snow vehicle use, as described under consequences of alternatives B modified, C and D.

In the recovery zone/primary conservation area, motorized over-snow vehicle use during the den emergence time period (when there is a risk of human disturbance to females with dependent cubs) would

be allowed on open roads when snow conditions permit but would otherwise be limited to three late spring areas (also containing routes) and one motorized route corridor. These are Challenge-Skyland, Lost Johnny, and Sixmile late spring areas and Canyon Creek groomed route corridor (see figure B-12). In the recovery zone/primary conservation area, where almost all modeled denning habitat occurs, less than 22 percent of modeled grizzly bear denning habitat on the Forest overlaps with the areas open for motorized over-snow vehicle use during the den emergence time period (see figure 1-32). Given that the number of snowmobilers generally declines during April of each year as the snow starts to melt, the probability of a snowmobiler encountering a female with cubs during this time period is low. The USFWS wrote in their five-year review for grizzly bear, “Our best information suggests that current levels of snowmobile use are not appreciably reducing the survival or recovery of grizzly bears” (USFWS, 2011c, p. 38). Snowmobile use has been monitored by the USFS, and grizzly bears emerging from their dens have been monitored by MFWP; detrimental effects to grizzly bears have not been demonstrated on the Forest (A. H. Jacobs, 2013; USDA, 2012, 2015d, 2016e).

Outside the recovery zone/primary conservation area in zone 1, there is little modeled denning habitat and few restrictions on motorized over-snow vehicle use during the den emergence time period. As of 2015, there has been one known occurrence of a grizzly bear denning outside the recovery zone/ primary conservation area, so the effects of activities in zone 1 during the den emergence time period are expected to be minor.

Consequences of recreation management direction under alternative A

Developed recreation sites

Under the no-action alternative, the forest would continue to follow the Interagency Grizzly Bear Committee recreation management guidelines in management situation 1 and management situation 2 grizzly bear habitat (USDA, 1986, p. II-37). Although there is a potential for developed recreation sites to affect grizzly bears through habituation, food conditioning, or risk of mortality, the likelihood is low because food storage orders are in place across the Forest, greatly reducing grizzly bear-human conflicts on NFS lands across the Forest.

In addition, the 1986 forest plan management direction and anticipated budgets limit increases in developed recreation sites. The 1986 forest plan has a forestwide standard to retain the existing capacity of national forest developed recreation sites and to improve the quality of the developed recreation opportunities through full-service maintenance or the redesign and reconstruction of existing sites to better accommodate present and future needs as funding allows. Some capacity increases are anticipated to occur as a result of these improvements. In the past decade, USFWS consultations for campground and cabin rental projects in the recovery zone/primary conservation area have limited the increase in the number and capacity of developed recreation sites and it is anticipated that limitations would continue as long as the NCDE grizzly bear population is listed. Increased risk of grizzly bear-human conflicts at developed recreation sites on the Forest has been and is anticipated to continue to be minor. Outside the recovery zone/primary conservation area, increases in the number or capacity of developed recreation sites is not limited.

The Whitefish Mountain Resort is in the recovery zone/primary conservation area and has year-round, developed recreation on private lands as well as NFS lands. As explained in the “Affected environment” section, its management has been guided by site-specific consultation. The resort is surrounded by modeled denning habitat, but it is unlikely that grizzly bears would den there due to the high level of human activity. Food and garbage storage requirements, timing constraints on activities during the spring time period, and the requirement to maintain habitat security in the Hellroaring watershed during the non-denning season reduces the risk of grizzly bear-human conflicts.

There is modeled denning habitat in the portion of the Salish Mountains geographic area near the Blacktail Mountain Ski Area west of Kalispell, but it is highly unlikely that grizzly bears would den in the area due to the high level of winter recreational use. Zone 1 has only about 400 acres (a very minor amount) of modeled denning habitat that is not in the Blacktail Mountain Ski Area. Because this potential area of modeled denning habitat is heavily timbered and not accessible by road or trail, it is unlikely to get motorized use during the den emergence time period, so any potential effects are expected to be minor.

Consequences of livestock management direction under alternative A

Over the past several years, more than half of the Forest's 20 allotments were vacated and closed. In 2010, the Flathead National Forest administratively closed five vacant range allotments where use had not occurred for several years (see section 3.23 for more details). Protections and mitigations to reduce livestock-grizzly bear conflicts include (1) deferring livestock grazing in important spring habitat until after July 1 and (2) including permit measures to protect vitally important food sources from conflicting and competing uses by livestock. There are no known livestock conflicts on cattle grazing allotments of the Forest. Based on the lack of history of conflicts, the mortality risk associated with cattle grazing is low and is expected to continue to be low under the no-action alternative.

Consequences of vegetation management direction under alternative A

Alternative A has the highest acreage suitable for timber production of all alternatives—about 526,900 acres (see figure 1-09). Under the no-action alternative, the forest would continue to follow the Interagency Grizzly Bear Committee vegetation management guidelines in management situation 1 and management situation 2 grizzly bear habitat in the recovery zone/primary conservation area. These guidelines state that project design will specify measures to protect, maintain, and/or improve grizzly bear habitat and populations (IGBC, 1986). In the recovery zone/primary conservation area, forest plan guidelines provide limits on distance to cover and limit regeneration harvest until adjacent areas recover. Vegetation management direction would provide for diverse cover and forage conditions that support grizzly bears and would reduce the potential for grizzly bear displacement through the timing of timber sale activities. Riparian areas are managed according to INFISH (USDA, 1995c), which states that treatments in riparian habitat conservation areas cannot retard the attainment of riparian management objectives. This may indirectly benefit the grizzly bear by providing for cover and habitat connectivity in riparian habitat conservation areas. With respect to patch size and landscape pattern, management direction for cover would result in smaller timber harvest openings, more edge, and more fragmented habitat than would have occurred historically due to large stand-replacing wildfires.

Under alternative A, the percentage of the Forest where temporary decreases in security core due to projects are anticipated is difficult to predict at the programmatic level. In general, timber sale projects do not occur in security core, but security core percentages may be reduced due to the influence zone of roads near the edge of security core. These calculations have been made for site-specific projects, in consultation with the USFWS, and it is anticipated that consultation on temporary changes due to vegetation management projects would continue to occur while the grizzly bear is a listed species.

Large stand-replacing wildfires as well as more insect and disease infestation are likely in the future due to warmer, drier summer climate conditions. Wildfires, insect and disease infestations, and timber harvest would reduce cover but would promote grizzly bear foods. The SIMPPLLE and Spectrum models were used to estimate the differences among alternatives with respect to timber harvest and prescribed fire (see section 3.3 and appendix 2 for more details).

Although no management direction specific to grizzly bears is given in the 1986 forest plan for the area outside the recovery zone/primary conservation area, the Forest has consulted on site-specific vegetation management projects as the grizzly bear population has expanded into zone 1. The forest plan contains

management direction that indirectly provides benefits to grizzly bears through direction pertaining to other species and their habitats, such as elk. Selected recommendations from the Montana Cooperative Elk-Logging Study (Lyon et al., 1985), which is appendix DD of the 1986 forest plan, would continue to be followed. This direction has the indirect effect of protecting moist sites that may provide grizzly bear foods, as does the management direction for riparian habitat conservation areas. (For a discussion of timber suitability, see the section below titled “Consequences of management area allocations.”)

Consequences of minerals management direction under alternative A

The 1986 forest plan contains management direction to mitigate the effects of mineral development. This direction includes standards and guidelines associated with INFISH and grizzly bear guidelines for minerals and special uses, applicable to all management situations (p. II-42) in the recovery zone/primary conservation area. These mitigation measures are intended to reduce the impacts of mineral activities upon grizzly bears by (1) reducing or eliminating impacts of mineral activities within riparian habitat conservation areas, (2) scheduling activities so as to provide grizzly bear security immediately adjacent to activity areas, (3) requiring restrictions on food storage, garbage disposal, firearms, and domestic pets at approved camps, (4) avoiding adverse effects that reduce habitat effectiveness in seasonally important habitats, and (5) restricting helicopter flight patterns. The Forest has not had to apply this management direction because it has not had mineral activities (except for salable activities such as gravel removal), and there is low probability of any effects to grizzly bears in the future because of the lack of high mineral potential (see figure 1-67).

Regarding leasable mineral activity (e.g., oil and gas), according to the current (1986) forest plan, “Stipulations which are displayed in Appendix O and which are based on the Environmental Assessment of Oil and Gas Leasing of Non-wilderness Lands on Flathead National Forest, 1980, will be recommended in accordance with the management area direction in Chapter III. Before action is recommended on any lease application, additional site-specific analysis of environmental affects will be done” (p. II-55). Each lease, if issued, would include numerous standard and special stipulations to minimize the effects of oil and gas activities on surface resources.

Consequences of habitat connectivity management direction under alternative A

Alternative A does not specifically address connectivity with respect to grizzly bears. The 1986 forest plan contributes to habitat connectivity in terms of cover and areas with low risk of human disturbance (see figure 1-38). Forestwide management direction associated with amendment 21, as well as INFISH, addresses connectivity in old growth and riparian areas, which would benefit grizzly bears. Amendment 19 provides for habitat connectivity with respect to motorized access.

Consequences of demographic connectivity management direction under alternative A

Demographic connectivity considers the genetic interchange between the Forest portion of the NCDE and the Cabinet-Yaak Ecosystem for grizzly bears. The 1986 forest plan does not provide specific management direction to provide for female grizzly bear occupancy in the area outside the recovery zone/primary conservation area and does not address demographic connectivity or genetic interchange with the Cabinet-Yaak Ecosystem. In the last decade, MFWP has translocated grizzly bears from the NCDE to the Cabinet-Yaak Ecosystem in order to facilitate genetic interchange. In recent years, the number of documented grizzly bear reports in the area outside the recovery zone has been increasing as the population in the NCDE increases. More grizzly bears are exploring new territory farther to the west (R. D. Mace & Roberts, 2012).

Consequences common to Alternatives B modified, C, and D

Some plan components apply to the recovery zone/primary conservation area, which totals about 90 percent of the total Forest area. Some plan components apply to areas that were previously outside the recovery zone/primary conservation area, designated as zone 1 (totaling about 10 percent of the total Forest area). Zone 1 includes the Salish demographic connectivity area (see forest plan figure B-10).

Consequences of motorized access management

Under the action alternatives, previous amendments to the forest plan (e.g., amendment 19) would no longer be part of the forest plan, but many of the past actions that have created the current baseline would be retained, such as having standards for motorized use of roads and trails. The moving window analysis method has been used to evaluate the effects of motorized access density on grizzly bears across the NCDE since 1995 and would continue to be used to calculate access percentages. Requirements resulting from consultation on the forest plan would replace requirements of the previous consultations for motorized access in the recovery zone/primary conservation area and zone 1.

Some members of the public expressed concern about methods used to calculate motorized access percentages. Under the action alternatives, the methods for calculating open motorized route density, total motorized route density, and secure core are different than the methods used for calculating percentages for alternative A (Ake, 2017a). The EIS uses different terms (rather than the terms open motorized access density, total motorized access density, and security core) to distinguish between amendment 19 (alternative A) and the action alternatives. For example, the draft Grizzly Bear Conservation Strategy uses the term “secure core” rather than “security core” to refer to the revised definition which does not include deductions due to high-use nonmotorized trails, based upon the best available scientific information. The Forest has adopted the same terminology and definition in developing the action alternatives for the forest plan revision (see glossary). Additionally, under the action alternatives the recovery zone/primary conservation area is no longer stratified into grizzly bear management situations 1, 2, or 3) (see the “Affected environment” section for more details). Management situation 3 is not counted in calculation of percentages for amendment 19, but would be counted for the action alternatives because motorized access standards apply to the whole recovery zone/primary conservation area. In calculating total motorized route density for the action alternatives, roads are not counted if they meet the definition of “impassable” (see glossary). Because the methods for calculating percentages under the action alternatives are different than the methods used for calculating percentages under alternative A, the percentages for some subunits may change even if there have been no changes on the ground. All of the action alternatives would maintain baseline levels (see glossary) of open motorized route density, total motorized route density, and secure core in the recovery zone/primary conservation area, providing on-the-ground levels of security for grizzly bears that have supported the NCDE grizzly bear population.

The action alternatives would maintain baseline levels of the linear density of motorized routes open to public use during the non-denning season in zone 1 inside the Salish demographic connectivity area (see the “Affected environment” section for more details).

Consequences of recreation management

All action alternatives would add plan components in the recovery zone/primary conservation area for developed recreation sites, but the action alternatives differ with respect to recreation plan components for zone 1. Limits on the number and capacity of developed recreation sites in the recovery zone/primary conservation area for alternatives B modified, C, and D (discussed in detail below) is anticipated to be similar to what has resulted through consultation, so increased risk of grizzly bear-human conflicts at developed recreation sites on the Forest would be minor. Most of the grizzly bears killed or removed by management agencies in the NCDE in the past had been involved in conflicts related to unsecured

attractants such as garbage, bird feeders, pet/livestock feed, and human food. Although the majority of these mortalities occurred on private lands, the risk of grizzly bear mortality at developed recreation sites on public lands in the recovery zone/primary conservation area remains of concern because grizzly bear-human conflicts have occurred at developed recreation sites on NFS lands in the past. The Forest's food storage orders are highly effective at reducing the risk of grizzly bear-human conflicts. As a result, the draft Grizzly Bear Conservation Strategy includes measures that would allow a slight increase in the number and capacity of overnight developed recreation sites within the recovery zone/primary conservation area, but this increase would be limited to further reduce the risk of conflicts (see the sections on consequences specific to each action alternative for more details).

Consequences of livestock management

Cattle grazing is a relatively minor use of NFS lands on the Forest, and there are no sheep grazing allotments. The existing cattle-grazing allotments have been compatible with an NCDE grizzly bear population that is stable to increasing and expanding in distribution (Costello et al., 2016). Based on the lack of a history of conflict, the risk of grizzly bear mortality associated with livestock grazing is low.

Consequences of vegetation management

Specific reference to the Interagency Grizzly Bear Guidelines (IGBC, 1986), including the delineation of management situations, would no longer be part of the forest plan. However, plan components are very similar to the Interagency Grizzly Bear Guidelines for timber management in terms of managing for a mosaic of successional stages, restricting logging activities in time and space as needed, designing projects to maintain or improve grizzly bear habitat quality or quantity where it would not increase the risk of grizzly bear-human conflicts, and retaining cover as needed in key habitat areas such as grass, forb, and shrub openings and riparian management zones. The vegetation management plan components would provide for diverse cover and forage conditions and would reduce the potential for grizzly bear disturbance through the timing of timber sale activities.

All action alternatives include guidelines FW-GDL-TE&V-01 through 05. These guidelines reduce the risk of grizzly bear-human conflicts, disturbance or displacement in the recovery zone/primary conservation area. All action alternatives allow for temporary increases in the percentage of open and total motorized route density and temporary decreases in the percentage of secure core under standard FW-STD-IFS-03 for projects, but management areas where this could occur and the magnitude of change that could occur are limited. In each bear management subunit within the NCDE primary conservation area, temporary changes in the open motorized route density, total motorized route density, and secure core shall be allowed for roads used for projects (as defined by "project (in grizzly bear habitat in the NCDE)" during the non-denning season; see glossary). Calculations will include estimated changes for each year of the anticipated duration of the project and shall be incorporated into the 10-year running average required by standard FW-STD-IFS-03. As in the past, effects of vegetation management projects would be disclosed in environmental assessments completed at the project level. Although there may be short-term negative impacts to individual bears from vegetation management projects and associated road use, these impacts have been and would continue to be limited by standards and guidelines so that Forest management can contribute to the continued recovery of the NCDE grizzly bear population. (The SIMPPLLE and Spectrum models were used to estimate the differences among the alternatives with respect to timber harvest and prescribed fire (see section 3.3 and appendix 2 for more details). For a discussion of timber suitability by alternative, see section 3.7.7 on consequences of vegetation management.

Consequences of minerals management

Mineral development can affect grizzly bears by causing long-term loss of habitat, increasing vehicle collisions, increasing grizzly bear disturbance or displacement, and increasing grizzly bear-human conflicts. The action alternatives include standards FW-STD-E&M-01 through 09 and guidelines FW-GDL-E&M-01 through 07 that specify minerals mitigation measures related to grizzly bears that reduce the risk of key habitat degradation, grizzly bear-human conflicts, and grizzly bear disturbance or displacement should mineral development occur in the future.

Alternative B modified

Consequences of motorized access management direction for alternative B modified

Recovery zone/primary conservation area

Desired condition NCDE-DC-IFS-01 would establish the intent to manage open motorized route density, total motorized route density, and secure core in a manner that would contribute to sustaining the recovery of the NCDE grizzly bear population. Three key standards and two key guidelines would help to achieve this desired condition: FW-STD-IFS-01 through 03 and FW-GDL-IFS-01 and 02. FW-STD-IFS-02 states, "In each bear management subunit within the NCDE primary conservation area, there shall be no net decrease to the baseline (see glossary) for secure core and no net increase to the baseline for open motorized route density or total motorized route density on NFS lands during the non-denning season (see glossary)." The bulleted items listed under FW-STD-IFS-02 note conditions that are not considered a net increase or decrease from the baseline based upon what has been learned through the application and monitoring of amendment 19. Listing the bulleted items is intended to provide clarity, as are the definitions in the glossary. During the time period that the NCDE grizzly bear population was growing and expanding in distribution, changes to open motorized route density, total motorized route density, and security core percentages occurred due to motorized route closures, but percentages also changed even though there was no change or a very minor change in on-the-ground conditions for grizzly bears (Ake & Jacobs, 2014; USDA, 2016a).

Table 77 and table 78 show the baseline open road motorized density, total motorized route density, and secure core percentages for each bear management subunit under alternative B modified (see figure 1-39). There would be some bear management subunits on the Forest where open road motorized density or total motorized route density exceed 19 percent or where secure core is less than 68 percent. These subunits would not be required to further decrease road densities or increase secure core in the future, so there would be negative effects to individual bears due to disturbance, displacement, and/or mortality risk (Kuennen et al., 2017). However, the best available scientific information documents increases in grizzly bear distribution, population size, and genetic diversity under these conditions. The estimated population size was 765 bears in 2004 (Katherine C. Kendall et al., 2009), more than double the target of 391 bears based on sightings of females with cubs. Distribution has increased, and the occupancy of bear management units has been documented (Costello et al., 2016). Mortality has been at an acceptable level based on ongoing research and monitoring showing that the NCDE grizzly bear population has been stable to increasing (Costello et al., 2016; Mikle, Graves, Kovach, Kendall, & Macleod, 2016). Motorized access conditions are expected to continue to support the recovery of the NCDE grizzly bear population. Habitat security conditions would continue to be monitored by the Forest, and the grizzly bear population would continue to be monitored by MFWP.

Table 77. Open road motorized density (OMRD), total motorized route density (TMRD), and secure core baseline (CORE) for bear management subunits with NFS lands greater than or equal to 75 percent (source: Ake (2017a)

Bear Management Subunit Name	OMRD (%)	TMRD (%)	CORE (%)
Albino Pendant	0	0	100
Big Salmon Holbrook	0	0	100
Black Bear Mud	0	0	100
Brushy Park	0	0	100
Buck Holland	24	41	49
Burnt Bartlett	0	0	100
Hungry Creek	0	0	100
Little Salmon Creek	0	0	100
Meadow Smith	20	54	42
White River	0	0	100
Big Bill Shelf	11	6	87
Bunker Creek	5	3	92
Gorge Creek	0	0	100
Harrison Mid	1	0	99
Jungle Addition	19	19	68
Lion Creek	18	47	51
Spotted Bear Mountain	19	18	68
Pentagon	0	0	100
Silvertip Wall	0	0	100
Strawberry Creek	0	0	100
Trilobite Peak	0	0	100
Doris Lost Johnny	57	20	36
Emery Firefighter	19	20	58
Peters Ridge	52	25	34
Riverside Paint	18	16	71
Wounded Buck Clayton	28	30	66
Dickey Java	9	0	85
Moccasin Crystal	8	1	81
Stanton Paola	8	3	83
Canyon McGinnis	18	31	50
Lower Big Creek	18	19	71
Werner Creek	29	20	63
Beaver Creek	6	26	66
Cold Jim	18	57	43
Crane Mountain	28	53	25
Glacier Loon	22	41	52
Hemlock Elk	6	30	64
Piper Creek	19	45	55
Ball Branch	8	12	84
Jewel Basin Graves	20	19	75

Bear Management Subunit Name	OMRD (%)	TMRD (%)	CORE (%)
Kah Soldier	19	19	68
Logan Dry Park	30	36	51
Lower Twin	9	2	92
Swan Lake	40	23	46
Twin Creek	0	0	100
Wheeler Quintonkon	25	19	68
Flotilla Capitol	0	0	100
Long Dirtyface	0	0	100
Plume Mountain Lodgepole	0	0	100
Skyland Challenge	20	17	65
Tranquil Geifer	0	2	90
Coal & South Coal	15	19	73
Frozen Lake	10	4	86
Hay Creek	25	16	55
Ketchikan	14	3	73
Lower Whale	36	17	50
Red Meadow Moose	25	17	68
Upper Trail	14	4	88
Upper Whale Shorty	12	11	86
Basin Trident	0	0	100
Gordon Creek	0	0	100
Jumbo Foolhen	0	0	100
Youngs Creek	0	0	100

Note. OMRD = percentage of subunit with open motorized route density greater than 1.0 mile/square mile, updated baseline; TMRD = percentage of subunit with total motorized route density greater than 2.0 miles/square mile, updated baseline; CORE = percentage secure core in subunit; updated baseline.

Table 78. Open road motorized density (OMRD), total motorized route density (TMRD), and secure core baseline (CORE) for bear management subunits with NFS lands less than 75 percent (source: Ake (2017a)

Bear Management Subunit Name	Principal Land Management Unit (all ranger districts (RD) are on the Flathead National Forest)	OMRD (%)	TMRD (%)	CORE (%)
Goat Creek	Swan Lake RD and Montana Department of Natural Resources and Conservation	23	59	39
South Fork Lost Soup	Swan Lake RD and Montana Department of Natural Resources and Conservation	25	47	37
Coram Lake Five	Hungry Horse RD	30	46	14
Cedar Teakettle	Glacier View RD	35	36	24
Porcupine Woodward	Swan Lake RD and Montana Department of Natural Resources and Conservation	27	74	15
Lazy Creek	Tally Lake RD and Montana Department of Natural Resources and Conservation	68	62	10
Stryker	Tally Lake RD and Montana Department of Natural Resources and Conservation	37	33	50
Upper Whitefish[1]	Tally Lake RD and Montana Department of Natural Resources and Conservation	34	57	54

Noisy Red Owl	Swan Lake RD	20	13	59
State Coal Cyclone	Glacier View RD and Montana Department of Natural Resources and Conservation	29	25	58

Note. OMRD = percentage of subunit with open motorized route density greater than 1.0 mile/square mile, updated baseline; TMRD = percentage of subunit with total motorized route density greater than 2.0 miles/square mile, updated baseline; CORE = percentage secure core in subunit; updated baseline.

Another standard addresses temporary changes in road densities due to projects in the recovery zone/primary conservation area. FW-STD-IFS-03 would allow temporary changes within a bear management subunit for projects (see glossary), up to a limit of 5 percent increase in open motorized route density, 3 percent increase in total motorized route density, and 2 percent decrease in secure core calculated by a 10-year running average. To reduce the risk of grizzly bear disturbance or displacement, each project would be designed so that implementation would not exceed five years (NCDE-GDL-IFS-01) and pre-project motorized route and secure core percentages would be restored within one year of project completion (NCDE-GDL-IFS-02). The temporary changes allowed to open motorized route density, total motorized route density, and secure core under FW-STD-IFS-03 are based on an analysis of six timber sale projects on NFS lands (Ake & Kuennen, 2017). During the life of these six projects, open motorized access density temporarily increased an average of 5.4 percent, total motorized access density temporarily increased an average of 2.9 percent, and security core temporarily decreased by 2 percent. This includes five projects that occurred on the Flathead National Forest and one on the Lolo National Forest, affecting 18 grizzly bear management subunits. The projects were reviewed and allowed through consultation with the USFWS. They occurred between 2003 and 2010, a period during which the NCDE grizzly bear population is estimated to have been increasing (Costello et al., 2016; Katherine C. Kendall et al., 2009; R. D. Mace et al., 2012). Therefore, the duration of these projects and the associated effects are believed to be compatible with a stable to increasing grizzly bear population in the NCDE.

Although the standards above would allow temporary changes in habitat security due to projects, including some activities in secure core, there would be no temporary decreases in secure core due to vegetation management projects over most of the recovery zone/primary conservation area. The Forest has about 1.7 million acres in secure core habitat, with only about 9 percent of secure core outside of wilderness and inventoried roadless areas, so high levels of habitat security would continue to be maintained (see figure 1-39). In addition, under alternative B modified, some of the inventoried roadless areas would be added as recommended wilderness, where timber harvest would not be allowed (see the discussion in the section below titled “Consequences of management area allocations—All alternatives”).

Table 79. Temporary changes in habitat security due to projects anticipated for alternative B modified

Recovery Zone/Primary Conservation Area	Alternative B Modified
Acres in the recovery zone/primary conservation area on the Forest	2,124,316 acres
Acres in secure core habitat	1,672,877 acres
Acres of existing wilderness	1,075,376 acres
Acres in inventoried roadless areas	478,758 acres
Percentage of secure core habitat where a temporary decrease would be anticipated	9%

Allowances made for project implementation would permit some negative impacts to individual bears as a result of human disturbance in a project area but would establish limits on the amount per subunit as well as on the duration of the disturbance. These impacts have been and would continue to be managed to provide for the needs of the NCDE grizzly bear population. Implementation of these standards and guidelines would be monitored and reported (see monitoring items in chapter 5 of the forest plan).

Standard FW-STD-IFS-01 addresses administrative use in the recovery zone/primary conservation area that do not meet the definition of a project. During the time period that the NCDE grizzly bear population was growing and expanding in distribution, administrative use was allowed on restricted roads if it met the criteria listed under standard FW-STD-IFS-01. Mace and others (1996) studied grizzly bear use of areas within a 0.5 kilometer (about 0.31 mile) influence zone of roads in the Swan Mountains of the Forest. Most grizzly bears exhibited either neutral or positive selection for this zone if it surrounded closed roads or roads receiving less than 10 vehicles per day, but avoided this influence zone if it surrounded roads having use by more than 10 vehicles per day. Based upon these findings, the administrative use of six trips per week on closed roads that would be allowed under alternative B modified would not be anticipated to cause grizzly bear avoidance. Unlimited use for one 30-day time period allowed by standard FW-STD-IFS-01 could cause bear avoidance in the affected area if it exceeded 10 vehicles per day, but this level of administrative use would be restricted to a short period of time to minimize adverse impacts to grizzly bears. This allowance provides for short-duration activities which must be accomplished during the non-denning season, such as culvert and road best management practice work on roads in secure core. Due to the short duration and low level of temporary administrative use, negative impacts to the grizzly bear resulting from disturbance are anticipated to be minor.

FW-STD-IFS-04 applies to temporary use of roads by the public. This standard states, “within the NCDE primary conservation area, a restricted road may be temporarily opened for public motorized use to allow authorized uses (such as firewood gathering), provided the period of use does not exceed 30 consecutive days during one non-denning season and occurs outside of spring and fall bear hunting seasons. However, temporary public use of a restricted road shall not be authorized in secure core (see glossary).” There would be some increase in disturbance and the risk of grizzly bear mortality in areas outside of secure core, but the risk is minimized by limiting the duration and season when temporary use by the public could occur. Gated roads on the Forest have been temporarily opened for periods of up to 30 days to allow firewood gathering during the time period when the NCDE grizzly bear population was growing and expanding, with no apparent population-level effects.

Overall, the set of plan components discussed above is intended to limit open motorized route density and total motorized route density and to maintain sufficient secure core in the recovery zone/primary conservation area to support the NCDE grizzly bear population. In addition, open motorized route density, total motorized route density, secure core, administrative use, and temporary changes due to projects would be monitored by the USFS (see the forest plan, chapter 5), and the plan could be modified in the future if monitoring indicates that changes are needed.

Zone 1

For zone 1, the draft Grizzly Bear Conservation Strategy establishes a goal to provide for grizzly bear occupancy. In the Salish demographic connectivity area within zone 1, the goal is to provide for female grizzly bear occupancy to provide for genetic interchange with the Cabinet-Yaak Grizzly Bear Ecosystem, but at a lower density than in the recovery zone/primary conservation area. Zone 1 is not intended to provide core habitat for the NCDE grizzly bear population. This goal is addressed by desired condition GA-SM-DC-01 for the demographic connectivity area. Desired conditions FW-DC-LSU-01 and GA-SM-DC-03 also address connectivity, including consolidation of NFS lands and conservation easements with willing landowners to provide habitat connectivity and facilitate movement of wildlife, including but not limited to the grizzly bear. In the last decade, MFWP has also translocated grizzly bears from the NCDE to the Cabinet-Yaak Ecosystem in order to facilitate genetic interchange between grizzly bear ecosystems.

Baseline densities of motorized routes in the Salish demographic connectivity area (table 80) would be sufficient to support occupancy by female grizzly bears, according to findings of Boulanger and Stenhouse (2014). In the rest of zone 1, baseline levels of the linear density of roads open to motorized

public use during the non-denning season would be maintained at baseline levels, but the density of motorized trails could increase. As displayed in table 80, the density of motorized roads and trails outside the Salish demographic connectivity area provides for grizzly bear occupancy and would continue to do so even if motorized trails increased slightly, based upon findings by Boulanger and Stenhouse (see table 62 in the “Affected environment” section).

Table 80. Public open motorized access for all roads/trails on NFS lands (includes highways and county/city and private roads/trails) (source: Ake (2017b); USDA (2016a, Dec. 28, 2015, roads/trails data set))

NCDE Management Zone	Open Roads (Miles)	Motorized Trails (Miles)	Total (Miles)	NFS Lands (Square Miles)	Public Open Motorized Roads Only (Miles/Square Mile)	Public Open Motorized Roads and Trails Miles/Square Mile
Zone 1, Salish demographic connectivity area	217	14	231	150	1.4	1.5
Zone 1, outside Salish demographic connectivity area	338	64	402	212	1.6	1.9

In recent years, the number of documented grizzly bear reports in the area outside the recovery zone/primary conservation area has been increasing as the population in the NCDE has increased. More grizzly bears are exploring new territory farther to the west (R. D. Mace & Roberts, 2012). Alternative B modified would maintain the baseline linear density of roads open to motorized vehicle use by the public that has supported the expansion of the grizzly bear population into areas outside the recovery zone/primary conservation area (see figure B-17 in Kuennen et al., 2017 for more details). Guideline GA-SM-GDL-01 for elk habitat security also provides indirect benefits to grizzly bears in zone 1 in terms of limiting the distribution of roads open to motorized vehicle use by the public during the non-denning season and providing for a mosaic of cover and forage in elk security habitat.

Motorized over-snow vehicle use

Under alternative B modified, about 60 percent of modeled grizzly bear denning habitat occurs within existing wilderness areas where motorized use is prohibited. About 13 percent of modeled denning habitat is within recommended wilderness areas, and about 13 percent of modeled denning habitat is in other areas that are not suitable for motorized over-snow vehicle use (see figure 1-33). In these areas, individual grizzly bears may be disturbed by nonmotorized uses, such as backcountry skiing or snowboarding, during the den emergence time period, but there would generally be a low risk of human disturbance, and population-level effects are not anticipated. The USFWS wrote in their five-year review for grizzly bear, “Our best information suggests that current levels of snowmobile use are not appreciably reducing the survival or recovery of grizzly bears” (USFWS, 2011c, p. 38).

The discussion of motorized over-snow vehicle use is focused on the den emergence time period due to concerns about the risk of disturbance to female grizzly bears with dependent cubs emerging from their dens (see the “Affected environment” section for more details). With this alternative, areas that are open to motorized over-snow vehicle use during the den emergence time period occur in about 3 percent of modeled grizzly bear denning habitat in the recovery zone/primary conservation area, a minor amount. In the recovery zone/primary conservation area there are about 19 miles of routes open to motorized over-snow vehicle use in modeled grizzly bear denning habitat after April 1; these routes could be open during the den emergence time period, depending upon annual snow conditions.

Because there is uncertainty regarding the potential effects of motorized over-snow vehicle use on females with cubs during the den-emergence time period and because this use could increase in the future, alternative B modified adopts standard FW-STD-REC-05, which states “Within grizzly bear denning habitat modeled by MTFWP in the NCDE primary conservation area, there shall be no net increase in percentage of area or miles of routes designated for motorized over-snow vehicle use on NFS lands during the den emergence time period (see glossary)” (see forest plan figure B-12; Skyland Challenge, Lost Johnny, and Sixmile areas and Canyon Creek groomed route corridor). Because very little modeled denning habitat is open when den emergence may be occurring and because many females with cubs are known to exit their dens during the latter part of the time period when these areas may be open to motorized over-snow vehicle use, the risk of disturbance is anticipated to be minor. Standard FW-STD-REC-05 would provide assurance that potential impacts to bears, particularly females with cubs, would not increase over time in the recovery zone/primary conservation area. Much of the area outside the recovery zone/primary conservation area is suitable for motorized over-snow vehicle use. There is a minimal amount of modeled grizzly bear denning habitat in zone 1 outside the primary conservation area, so the risk of disturbance or displacement to grizzly bears (including females with cubs) is very low.

Consequences of recreation management direction under alternative B modified

Developed recreation sites

Developed recreation sites with frequent or prolonged human occupancy may result in increased bear attractants, increasing the risk of grizzly bear-human conflicts or grizzly bear mortality. The draft Grizzly Bear Conservation Strategy stated that the main concern with developed recreation sites has to do with overnight use. Under alternative B modified, two desired conditions and one standard address developed recreation sites designed and managed for overnight use. Within the recovery zone/primary conservation area, the number, capacity, and improvements of developed recreation sites would provide for user comfort and safety while minimizing the risk of grizzly bear–human conflicts on NFS lands (FW-DC-REC-01 and FW-DC-REC-02). Standard NCDE-STD-REC-01 would set a limit of one increase in the number or the overnight capacity of developed recreation sites designed and managed for overnight use per bear management unit per decade on NFS lands in the recovery zone/primary conservation area. There are 11 bear management units within the recovery zone/primary conservation area on the Flathead National Forest, not counting the Stillwater bear management unit (where NFS lands are minimal). Out of these 11, 6 are shared with other Forests or agencies (e.g., the National Park Service). Therefore, in a 10-year time period, the Flathead National Forest has the ability to add a maximum of 5 to 11 overnight developed recreation sites in the recovery zone/primary conservation area (6 to 12 counting the Stillwater bear management unit). Outside of the recovery zone/primary conservation area, the limitation on overnight developed recreation sites is not applied.

The draft Grizzly Bear Conservation Strategy states, “The intent of the developed recreation site standard is to not increase the number of developed sites or capacity at most overnight developed sites on public Federal lands within each bear management unit above levels known to have occurred at a time when there was a stable to increasing grizzly bear population” (USFWS, 2013c, p. 59); planning record #00671. Although the NCDE grizzly bear population was listed as threatened under the Endangered Species Act, there were occasional increases in developed sites that were approved through consultation with the USFWS. To allow a similar level of increase in developed site numbers or capacity that has occurred under listed status, one increase in the capacity or number of developed sites would be allowed per bear management unit per 10 years. The set of plan components for developed recreation sites is consistent with what has occurred on the Forest through consultation during the time period when the NCDE grizzly bear population was stable to increasing and expanding in distribution (Costello et al., 2016).

Although there may be an increased risk of grizzly bear-human conflicts as a result of some increase in developed recreation sites with overnight use in the future, the risk of grizzly bear-human conflicts or mortality for grizzly bears would be limited. The action alternatives include standard FW-STD-WL-02, which states that within the NCDE primary conservation area and zone 1 (including the Salish demographic connectivity area), food/wildlife attractant storage special order(s) shall apply to all NFS lands. Food storage orders are in effect across the Forest and are very effective in reducing grizzly bear-human conflicts or mortality on NFS lands. The orders are updated over time as new information and new technologies become available but would continue to be guided by the Interagency Grizzly Bear Committee or a similar group of experts. Concerted efforts by MFWP to respond to grizzly bear-human conflicts, both on and off NFS lands, have greatly reduced the risks to both bears and people. Additionally, guideline FW-GDL-REC-01 specifies that additional measures should be used to reduce the risk of grizzly bear-human conflicts if the number or capacity of day-use or overnight developed recreation sites is increased.

There is one developed year-round resort in the recovery zone/primary conservation area, Whitefish Mountain Resort. It has operated as a ski area since the 1940s and has operated during the non-denning season since the 1980s. This resort does not have overnight use on NFS lands. As discussed in previous biological assessments, the Whitefish Mountain Resort likely causes disturbance and/or displacement of grizzly bears, but there have been no known grizzly bear mortalities. The Whitefish Mountain Resort has had mitigation measures in place for decades to reduce grizzly bear-human conflicts during the non-denning season. The following standards and guidelines would apply under alternative B modified. Standard FW-STD-REC-04 requires that new or reauthorized ski area permits on NFS lands that operate during the non-denning season shall include measures to limit the risk of grizzly bear-human conflicts, and this would continue to decrease the potential for detrimental effects to the NCDE grizzly bear population. Additionally, guideline GA-SM-MA7-Big Mtn-GDL-01 and desired condition GA-SM-MA7-Big Mtn-DC-04 would benefit the grizzly bear by limiting the risk of grizzly bear disturbance or displacement or grizzly bear-human conflicts at the resort.

No limits on developed recreation sites would occur in zone 1 under alternative B modified. There is one developed ski area in Zone 1, the Blacktail Ski Area. This ski area is not currently operated during the non-denning season, but forestwide standard FW-STD-REC-04 would apply to this area as well.

Other recreation activities

As stated in the "Affected environment" section, individual grizzly bears may avoid nonmotorized trails and thus reduce the risk of grizzly bear human conflicts or they may have conflict with people on nonmotorized trails; the effects of nonmotorized trails are highly variable. There are no demonstrated population-level effects to the NCDE grizzly bear as a result of nonmotorized trail use, so deductions to secure core percentages for high-use nonmotorized trails are eliminated under this alternative. As stated in the draft Grizzly Bear Conservation Strategy, "If research demonstrates that high intensity use non-motorized trails do significantly impact grizzly bear populations or that there are areas of significantly higher mortality risk near high intensity use nonmotorized trails (as opposed to other trails or roads), this new information will be appropriately considered and incorporated through an adaptive management approach" (USFWS, 2013c, p. 23). In the future, grizzly bear population monitoring would be conducted by MFWP to determine whether any population-level effects of human uses are occurring. Alternative B modified also has recreation plan components that are Forest specific. For example, desired conditions MA7-DC-01 and 02 are applicable to management area 7 (focused recreation areas; see figure 1-02). The proposed action includes plan components to reduce the risk of bear-human conflicts, benefiting grizzly bears.

To reduce the risk grizzly bear-human conflicts, alternative B modified includes the following guidelines:

FW-GDL-IFS-15. When developing, constructing, or reconstructing system trails, pertinent public information on how to avoid and respond to bear-human encounters should be posted at trailheads. In addition, site-specific trail design should include one or more methods to limit the risk of bear-human conflicts such as, but not limited to:

- locating trails outside of riparian management zones or avalanche chutes, unless it is necessary to cross or to access an existing developed recreation site,
- designing and maintaining trails to increase sight distance and/or to address speed of travel consistent with site-specific conditions for the managed use of the trail.
- FW-GDL-REC-05. To reduce the risk of conflicts between wildlife and event participants as well as with other recreationists, authorizations for recreation events, group use, and commercial activities should include permit measures that address potential conflicts such as, but not limited to, location of the event, timing of the event, party size, and education on reduction of wildlife-human conflicts.

Grizzly bear-human conflicts are monitored by MFWP and would continue to be monitored in the future so that adaptive changes could be made, if warranted.

Consequences of livestock management direction under alternative B modified

Desired condition FW-DC-GR-01 for grazing provides for ecological conditions for the grizzly bear. To incorporate livestock allotment standards in the draft NCDE Grizzly Bear Conservation Strategy, alternative B modified includes standards FW-STD-GR-01 through 06 and guideline FW-GDL-GR-01 for the recovery zone/primary conservation area. Standards FW-STD-GR-01 through 04 and 06 also apply to zone 1 to reduce the future risk, in response to public comments. In addition, in order to reduce the cost of administering very small livestock allotments, the forest plan includes a Forest-specific guideline for the Swan Valley geographic area (GA-SV-GDL-04) that would reduce cattle-grazing allotments in the recovery zone/primary conservation area if opportunities arise with a willing permittee. The additional management direction for grazing included in alternative B modified is not associated with the draft Grizzly Bear Conservation Strategy. Although the Flathead National Forest has not had conflicts between cattle and grizzly bears in the past, the set of plan components for livestock grazing would reduce the risk conflicts with grizzly bears in the future.

Additionally, attractant storage orders required by FW-STD-WL-02 reduce the risk of grizzly bear-human conflicts associated with livestock. According to the draft Grizzly Bear Conservation Strategy (2013c), “Impacts on grizzly bears due to attractants associated with livestock can be effectively minimized with requirements to securely store and/or promptly remove attractants associated with livestock operations (e.g., livestock carcasses, livestock feed, etc.)” (p. 25). Continued implementation of the Forest’s attractant storage orders is expected to result in minimal risk of grizzly bear-livestock conflicts.

As stated in the draft Grizzly Bear Conservation Strategy, “Current levels of grazing intensity [on permitted livestock allotments] in forested environments are not displacing grizzly bears in significant ways and are not likely to affect vegetation structure enough to result in direct competition for forage species on public lands within the NCDE, as evidenced by the increasing population trend in the NCDE” (USFWS, 2013c, p. 25). As a result, the draft Grizzly Bear Conservation Strategy included measures to keep livestock grazing at or below the baseline levels in the recovery zone/primary conservation area. The 2011 baseline was selected because available information documents increases in grizzly bear distribution and population size. The estimated population size was 765 bears in 2004 (Katherine C. Kendall et al., 2009), more than double the target of 391 bears based on sightings of females with cubs. Occupancy of bear management units has been documented (Costello et al., 2016). Mortality has been at an acceptable level based on ongoing research and monitoring showing that the NCDE grizzly bear population has been stable to increasing and expanding its distribution (Costello et al., 2016).

Consequences of vegetation management direction under alternative B modified

As stated in the "Affected environment" section, the grizzly bear is a habitat generalist that is adaptable to changing vegetative conditions. Alternative B modified provides for habitat diversity, taking into account the modeled effects of climate change that are anticipated to occur over the next 50 years. Because the grizzly bear uses a wide variety of habitats across the Forest, a specific model was not developed for this species. Instead, the discussion below is a summary of modeled vegetation changes on the Forest. Grizzly bear habitat and its use by grizzly bears would vary across time and space due to natural processes (e.g., succession, wildfires, insects and disease) and vegetation management activities (e.g., timber harvest, prescribed fire, thinning, planting). On the heavily forested Flathead National Forest, changes in successional stages and other vegetation characteristics are one indicator of the potential availability of bear foods, cover, and connectivity.

SIMPPLE modeling for alternative B modified shows that grass/forb/shrub communities would be likely to increase by the fifth decade, corresponding to the amount of high- and moderate-severity wildfire as well as prescribed fire and timber harvest. These increases are likely to result in more bear foods, such as berry-producing shrubs and grasses that need more light, but would result in temporary decreases in cover. The model predicts there would be a forestwide increase in the amount of area in the large tree size class by the fifth decade. This size class provides cover and forested connectivity, as well as some forage. Because the SIMPPLE model is probabilistic, it is not possible to predict the connectivity of forest cover with certainty, but this would be assessed at the project level. Vegetative succession is responsible for the majority of changes in the size classes because trees that are not killed by fire grow and advance into larger forest size classes. In contrast, the model predicts a downward trend in the very large forest size class in the cool-moist and cold potential vegetation types. Although forestwide standards protect old-growth forest and very large trees, stand-replacing wildfire and Douglas-fir and spruce bark beetle can result in the loss of the very large forest size class and likely affect far more area than timber harvest in the cool-moist and cold potential vegetation types.

Inside the recovery zone/primary conservation area, desired conditions for the grizzly bear include FW-DC-TE&V-01 and 02 and guidelines FW-GDL-TE&V-01 through 05, similar to the Interagency Grizzly Bear Committee vegetation guidelines. These guidelines would benefit the grizzly bear because they promote a mosaic of successional stages; restrict logging activities in time and space as needed; encourage project designs that maintain or improve grizzly bear habitat quality or quantity where it would not increase the risk of grizzly bear-human conflicts; and retain cover as needed along grass, forb, and shrub openings. Appendix C also includes possible strategies for vegetation management related to grizzly bear habitat.

In addition to vegetation guidelines for the recovery zone/primary conservation area that are specific to the grizzly bear, other standards and forestwide plan components would indirectly benefit the grizzly bear. Desired condition FW-DC-TE&V-02 would promote a variety of grass/forb/shrub species, including berry-producing species that provide forage for grizzly bears and other wildlife species (e.g., huckleberries (*Vaccinium globulare*, *Vaccinium membranaceum*), serviceberries (*Amalanchier alnifolia*), mountain ash (*Sorbus scopulina*), and buffaloberry (*Shepherdia canadensis*). This desired condition may be met in wildfire areas, prescribed burn areas, and areas managed to produce timber. Lynx management standards VEG S1, VEG S2, VEG S5, and VEG S6 (see the forest plan, appendix A) apply across about 1.8 million acres of the Forest and would limit vegetation treatments in lynx habitat on the Forest. Because the Forest's lynx habitat also provides grizzly bear habitat and many analysis units overlap with grizzly bear management subunits, these limitations on vegetation management would also provide for distribution of cover for grizzly bears. Forestwide, riparian management zones total about 427,320 acres and are not suitable for timber production, although timber harvest may occur under specific conditions (see FW-SUIT-RMZ-01, section 3.21, and the bull trout section of the biological assessment (Kuennen et

al., 2017) for more details). Plan components for riparian management zones, including forestwide standards FW-STD-RMZ-01, 05, and 06 and forestwide guidelines FW-GDL-RMZ-08 through 15, provide for ecological conditions of key wetland and riparian habitats used by grizzly bears. Forestwide guideline FW-GDL-RMZ-09, which applies to the entire riparian management zone defined by FW-STD-RMZ-01, states that the distance to cover for created openings should not exceed 350 feet. These plan components indirectly benefit the grizzly bear by providing for cover and habitat connectivity (see section 3.74, subsection "Aquatic, wetland, and riparian habitats," for more details).

Although there are known, usually short-term impacts to individual bears from vegetation management activities and associated road use, these impacts have been and would continue to be managed to support the NCDE grizzly bear population. In summary, available information documents increases in grizzly bear distribution and population size. The estimated population size was 765 bears in 2004 (Katherine C. Kendall et al., 2009), more than double the target of 391 bears based on sightings of females with cubs. Occupancy of bear management units has been documented (Costello et al., 2016). Mortality has been at an acceptable level based on ongoing research and monitoring showing that the NCDE grizzly bear population has been stable to increasing and expanding its distribution (Costello et al., 2016). Under this alternative, the NCDE grizzly bear population would continue to be monitored by MFWP, including grizzly bear population trend, body condition (an indicator of food availability), survival, mortality, and grizzly bear-human conflicts. The Forest would monitor vegetation conditions using analysis tools such as VMap and Forest Inventory and Analysis data that classify all lands (see chapter 5 in the forest plan for more details). Vegetation management activities would also continue to be assessed through project-specific NEPA analysis so site-specific effects would be determined as vegetation conditions change.

Consequences of minerals management direction for alternative B modified

As discussed in the section on consequences common to all alternatives, the Forest has low potential for locatable mineral activity. Adverse impacts on the NCDE grizzly bear population from saleable mineral activity that occurs on the Forest would be very minor. Forestwide guideline FW-GDL-E&M-05 would reduce the risk of grizzly bear-human conflicts and grizzly bear disturbance or displacement. Although the Forest has very low potential for oil and gas leasing, alternative B modified would lower the risk of grizzly bear habitat loss and mortality even further because NCDE-STD-MIN-08 would require that no surface occupancy stipulations be applied to any new oil and gas leases in the recovery zone/primary conservation area.

Consequences of habitat connectivity management direction for alternative B modified

Alternative B modified provides for habitat connectivity during the non-denning season, both in terms of cover and in terms of areas with low risk of human disturbance. Alternative B modified includes the following plan components related to habitat connectivity:

- appendix A: ALL 01, ALL S1, ALL G1, LINK 01, LINK S1, LINK G1, G2 for Canada lynx;
- plan components that provide for riparian connectivity (FW-DC-WTR-02; FW-STD-RMZ-01, 05, and 06; FW-GDL-RMZ-09 and 12);
- plan components for forest vegetation connectivity (FW-DC-TE&V-14 and 19; FW-GDL-TE&V-03, 06, and 07; MA6a-DC-02, MA6b-DC-02, and MA6c-DC-02);
- plan component FW-GDL-IFS-12 which states that within areas specifically identified as important for wildlife connectivity across highways, the USFS should cooperate with highway managers and other landowners to implement crossing designs that contribute to wildlife and public safety.

- plan components for connectivity in areas that have been modeled as important for several wide-ranging carnivores or big game species, including Canada lynx, wolverines, grizzly bears, and elk (GA-HH-DC-03, GA-MF-DC-04, GA-NF-DC-06, and 07, GA-SM-DC-03, and GA-SV-DC-09).
- plan components to retain NFS lands in public ownership or acquired lands by purchase, donation, exchange, or other authority as opportunities arise to improve national forest management (FW-DC-LSU-01).

These desired conditions, standards, and guidelines would contribute to habitat connectivity and linkage areas for grizzly bears.

Alternative C

Alternative C has the most extensive protections of grizzly bear habitat and exceeds the requirements of the draft Grizzly Bear Conservation Strategy, in response to public comments. Under alternative C, numerous plan components that apply to the recovery zone/primary conservation area in alternative B modified would also apply to zone 1. These include vegetation management guidelines for grizzly bears (FW-GDL-TE&V-01 through 05), grazing standards FW-STD-GR-01 through 04 and 06, and guideline FW-GDL-GR-01. Similarly, FW-STD-MIN-08, requiring that no surface occupancy stipulations be applied to any new oil and gas leases, would also apply to zone 1. These plan components have not been applied under the 1986 forest plan nor have they been required as a result of consultation.

This alternative has the lowest percentage of area suitable for timber production, about 317,300 acres. (For a discussion of timber suitability, see the section on consequences of management area plan components below and section 3.21for more details). As a result, the percentage of the recovery zone/primary conservation area that could be anticipated to have a temporary decrease in secure core due to projects (see glossary) is the lowest of all the action alternatives, about 3 percent.

Similar to alternative B modified, alternative C limits motorized access, including wheeled motorized trails on NFS lands in the Salish demographic connectivity area, to baseline densities (see discussion above under alternative B modified for more details). Similar to alternative B modified, FW-STD-IFS-04 states that roads within secure core shall not be opened for temporary motorized use by the public, e.g., firewood cutting.

Alternative C has the greatest acreage of recommended wilderness (MA 1b). Similar to alternative B modified, alternative C states that mechanized transport and motorized travel are not suitable in recommended wilderness areas. When site-specific decisions are implemented, three of the areas open to motorized over-snow vehicle use during the den emergence time period would be virtually eliminated due to changes in suitability for management area 1b and its associated management direction (see figure 1-34). Areas of modeled denning habitat that would remain suitable for over-snow motorized vehicle use during the den emergence time period include the groomed route corridor in Canyon Creek and areas near Whitefish Mountain Resort. These two areas currently receive very high levels of public recreational use. In zone 1, suitability for motorized over-snow vehicle use generally would not change. Most areas in zone 1 would not have restrictions on motorized over-snow vehicle use during the den emergence time period.

Taken together, these additional programmatic plan components would further reduce the risk of future grizzly bear disturbance or displacement as well as the risk of grizzly bear-human conflicts. As explained in the “Affected environment” section, it is unknown whether additional habitat protections on NFS lands would have population-level effects because grizzly bear social characteristics influence their populations, as do the availability of attractants and mortality on private lands.

Alternative D

As under the other action alternatives, the forest plan would incorporate standards and guidelines relative to motorized access, developed recreation sites, and livestock allotments in the recovery zone/primary conservation area. Standards would maintain baseline levels of open and total motorized route density and secure core in the primary conservation area (see glossary). In zone 1, there would be no net increase in the density of roads open to public motorized use.

In contrast to alternatives B modified and C, the density of motorized trails in zone 1 would not be limited. In contrast to alternatives B modified and C, roads within secure core could be opened for motorized use by the public for up to 30 days (e.g., for purposes such as firewood cutting) outside the spring and fall bear hunting seasons. Alternative D would slightly increase areas that are suitable for motorized over-snow vehicle use during the den emergence time period. Areas of modeled denning habitat that would remain suitable for over-snow motorized vehicle use during the den emergence time period include designated routes and areas in Canyon Creek and near Whitefish Mountain Resort, the Challenge-Skyland, Lost Johnny, and Sixmile areas (see figure 1-35). In zone 1, suitability for motorized over-snow vehicle use would not change. Most areas in zone 1 would not have restrictions on motorized over-snow vehicle use. Taken together, programmatic plan components would slightly increase the risk of future grizzly bear disturbance or displacement as well as the risk of grizzly bear-human conflicts.

Consequences of geographic area plan components for alternative B modified

Swan Valley

As detailed in the “Affected environment” section, land ownership in the Swan Valley geographic area has changed substantially since the 1986 forest plan and the Swan Valley Grizzly Bear Conservation Agreement were adopted. Alternative B modified would manage all of the Forest’s bear management subunits using the same forestwide set of management direction and would terminate the previous agreement. As stated in desired condition FW-DC-P&C 03, “Recovery of threatened and endangered species is accomplished through cooperation with USFWS (including section 7 consultation, as required), State agencies, other Federal agencies, tribes, counties, interested groups, and interested private landowners.” The Forest would continue to coordinate with the other land managers that share bear management subunits with the Forest.

Additional plan components would provide benefits for the grizzly bear in the Swan Valley. Alternative B modified includes desired conditions GA-SV-DC-06 through 09 and objective GA-SV-OBJ-04 that would have the indirect effect of continuing to improve habitat quality for grizzly bears. As explained in the “Affected environment” section, most of the Montana Legacy Project land acreage had regeneration harvest prior to being acquired by the Forest, so the trees on these acres will not be large enough to be merchantable for many decades. As a result, the level of timber harvest and associated road use that occurred on these lands over the last decade would not be likely to occur in the near future. The Forest has made its best programmatic estimate of the range of miles of road that could be decommissioned or placed into intermittent stored service for objective GA-SV-OBJ-04, but specific roads would be assessed during site-specific project planning. Guideline FW-GDL-IFS-12 also applies to the Swan Valley. These plan components would benefit grizzly bears in the Swan Valley by contributing to habitat connectivity, linkage, and improving habitat quality on lands acquired through the Montana Legacy Project.

Salish Mountains

The Salish Mountains geographic area has specific grizzly bear management direction that applies to zone 1, including the Salish demographic connectivity area, as discussed throughout this grizzly bear section. Additional plan components such as GA-SM-DC-04 and 05, GA-SM-OBJ-04, GA-SM-GDL-01, and

FW-GDL-IFS-12 would indirectly provide benefits for the grizzly bear. These plan components would benefit grizzly bears in the Salish Mountains by emphasizing linkage of habitat in the Salish demographic connectivity area and providing elk habitat security in zone 1, which would also benefit the grizzly bear population.

Consequences of management area allocations

Forestwide plan components are followed regardless of management area, as applicable. The management areas, their acreage, suitability, and their distribution may differ among the alternatives. The management areas under the no-action alternative (alternative A) are different than those under the action alternatives (alternatives B modified, C, and D), so a cross-reference of management areas was prepared for comparison purposes (see final EIS, volume 1, table 3, proposed management areas and equivalent 1986 forest plan management acres). The management areas for each alternative are displayed in figures 1-01 to 1-04 and are displayed by geographic areas for alternative B modified in the forest plan in figures B-19 through B-24. The Canada lynx section of (see section 3.7.5) describes the effects of specific management areas in detail; the effects to grizzly bears would be similar. The following sections discuss key management area differences related to grizzly bear habitat and management zones by alternative (see table 81 through table 84).

Alternative A

Table 81. Distribution of alternative A management areas in grizzly bear management zones

Management area	Recovery zone/primary conservation area	Zone 1, Salish demographic connectivity area	Zone 1, outside demographic connectivity area
1a Designated wilderness	50%		< 1%
1b Recommended wilderness	5%		
2a Designated wild and scenic rivers	1%		
2b Eligible wild and scenic rivers	1%		
3a Administrative areas	< 1%		< 1%
3b Special areas	< 1%		
4a Research natural areas	< 1%	6%	
4b Experimental and demonstration forests	< 1%		
5a, 5b, 5c, 5d Backcountry	17%	4%	8%
6a General forest low-intensity vegetation management	3%	10%	7%
6b, 6c General forest medium- and high-intensity vegetation management	23%	80%	84%
7 Focused recreation areas	< 1%	1%	1%

Under the 1986 forest plan, one management area (management area 11) specifically emphasizes management for grizzly bears in the Trail Creek, Bunker Creek, and Swan/Clearwater Divide areas. This management area has a goal to maintain or enhance grizzly bear habitat by implementing appropriate management and investment activities and controlling public access. This management area also has a goal to have about 60 percent open and 40 percent security cover, with good geographic distribution of burns, meadows, riparian areas, ridgetops, shrubfields, sidehill parks, scree and talus, and timber. This alternative has less recommended wilderness (management area 1b) than alternatives B modified or C but

more than alternative D. Wilderness (management area 1a) and recommended wilderness (management area 1b) would provide the highest levels of habitat security (see figure 1-38; sections 3.14 and 3.15 for more details). There would be no commercial timber harvest in wilderness or recommended wilderness. These areas currently have and are anticipated to continue to have high levels of successional stage and habitat diversity, primarily provided by natural ecosystem processes.

This alternative has the highest amount of medium- to high-intensity general forest vegetation management in the primary conservation area. In zone 1, the majority of lands is also in general forest management area 6b or 6c. These management areas currently have and would continue to have high levels of successional stage diversity, primarily provided by timber harvest, fuels reduction, and thinning. Under alternative A, management area 7 (focused recreation areas) includes areas such as Whitefish Mountain Resort, Blacktail Mountain Ski Area, three groomed Nordic ski areas, the Blacktail Wild Bill motorized trail system, the Cedar Flats and Hungry Horse off-highway vehicle areas, and several developed campgrounds. Since 1986, many of these areas have been managed as grizzly bear management situation 3 (where grizzly bear habitat maintenance and improvement are not management considerations) or they are outside the recovery zone/primary conservation area.

Alternative B modified

Table 82. Distribution of alternative B modified management areas in grizzly bear management zones

Management area	Recovery zone/primary conservation area	Zone 1, Salish demographic connectivity area	Zone 1, outside demographic connectivity area
1a Designated wilderness	50%		< 1%
1b Recommended wilderness	9%		
2a Designated wild and scenic rivers	1%		
2b Eligible wild and scenic rivers	1%	< 1%	1%
3a Administrative areas	< 1%		< 1%
3b Special areas	< 1%	< 1%	< 1%
4a Research natural areas	< 1%	6%	
4b Experimental and demonstration forests	< 1%	5%	
5 a, 5b, 5c, 5d Backcountry	14%		< 1%
6a General forest low-intensity vegetation management	6%	1%	3%
6b, 6c General forest medium- and high-intensity vegetation management	17%	86%	84%
7 Focused recreation areas	2%	1%	12%

Under alternative B modified, much of the acreage that is grizzly bear habitat management area 11 in Trail Creek and Bunker Creek (under the 1986 forest plan) is included in recommended wilderness (management area 1b). Management of wilderness (management area 1a) and recommended wilderness (management area 1b) would provide the highest levels of habitat security for grizzly bears (see figure 1-39 and sections 3.14 and 3.15 for more details). There would be no commercial timber harvest in wilderness or recommended wilderness. These areas currently have and are anticipated to continue to have high levels of successional stage and habitat diversity, primarily provided by natural ecosystem processes. Prescribed fire may also be used to achieve desired conditions, such as restoration of whitebark

pine. Under this alternative, the area along the Swan-Clearwater divide that is in management area 11C under the 1986 forest plan is in management area 6a or 6b. Similar to management area 11C, vegetative manipulation including timber harvest and prescribed burning would occur in this area (and GA-SV-DC-09 emphasizes habitat connectivity in this area).

In zone 1, the majority of lands are in management area 6b or 6c (general forest medium- or high-intensity vegetation management). These areas currently have and are anticipated to continue to have high levels of successional stage diversity, primarily provided by timber harvest, fuels reduction, and commercial thinning. In order to place more emphasis on demographic connectivity than for alternatives A or D, a continuous area of management area 6b is designated in the Salish demographic connectivity area along the north and west boundary of the Tally Lake Ranger District, contiguous with a research natural area that is unroaded (management area 3b).

Focused recreation areas (management area 7) are more extensive in alternatives B modified and D than the other alternatives (see section 3.10 for more details). A variety of recreation activities are discussed for this management area, as specified in the geographic area sections of the plan (chapter 4). Recreational uses may be more concentrated in management area 7, so there would be a greater risk of grizzly bear disturbance or displacement than under alternatives A or C, but it is also likely that that human activities would be more predictable, which could allow grizzly bears to avoid people (see the “Affected environment” section for more details). Recreation uses and grizzly bear habitat in management area 7 areas are highly variable, so it is difficult to anticipate effects at the programmatic level. Projects would continue to be evaluated during site-specific NEPA analysis.

Alternative C

Table 83. Distribution of alternative C management areas in grizzly bear management zones

Management area	Recovery zone/primary conservation area	Zone 1, Salish demographic connectivity area	Zone 1, outside demographic connectivity area
1a Designated wilderness	50%		< 1%
1b Recommended wilderness	23%	6%	< 1%
2a Designated wild and scenic rivers	1%		
2b Eligible wild and scenic rivers	1%	< 1%	1%
3a Administrative areas	< 1%		< 1%
3b Special areas	< 1%	< 1%	< 1%
4a Research natural areas	< 1%		
4b Experimental and demonstration forests	< 1%	5%	
5a, 5b, 5c, 5d Backcountry	6%		< 1%
6a General forest low-intensity vegetation management	9%	22%	4%
6b,c General forest medium- and high-intensity vegetation management	9%	66%	89%
7 Focused recreation areas	1%	1%	6%

Under alternative C, the highest amount of acreage of the grizzly bear habitat management areas (management area 11 in the 1986 forest plan) in Trail Creek and Bunker Creek would be included in recommended wilderness (management area 1b). The Le Beau Research Natural Area in the Salish

demographic connectivity area would also be recommended wilderness. Wilderness (management area 1a) and recommended wilderness (management area 1b) would provide the highest level of habitat security. This alternative has the largest amount of recommended wilderness, which would not be suitable for motorized use or mechanized transport (see figure 1-40 and section 3.15 for more details). These areas currently have and are anticipated to continue to have high levels of successional stage and habitat diversity, primarily provided by natural ecosystem processes.

This alternative has the lowest amount of medium- or high-intensity vegetation management (management areas 6b and 6c). In order to place more emphasis on demographic connectivity, a continuous area of management area 6a is designated in the Salish demographic connectivity area along the north and west boundary of the Tally Lake Ranger District, contiguous with a research natural area that is unroaded (management area 3b) and the area along the Swan-Clearwater divide that is in management area 11C under the 1986 forest plan is in management area 6a or 5.

In comparison to alternatives B modified and D, alternative C would have less focused recreation area (management area 7), particularly along the southern end of the Whitefish Range. Compared to alternatives B modified and D, there would also be less management area 7 across the Forest (see section 3.10 for more details). Nonmotorized recreational uses would continue to occur across the Forest as these uses are generally not restricted, but there would likely be less emphasis on increasing recreation opportunities in frontcountry areas. Recreation uses and grizzly bear habitat in management area 7 areas are highly variable, so it is difficult to anticipate effects at the programmatic level. Projects would continue to be evaluated during site-specific NEPA analysis.

Alternative D

Table 84. Distribution of alternative D management areas in grizzly bear management zones

Management area	Recovery zone/primary conservation area	Zone 1, Salish demographic connectivity area	Zone 1, outside demographic connectivity area
1a Designated wilderness	50%		< 1%
1b Recommended wilderness			
2a Designated wild and scenic rivers	1%		
2b Eligible wild and scenic rivers	1%	< 1%	1%
3a Administrative areas	< 1%		< 1%
3b Special areas	1%	< 1%	< 1%
4a Research natural areas	< 1%	6%	
4b Experimental and demonstration forests	< 1%	5%	
5a, 5b, 5c, 5d Backcountry	22%		< 1%
6a General forest low-intensity vegetation management	5%	1%	3%
6b, 6c General forest medium- and high-intensity vegetation management	17%	86%	84%
7 Focused recreation areas	2%	1%	12%

Alternative D has no recommended wilderness (management area 1b) and more inventoried roadless acres in a variety of backcountry management areas (management area 5) (see figure 1-41 and sections 3.14 and 3.15 for more details). Under alternative D, much of the grizzly bear habitat in Trail Creek and Bunker Creek that is designated as management area 11 in the 1986 forest plan is in management area 5a,

backcountry nonmotorized year-round. Mechanized transport would be the least limited under alternative D because there would be no recommended wilderness. These management areas currently have and are anticipated to continue to have high levels of successional stage diversity, primarily provided by natural ecosystem processes.

This alternative has about the same amount of general forest medium- and high-intensity vegetation management areas (management areas 6b and 6c) as alternative B modified. These areas currently have and are anticipated to continue to have high levels of successional stage diversity, primarily provided by timber harvest, fuels reduction, and commercial thinning.

Under alternative D, focused recreation areas (management area 7), are similar to those in B modified (see section 3.10 for more details). A variety of recreational activities are discussed for this management area, as specified in the geographic area sections of the plan (chapter 4). Recreational uses may be more concentrated in management area 7, so there would be a greater risk of grizzly bear disturbance or displacement than under alternatives A or D, but it is also likely that human activities would be more predictable. Recreation uses and grizzly bear habitat in management area 7 areas are highly variable, so it is difficult to anticipate effects at the programmatic level. Projects would continue to be evaluated during site-specific NEPA analysis.

Adequacy of plan components for the grizzly bear

The 2012 planning rule requires the Forest to determine whether or not the plan components provide the ecological conditions necessary to contribute to the recovery of federally listed threatened and endangered species that occur within the plan area (36 CFR 219.9(b)(1)). Key ecosystem characteristics for the grizzly bear are a mosaic of habitats that provide food, cover, habitat security, and connectivity. Alternative B modified has plan components, including standards and guidelines, to maintain, improve, and restore ecological conditions within the plan area to contribute to grizzly bear population recovery. In providing such plan components, the Forest has coordinated with other Federal, State, tribal, and private land managers who have management authority over lands relevant to the NCDE grizzly bear population (36 CFR § 219.9).

Habitat in the primary conservation area/recovery zone would be managed so that it serves as a source area with continual occupancy by grizzly bears. Ecosystem and species-specific plan components in the forest plan would maintain baseline habitat conditions in the recovery zone/primary conservation area relative to motorized access and livestock grazing, would limit increases in developed recreation sites designed and managed for overnight use, and would coordinate vegetation management and mineral development to contribute to recovery of the NCDE grizzly bear population. While meeting the requirements of the 2012 planning rule (36 CFR §§ 219.8 and 219.9), the plan must provide for ecosystem services and multiple uses, including outdoor recreation, range, timber, watershed, wildlife, and fish. Plan components for the grizzly bear have been integrated with plan components for ecosystem services and multiple uses (36 CFR § 219.10). The impacts of logging, mining, livestock grazing, and many forms of recreation in grizzly bear habitat can be mitigated through well-designed management programs (USFWS, 1993, p. 22). As stated in the draft Grizzly Bear Conservation Strategy (USFWS, 2013c):

> The available habitat for bears is determined largely by people and their activities. Human activities are the primary factor impacting habitat security. Human activities and the social structure and relationships among resident bears are the two major influences on the accessibility of available foods for bears. The question of how many grizzlies can live in any specific area is a function of overall habitat productivity (e.g., food distribution and abundance), the availability of habitat components (e.g., denning areas, cover types), the levels and types of human activities,

> grizzly bear social dynamics, learned behavior of individual grizzly bears, and stochasticity. Because carrying capacity in such an omnivorous and opportunistic species can vary annually and even day to day, there is no known way to deductively evaluate habitat components to calculate the maximum number of grizzly bears a landscape can support. Therefore, controlling human-caused mortality, monitoring both population and habitat parameters, and responding when necessary with adaptive management (Walters and Holling 1990) are the best ways to ensure a healthy grizzly population. The USFWS defines adaptive management as "a method for examining alternative strategies for meeting measurable biological goals and objectives, and then, if necessary, adjusting future conservation management actions according to what is learned." This Conservation Strategy allows for modification of management practices in response to new or changing conditions. (p. 18)

The national forests comprise the majority (about 60 percent) of lands in the NCDE primary conservation area; thus, Forest Service management actions make an important contribution to the conservation of the NCDE grizzly bear population. However, because the grizzly bear is a wide-ranging species that uses a broad range of elevations and habitats during the year, the actions of other landowners in the NCDE are also very important, particularly with regard to mortality risk. Although the Forest does not have authority over all the stressors that may affect the grizzly bear, plan components would maintain, improve, or restore grizzly bear habitat. This would be accomplished by plan components, including standards and guidelines for diverse ecosystems, their integrity and connectivity, as detailed in sections 3.7.4, 3.7.5, and 3.7.6.

Cumulative effects

For a discussion of other national forests in the NCDE and cumulative effects to the grizzly bear, see section 6.5.5. The Forest Service would continue to cooperate with other Federal, State, local, and tribal agencies and private landowners in the NCDE to support coordinated grizzly bear conservation. The programmatic plan components in the forest plan are not based on the particular status of the grizzly bear. As a future signatory of the multi-agency final NCDE Grizzly Bear Conservation Strategy, the Forest Service is committed to doing its part and adopting a regulatory framework to support continued recovery of the NCDE grizzly bear population. The draft Grizzly Bear Conservation Strategy outlines monitoring requirements for multiple agencies. All action alternatives include grizzly bear monitoring items MON-NCDE-01 through 08, MON-WL-04, 09, 13, and 14, and numerous other monitoring items for aquatic and terrestrial ecosystems (see chapter 5 in the forest plan for more details). Broadscale monitoring of vegetation conditions would occur on the Forest, and broad-scale monitoring of grizzly bears is anticipated to occur in the NCDE, to inform the forest plan and project implementation in the future. Site-specific consultation with the USFWS would continue to occur, as needed, while the grizzly bear is a federally listed species.

Canada lynx

Introduction

On March 24, 2000, the USFWS published the final rule listing the contiguous United States distinct population segment of Canada lynx (*Lynx canadensis*) as a threatened species (65 FR 16052). In its analysis of threats to the species, the USFWS concluded that the single factor threatening the distinct population segment was the inadequacy of existing regulatory mechanisms, specifically the lack of guidance for conservation of lynx in national forest land and resource management plans and Bureau of Land Management land use plans. The USFWS prepared a recovery outline for the Canada lynx (USFWS, 2005b). A recovery outline is intended to provide interim guidance for consultation and recovery efforts until a formal recovery plan has been approved. No recovery plan has yet been developed

for the lynx. The recovery outline did not establish recovery goals but did identify a preliminary set of objectives and potential recovery actions for each area. Under the recovery outline, lynx habitat was stratified into core, secondary, and peripheral areas based on lynx occupancy, reproduction, and use as documented by historical and current records. Core areas were identified by the USFWS where there was strong evidence of long-term persistence of lynx populations, including both historical records of lynx occurrence over time and recent (within the past 20 years) evidence of presence and reproduction. The Forest is in a core area for Canada lynx, as identified by the USFWS (USFWS, 2005b, p. 21).

The Northern Rockies Lynx Management Direction (NRLMD) amended 18 forest plans of the national forests in Idaho, Montana, Utah, and Wyoming, including the Flathead National Forest (USDA, 2007d). The amendment adopted forest plan components applicable to vegetation management, livestock grazing, human uses, and linkage areas in order to conserve and promote the recovery of the lynx by reducing or eliminating adverse effects from land management activities on NFS lands while preserving the overall multiple-use direction in existing plans (Bertram, 2007; USDA, 2007a, 2007b; USFWS, 2007b). In March of 2007, the USFWS issued a biological opinion on the effects of the northern Rocky Mountains lynx amendment on the Distinct Population Segment of Canada lynx in the contiguous United States. In its 2007 biological opinion, the USFWS concluded that the level of adverse effects to lynx that may result from implementation of the NRLMD are not reasonably expected to either directly or indirectly appreciably reduce the likelihood of survival and recovery of the lynx distinct population segment in the wild by reducing the reproduction, numbers, or distribution of lynx (USFWS, 2007b, p. 75).

Methodology and analysis process

Canada lynx use of habitat within their home range is dependent upon vegetation condition. Lynx analysis units are landscape units that approximate the size of a female lynx annual home range and encompass all seasonal habitats. These may also contain areas of non-lynx habitat such as open meadows, especially in mountainous regions (ILBT, 2013). The existing vegetation condition of Canada lynx habitat is estimated for each lynx analysis unit on the Forest based upon past vegetation treatments and historic fire occurrence data. Past harvest and fire occurrence is based upon data listed in the Forest Service Activity Tracking System (FACTS) and the Forest Fire Atlas. These data sets are linked to a variety of spatial data sets so that past activities and the consequences of alternatives can be analyzed with GIS systems. See section 3.3.1 and the biological assessment (Kuennen et al., 2017) for more details on this and other aspects of the methodology and analysis process. The SIMPPLLE model is a spatially explicit model that uses logic pathways to predict how forests respond over time to succession, wildfires, and insect and disease risks based on cover types, size classes, crown closure, aspect, and slope (Chew, Moeller, & Stalling, 2012). This model was used for assessments of the natural range of variation and the potential future consequences of alternatives.

Information sources and incomplete or unavailable information

A synthesis of information on lynx biology and ecology that is relevant to lynx at the national scale can be found in *Ecology and Conservation of Lynx in the United States* (Ruggiero et al., 1999) and in the Canada Lynx Conservation Assessment and Strategy (ILBT, 2013). The final rule listing the lynx (65 FR 16052) and the notice of remanded determination (68 FR 40076) evaluated population status and threats for the contiguous United States distinct population segment. The recovery outline (USFWS, 2005b) provided preliminary recovery objectives and actions based on an understanding of current and historical lynx occurrence and lynx population dynamics in the contiguous United States.

At the Forest scale, some information used to assess lynx habitat is incomplete or unavailable. At any given point in time in a forest stand’s development, it may provide habitat in a suitable condition or it may provide lynx habitat in a temporarily unsuitable condition, depending upon the existing vegetation condition. Vegetation condition is in turn dependent upon time since disturbance (e.g., fire, timber

harvest) and the rate of forest succession. Satellite imagery and forest databases can be used to accurately classify recently harvested and burned areas, which helps to identify areas that provide lynx habitat in an unsuitable condition on a temporary basis (see NRLMD glossary in appendix A). However, satellite imagery is poor at detecting both the dense horizontal cover that provides snowshoe hare habitat in a multistory forest structure, which is an important feature of lynx foraging habitat, and downed woody material for denning habitat. Therefore, no forestwide estimates are made for these components of lynx habitat. During site-specific planning, habitat types used for the modeling and mapping of lynx habitat are verified and refined and lynx habitat is further characterized to estimate the amount and distribution of foraging and denning habitat components.

Some commenters on the draft forest plan asked the Forest to use Kosterman's (2014) thesis to inform changes in management of lynx and lynx habitat. Although the Forest considered her findings in a general sense in its description of desired conditions, the parameters and metrics that Kosterman used do not directly correlate to Forest Service vegetation inventory data. Kosterman and Rocky Mountain Research Station scientists are working to refine her lynx habitat classification and publish results in a peer-reviewed scientific journal. Some of the habitat classifications, analysis, or findings in the original thesis may change through that process. Forest Service staff will continue to work in partnership with the USFWS, the Rocky Mountain Research Station, and Kosterman to determine the appropriate application of her information to the management of Canada lynx habitat once it becomes available (Marten, 2016) (see also section 2.4.6).

The biological assessment (Kuennen et al., 2017), biological opinion (USFWS, 2017b), and references section of the final EIS provide references to a comprehensive set of scientific information about the Canada lynx, its habitat requirements, and its response to human activities. This information includes the best available scientific information as well as opposing scientific information. The following description of the affected environment provides a summary, in the context of the northern Rocky Mountains and critical habitat unit 3, which focuses on the Flathead National Forest and information that is necessary to understand the consequences of the alternatives. Canada lynx critical habitat is discussed in a separate section that follows the section on Canada lynx.

Analysis area and temporal scale of analysis

The period considered for the analysis of indirect effects of the alternatives is the anticipated life of the forest plan, which is about 15 years. However, because lynx habitat is dynamic, the anticipated vegetation and changing climate conditions were evaluated over longer time periods. The SIMPPLLE model was used to estimate the natural range of variation as it would have influenced forest ecosystems on the Flathead National Forest going back about 1,000 years (see sections 3.3, 3.8, and appendix 2). Effects of the alternatives on lynx habitat were modeled over the next 50 years by Ecosystem Research Group in 2015. Ecosystem Research Group modeled several scenarios for comparison purposes, including a warmer/drier climate over the next five decades (including acres burned due to anticipated climate changes as well as fire suppression into the future) (see appendix 3 for more details).

The area used for the analysis of indirect effects on Canada lynx is the Forest's modeled lynx habitat (see forest plan appendix A, figure A-01). Canada lynx habitat was initially mapped on the Flathead National Forest in 2000 using a specified set of criteria and biophysical attributes that were derived from remote sensing data and GIS modeling (Ruediger et al., 2000; Ruggiero et al., 1999; USDA, 2000b). The area of lynx habitat modeled and mapped by the Forest in 2000 was 1.73 million acres (USDA, 2007c, appendix C). Since 2000, the Forest has acquired additional lands providing lynx habitat. In 2013-2014, the Flathead National Forest initiated the planning process to revise its forest plan and conducted a review of the lynx habitat originally mapped on the Forest in 2000. The review indicated a need to update and refine mapped lynx habitat based on (1) new information from research concerning lynx populations,

distribution, habitat use, and prey species on the Forest; (2) improved vegetation classification data; and (3) improved GIS mapping, (4) changes in NFS lands. The updated map was published in the assessment of the Flathead National Forest (April 2014), in the draft forest plan (March 2015), and in the draft EIS (May 2016). The Flathead National Forest's updated estimate of lynx habitat is about 1.795 million acres (Kuennen et al., 2017). The modeling and mapping process used by the Forest is consistent with the definition of lynx habitat (Hanvey, 2016; ILBT, 2013) and is verified at the project level.

Lynx habitat on the Forest is further subdivided into lynx analysis units for the analysis of effects on Canada lynx (see figure 1-50). Lynx habitat within the USFWS Northern Rockies Geographic Area has been divided into lynx analysis units to facilitate analysis, management, and monitoring. Lynx analysis units on the Forest were reviewed and are consistent with guidance in the Canada Lynx Conservation Assessment and Strategy (ILBT, 2013):

> The size of the LAU [lynx analysis unit] reflects female home range size in the geographic unit. A sufficient amount of habitat must be present within the LAU to support a female lynx. For example, in the western United States, it appears that at least 26 km^2 (10 mi^2) of primary vegetation (e.g., spruce/fir) must be present. The arrangement of habitat within the LAU should take into consideration the daily movement distances of resident females. . . . Since the LAU represents a hypothetical female home range, and is the basis for analysis, it can be larger and contain more lynx habitat than an actual home range. (p. 87)

Geographic information system analysis of lynx analysis units on the Forest showed they contain at least 10 square miles of habitat capable of producing primary vegetation (e.g., spruce/fir forest), and this habitat within a lynx analysis unit is arranged considering the movement distances reported by Squires et al. (2013). Lynx analysis units on the Forest are in accordance with guidance provided in the Lynx Conservation Assessment and Strategy and the NRLMD. There are 109 lynx analysis units that are wholly or partially within the Flathead National Forest (see figure 1-50). These lynx analysis units encompass a total of about 2.4 million acres on the Forest. Changes to lynx analysis units may only be made if site-specific habitat information demonstrates it is needed and after review by the Northern Region. Changes have not been made to lynx analysis unit boundaries on the Flathead National Forest subsequent to their delineation in 2000.

The analysis area for effects on critical habitat is the Forest's lynx critical habitat (see figure 1-51). The analysis area for cumulative effects is the larger area of Canada lynx critical habitat unit 3 (USFWS, 2014d). This area is large enough to include the effects of activities on adjoining lands but not so large that it obscures effects on a biologically meaningful unit. This area selected for analysis of cumulative effects encompasses the area identified by Squires et al. (2013) as the current distribution of lynx in western Montana (based upon a compilation of telemetry data from 1998-2007 and monitoring detections confirmed with DNA analysis or remote camera photos. This area also encompasses telemetry locations of lynx captured on the Forest from 2009-2015). The cumulative effects analysis area is about 8.9 million acres in size that includes portions of the Flathead and Kootenai National Forests, the Seeley Lake and Lincoln Ranger Districts on the Lolo and Helena National Forests, and Glacier National Park. The Northern Rockies Geographic Area, a region encompassing 18 national forests and an estimated 18.5 million acres of lynx habitat in Montana, Idaho, Wyoming, and Utah, also provides context for the analysis of cumulative effects. Adjoining areas in Canada were also considered with respect to connectivity.

Affected environment—Canada lynx population, distribution, and status

The range of Canada lynx extends from Alaska across much of Canada (except for the coastal forests), with southern extensions into parts of the western United States, the Great Lakes region, and the

northeast. Lynx distribution is closely tied to the distribution of snowshoe hares and boreal forests (McKelvey, Aubry, & Ortega, 1999). The Forest is in the USFWS Northern Rocky Mountain region of the contiguous distinct population segment of Canada lynx.

Snowshoe hares are the primary winter prey of lynx in Montana (J. R. Squires & Ruggiero, 2007), as they are throughout the range of lynx (Aubry, Koehler, & Squires, 1999). Lynx are highly specialized predators of snowshoe hares, with unique adaptations that include a lightweight body frame and large paws that enable them to travel on top of deep snow. In their study of lynx winter diets in northwest Montana, Squires and others (2013) described 86 lynx kills that included 7 prey species. Snowshoe hares contributed about 96 percent of prey biomass, whereas red squirrels, the second most common prey, provided only about 2 percent of prey biomass (J. R. Squires, Ruggiero, Kolbe, & DeCesare, 2006).

Lynx do not occur everywhere within the range of snowshoe hares in the contiguous United States, as discussed in both Bittner and Rongstad (1982) and McCord and Cardoza (1982) (USFWS, 2014d). This may be due to inadequate abundance, density, the spatial distribution of hares in some places, the absence of snow conditions that would allow lynx to express a competitive advantage over other hare predators, or a combination of these factors (USFWS, 2014d). In the southern part of its range, the low densities of lynx populations are likely a result of naturally patchy habitat and lower densities of their snowshoe hare prey (Adams, 1959; Paul Carlo Griffin, 2004; Koehler, Hornocker, & Hash, 1979; Mills et al., 2005).

The lynx recovery outline (USFWS, 2005b) stratified lynx habitat into three categories: core, secondary, and peripheral. Core areas are places where long-term persistence of lynx and recent evidence of reproduction have been documented and where the quality and quantity of habitat provides for both lynx and snowshoe hare. The lynx recovery outline emphasized focusing conservation efforts on core areas to ensure the continued persistence of lynx in the contiguous United States. Six core areas were identified in the recovery outline, one of which is in northwest Montana/northeast Idaho. The Flathead National Forest is located entirely within the northwest Montana/northeast Idaho core area. Museum records, trapping data, and other information verify the historical occurrence of lynx in western Montana (McKelvey et al., 1999).

Squires and others have conducted extensive studies of Canada lynx in northwest Montana to determine their current distribution, stating,

> Our study area encompassed the occupied range of lynx within the northern Rockies as estimated from a compilation of lynx distribution data collected from 1998 to 2007. The study area border followed natural topographic and vegetative boundaries to generally encompass all forested regions with recent evidence of lynx presence, including all telemetry locations we documented for resident lynx from 1998 to 2007 (N = 81,523 locations); this study area represented our best estimate of the current distribution of lynx in western Montana. (J. R. Squires et al., 2013).

The study area delineated by Squires and others encompasses most of the Flathead National Forest, with the exception of the area west of Kalispell known as the Island Unit.

Canada lynx are known to be distributed throughout portions of the Flathead National Forest included in the study area delineated by Squires and others in 2013. During 2010–2015, 15 individual adult or subadult lynx were captured and fitted with radiotelemetry collars on the Flathead National Forest, confirming that the North Fork, Middle Fork, and South Fork of the Flathead River watersheds were occupied by lynx (Holmquist, 2015; L. E. Olson, 2015). Noninvasive sampling techniques have also been used to detect lynx on the Forest. In addition to areas where Squires and others had previously trapped lynx, this effort detected lynx in the Salish Mountains portion of the distribution area, based upon tracks

and DNA. A female lynx with two kittens was also photographed on the east side of Hungry Horse Reservoir (Curry et al., 2016; Swanson, 2017; SWCC, 2015).

Reproduction by Canada lynx has been studied in Montana. As reported in 2011 by Olson et al., in Montana, female lynx stayed in natal dens on average for 21 ± 17 days and subsequently used an average of 3 ± 2 maternal dens in a given year (ILBT, 2013). Nine female lynx exhibited roughly equal levels of activity from dawn to dusk when they had newborn to two-month-old kittens. Kittens are left alone at den sites while the female lynx hunts, as noted by Slough in 1999, Moen et al. in 2008, and Olson et al. in 2011 (ILBT, 2013). In northwest Montana, litter sizes vary from one to five kittens per litter, with two or three kittens being the most frequently observed (Kosterman, 2014).

The most commonly reported causes of Canada lynx mortality are (1) starvation, especially of kittens, as reported by Quinn and Parker in 1987, Koehler in 1990a, and Vashon et al. in 2012 (ILBT, 2013) and (2) human-caused mortality, including trapping and shooting (addressed in Ward and Krebs in 1985, Bailey et al. in 1986, and Moen in 2008) (ILBT, 2013). Predation of lynx by mountain lion, coyote, wolverine, gray wolf, fisher, and other lynx has been confirmed by Berrie in 1974, Koehler et al. in 1979, Poole in 1994, Slough and Mowat in 1996, O'Donoghue et al. in 1997, Apps in 2000, Squires and Laurion in 2000, O'Donoghue et al. in 2001, and Vashon et al. in 2012 (ILBT, 2013). Squires and Laurion (2000) reported that two out of six mortalities of radio-collared lynx in Montana were due to mountain lion predation.

In the southern part of the range of Canada lynx , which includes western Montana, lynx population density and productivity are lower than in the northern part of its range; harvest may be an additive source of mortality, and lynx may be highly vulnerable to overexploitation (Koehler, 1990). State wildlife management agencies regulate the trapping of furbearers. Trapping and snaring of lynx is currently prohibited across the contiguous United States. Incidental trapping or snaring of lynx is possible in areas where regulated trapping for other species, such as wolverine, coyote, fox, fisher, marten, bobcat, and wolf, overlaps with lynx habitats (J. R. Squires & Laurion, 2000). A trapped lynx can be released, but there is potential for accidental injury or mortality (Kolbe, Squires, & Parker, 2003). The magnitude of illegal shooting of lynx is unknown. Incidents have been reported throughout the range of the species. Devineau et al. (2010) reported a substantial number of shootings of lynx during the first 10 years after their reintroduction into Colorado (14 known shootings and 5 probable shootings out of 102 known mortalities). Aubry et al. (1999) hypothesized that human-caused mortality such as illegal or incidental harvest could significantly reduce lynx population numbers in southern regions. The state wildlife agencies have taken actions to reduce incidental or illegal trapping and shooting.

Montana Fish, Wildlife and Parks has implemented special regulations to reduce the likelihood of the incidental capture of lynx. A recent court settlement with MFWP established a lynx protection zone (which includes the Flathead National Forest) that restricts the size and placement of traps and snares that can inadvertently catch lynx and requires bobcat trappers to check their traps at least once every 48 hours. The use of fresh meat or feathers as bait is now prohibited in the lynx protection zone. Since the implementation of these changes to the trapping regulations in 2008, the amount of accidental trapping of lynx has decreased. A total of three lynx were captured during the eight license years 2008-2015, and all were released uninjured. Overall, lynx "take" during 2000-2007 averaged 1.6/year, and during 2008-2015, when more protective regulations were in place, they averaged 0.4/year, a fourfold decrease (MFWP, 2016a). Montana Fish, Wildlife and Parks also provides education and outreach programs aimed at preventing the illegal shooting of lynx. The magnitude of illegal shooting of lynx is unknown. Incidents have been reported throughout the range of the species. State wildlife agencies work to reduce lynx mortality by disseminating information to the public and providing hunters with guides to the identifying characteristics of lynx.

The USFWS convened an expert workshop in October 2015 to improve understanding of the status of the contiguous U.S. distinct population segment of Canada lynx (Bell et al., 2016). The workshop was organized by a lynx species status assessment team consisting of USFWS and U.S. Geological Service staff who developed and piloted implementation of the species status assessment framework as well as by other biologists who were working on lynx throughout the range of the distinct population segment. The results of the workshop contributed to the species status assessment report, which compiled and summarized the empirical data, published literature, and expert input. This information is being used by USFWS to develop a final species status review and inform recovery planning direction, classification decisions, and other determinations required by the Endangered Species Act (Bell et al., 2016).

In the geographic unit identified in the species status assessment workshop's final report that encompasses northwest Montana/northeastern Idaho, experts concluded there would be an initially high probability of Canada lynx persistence until 2025 and decreasing probability after that due to projected climate change. For the geographic unit encompassing northwest Montana/northeast Idaho, experts predicted near-term (year 2025) persistence probability ≥ 95 percent and mid-century persistence = 70 percent to 100 percent (median = 90 percent), with increasing uncertainty over time (Bell et al., 2016).

An important consideration for the long-term persistence of lynx in the northern Rockies is maintaining connectivity with lynx populations in Canada (ILBT, 2013). Squires et al. (2013) combined resource selection, step selection, and least-cost path models to predict movement corridors for lynx in the northern Rockies. The models identified a few corridors that extend south from the international border with Canada. Currently, there is no evidence that there are significant impediments to lynx movements or that genetic isolation is occurring in western Montana (J. R. Squires et al., 2013). Lynx are managed provincially in Canada, with each province responsible for its own management program, harvest (trapping) policies, and conservation strategies. Lynx are considered secure in all provinces except New Brunswick and Nova Scotia (Bell et al., 2016).

Affected environment—Canada lynx habitat

The "Affected environment" section for Canada lynx habitat discusses elements that are important to lynx, including vegetation, deep fluffy snow, habitat connectivity, and their current condition on the Forest. For the forest plan, habitats across the Flathead National Forest have been grouped into broad potential vegetation types. These are groupings based upon habitat types (Pfister et al., 1977). Potential vegetation types serve as a basis for describing certain ecological conditions across the Forest and are useful in understanding the various ecosystems and their potential productivity, natural biodiversity, and the kinds of processes that sustain these conditions. Potential vegetation types are based upon vegetation potential, whereas dominance types describe existing vegetation.

Across their range, lynx typically occur in boreal and subalpine coniferous forests dominated by subalpine fir and spruce in landscapes with gentle topography (J. R. Squires et al., 2013). On the Flathead National Forest, the cool-moist and cold potential vegetation types are capable of growing subalpine fir and Engelmann spruce, but the dominance type changes over time due to factors such as fire, insects and disease, vegetation management, and forest succession (see appendix D of the forest plan for more details). Forests with a subalpine fir/spruce dominance type currently occur on an estimated 43 percent (90 percent confidence interval = 39-47 percent) of all Flathead NFS lands (R1 Summary Data Base, Forest Inventory and Analysis (USDA, 1980)). Both tree species may also be found in other forest dominance types because they are very shade tolerant and commonly occur in mid- and understory tree canopy layers with western larch, lodgepole pine, and/or Douglas-fir in the overstory.

During the winter and early spring, availability of den sites is important to lynx. Boutros and others in 2007 as well as Moen et al. in 2008 found that coarse downed woody material provides kittens with

protection from extreme temperatures, precipitation, and predators (ILBT, 2013). Lynx dens in northwest Montana are typically found in multistory stands of spruce-fir forests with dense horizontal cover and abundant coarse downed woody material. Squires and others found that 80 percent of dens were in mature forest stands and 13 percent in mid-seral, regenerating stands (J. R. Squires, DeCesare, Kolbe, & Ruggiero, 2008). Young stands that were either naturally sparse or mechanically thinned were seldom used for denning. Denning habitat is generally abundant across the coniferous forest landscape of northwest Montana and is not likely to be limiting for lynx (J. R. Squires et al., 2008; J. R. Squires, Decesare, Kolbe, & Ruggiero, 2010; J. R. Squires et al., 2006).

In Montana, Squires and others (2010) reported that horizontal cover was denser at lynx kill sites than along travel paths. They further reported that lynx kill sites were associated with a higher proportion of spruce-fir overstory than lodgepole pine overstory and that neither snow depth nor snow penetrability influenced lynx kill sites. Hodges reported that snowshoe hare abundance is also positively associated with dense horizontal cover (Hodges, 2000). In western Montana, Griffin and Mills (2007) found the highest snowshoe hare densities in regenerating conifer stands that had a high density of saplings (defined as more than 2,267 stems/acre) and in mature multistory conifer stands that had abundant saplings. Hare abundance was negatively affected in stands treated with traditional precommercial thinning prescriptions that reduced stem densities to about 263-526 stems/acre (Paul C. Griffin & Mills, 2007).

Squires and others (2010) compared lynx resource selection in summer vs. winter, including lynx success in capturing snowshoe hares, their primary prey. During winter, lynx foraged primarily in mid- to high-elevation forests (4,134–7,726 feet) composed of mature, large-diameter (greater than about 11 inches d.b.h.) trees. In a comparison of use versus variability within a lynx home range, Squires and others found that lynx selected forests with relatively denser horizontal cover, more abundant hares, and deeper snow. The preferred forests had a multistory structure with dense horizontal cover provided by the young trees in the understory and conifer boughs touching the snow surface, which could support snowshoe hare populations at varying snow depths throughout the winter. Engelmann spruce and subalpine fir were the dominant tree species in forests used by lynx, but these forests contained a mix of other conifer species, including lodgepole pine, western larch, and Douglas-fir. Squires stated that the primary limiting factor for Canada lynx in northwest Montana appears to be suitable winter foraging habitat.

During the summer months, lynx in Montana broaden their preferred habitat use to include more of the early-successional forest (stand initiation structural stage) with dense horizontal cover provided by abundant shrubs, spruce and fir saplings, and small-diameter trees (J. R. Squires et al., 2010). These conditions can occur in forests burned by wildfire, regenerated by insects or disease, or regenerated by timber harvest. Squires and others found that lynx used slightly higher elevations during the summer but, as in winter, were located below the alpine zone and above the low-elevation dry forests dominated by ponderosa pine. The alpine zone and low-elevation ponderosa pine forests were not modeled as potential lynx habitat on the Flathead National Forest.

Young regenerating stands (20-40 years old) can support high densities of snowshoe hares before growing into a structure that no longer provides the needed dense horizontal cover. A regular influx of this “early stand initiation stage” of forest succession (created by processes such as fire or vegetation management) can help to enhance snowshoe hare production. Cheng and others (2015) studied snowshoe hare densities in areas of Glacier National Park that were burned by wildfire in 1988 and 1994. Hare pellet densities in lodgepole pine stands were 10 times higher 17 years post-fire (at the time of their study) than in the 11-year post-fire forests or other mature forests. Their “best” model for habitat predicted that the mean pellet density for 17-year-old lodgepole forests equates to hare densities nearly three times the threshold believed necessary to support lynx populations. Among the continuous habitat parameters measured in the Cheng et al. study, only understory cover (at a height of 0 to 20 inches above the ground surface) and

percent canopy cover were identified as predictors of hare density. Mean pellet density increased slowly with understory cover up to 80 percent, above which pellet densities declined (Cheng et al., 2015). Mean pellet densities increased from 10 percent canopy closure to 70 percent canopy closure when other variables were held at typical values. Cheng and others (2015) stated that snowshoe hares' association with regenerating lodgepole pine forests is transient because these forests will eventually grow tall enough and dense enough to no longer provide the habitat conditions selected by snowshoe hares.

At the landscape scale, a mosaic of forest structure, from young regenerating to mature multistory stands, is recommended to provide for the habitat needs of lynx (ILBT, 2013). Kosterman collected field data on denning and offspring survival in northwest Montana from 1998–2012, studying the relationship between female lynx reproductive success and habitat composition/arrangement at the scale of a lynx home range on two national forests adjacent to the Flathead (Kootenai and Lolo). Connectivity of mature forest, percent composition of young regenerating forest, low perimeter-area ratio of young regenerating forest patches, and adjacency of mature to young regenerating forest types were the most important predictors for overall lynx reproductive success in her study areas (Kosterman, 2014).

Dynamics of snowshoe hare and lynx habitat on the Flathead National Forest

Historically, fire, insects, and disease have been the primary processes that have affected forest vegetation in lynx habitat, reverting the vegetation to an early stage of succession or creating openings within the forest canopy (USDA). Immediately after a disturbance, forest areas are not yet able to support snowshoe hares and lynx because of the lack of live trees and shrubs, so these areas are in a temporarily unsuitable condition. The NRLMD (USDA, 2007c) defines lynx habitat in an unsuitable condition as being in the stand initiation structural stage where trees are generally less than 10 to 30 years old and have not grown tall enough to protrude above the snow in winter. As a result, trees in this structural stage are too short or too open to provide dense seedling-sapling forage for snowshoe hares during winter, but the trees will become taller and denser as the forests go through vegetative succession.

As vegetation regrows after a disturbance, the burned or harvested areas first develop into summer hare habitat. Then, after approximately 20 years (the typical average time for the Forest), trees and some shrubs will have grown tall enough to have branches at the snow surface and be dense enough to provide winter food and cover for hares. During the next couple of decades, this stage of forest succession will likely continue to provide winter snowshoe hare habitat, but this depends upon the species composition and density of regenerating trees. As trees continue to grow, forests may move into the "stem exclusion" structural stage, where food for hares is lacking. In this stage, tree branches grow out of reach of the hares, tree crowns close, and understory trees and/or shrubs decline due to too much shade. The denser the regenerating forest stand, the faster trees such as lodgepole pine lose their lower live branches and grow out of reach of hares.

Subalpine fir is the indicated climax species across most of the Flathead National Forest. So, given enough time, these shade-tolerant species will eventually dominate. However, both subalpine fir and Engelmann spruce are intolerant of drought and fire due to their shallow roots, thin bark, and tree crowns that extend to the ground, making them susceptible to being killed by even low-severity fires. Though they may regenerate into the opening created by a fire, they have comparably slow growth rates and are soon overtopped by other early-successional species such as lodgepole pine or western larch. However, their shade tolerance allows them to persist indefinitely, and eventually, over many decades to centuries, they will dominate the site unless there is a fire event or other stand-replacing disturbance that re-initiates succession with early-successional species.

On the Forest, the prevalence of subalpine fir and spruce-dominated forests is closely tied to the frequency of fire. More frequent fires will reduce the presence and dominance of these species; long fire-

free intervals and/or the lack of a seed source of other species will favor their dominance. Forests dominated by subalpine fir and Engelmann spruce tend to support higher-severity fires due to the lower fire frequency, higher tree densities, multiple canopy layers, and greater litter depths and fuel loads typical in these stands. These stand-replacing fires make lynx habitat temporarily unsuitable. The multistory forest conditions that typically develop in subalpine fir and Engelmann spruce-dominated forests are also highly susceptible to damage from western spruce budworm. In contrast to stand-replacing wildfires, beetles may only kill some of the overstory trees, allowing the understory to respond.

Past disturbances and the natural range of variation

The USFS SIMPPLLE model (SIMulating Patterns and Processes at Landscape scaLEs) was used to model the natural range of variation for lynx habitat in a temporarily unsuitable condition. Ecosystem Research Group provided the Forest with an assessment of SIMPPLLE model outputs (see appendix 3). Figure 53 shows the natural range of variation going back about 1,000 years, for maximum, minimum, and average levels of lynx habitat in an unsuitable condition within the Forest's lynx analysis units, and compares that to the current level, projected back in time for comparison. Decade 1 on the x-axis represents 1,000 years ago and decade 101 represents the decade beginning with 2010.

As shown in figure 53, the acreage of lynx habitat in a temporarily unsuitable condition across the Forest fluctuated a great deal from decade to decade. Many factors (including weather, climate, ignition sources, available fuels, and fire suppression efforts) interact to influence the amount of acreage burned by wildfire in a given year. As shown in figure 53, the current average is estimated to be above maximum natural range of variation for some decades and below maximum natural range of variation for others. The current condition is estimated to be above the long-term average.

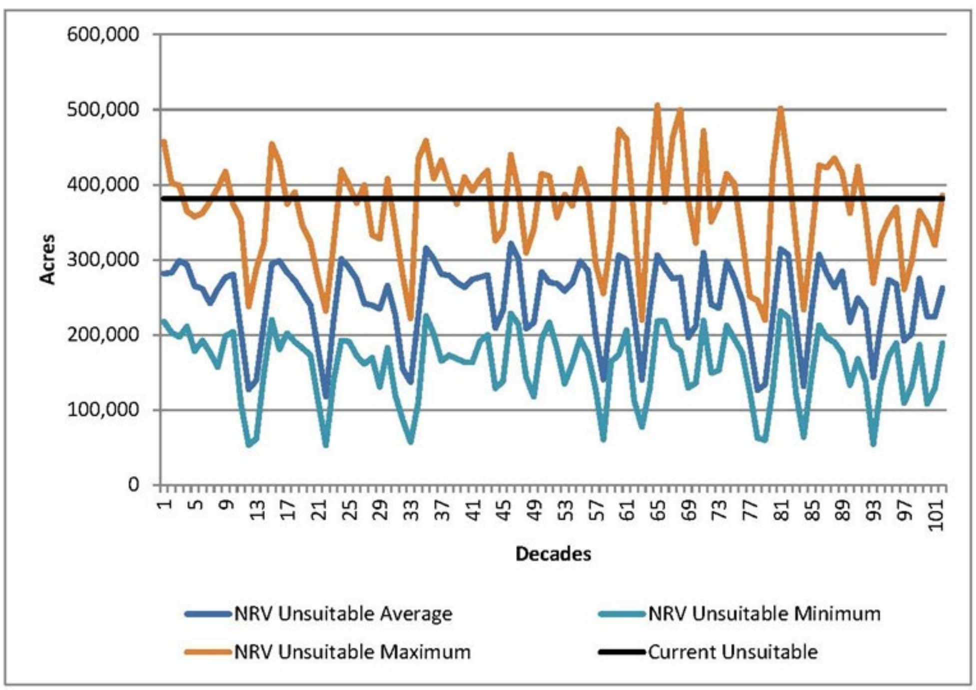

Figure 53. Average, maximum, and minimum levels of lynx habitat in a temporarily unsuitable condition modeled for the past 102 decades: natural range of variation (NRV) and current levels

Standard VEG S1 of the NRLMD limits vegetation management projects designed to regenerate forests if more than 30 percent of lynx habitat in a lynx analysis unit does not yet provide winter snowshoe hare habitat (is in a temporarily unsuitable condition). To provide context for NRLMD standard VEG S1, the natural range of variation for the number of lynx analysis units with more than 30 percent of lynx habitat in a temporarily unsuitable condition was also modeled for the Flathead National Forest. The model estimated that, at a maximum level of lynx habitat, 13.8 percent of Forest lynx analysis units would have had more than 30 percent of the lynx habitat in a lynx analysis unit in an unsuitable condition. At a minimum level, 4.0 percent of lynx analysis units would have had more than 30 percent of lynx habitat in an unsuitable condition, with a mean level of 8.6 percent.

Analysis of acreage burned on the Forest over the last 125 years or so also shows a large amount of variation. Figure 54 displays Forest acres burned from 1889-2015. The number of acres burned on the Flathead National Forest in 2016 totaled less than 500 acres. During the largest fire years, which occurred about a century ago, the actual area burned on the Flathead National Forest was estimated as about 140,000 acres in 1890, 432,500 acres in 1910, 150,000 acres in 1919, and 90,000 acres in 1929. From 1939 to 1987, very few acres were burned. Starting in 1988, there has been an increase in acres burned; the three largest recent fire years burned about 235,000 acres in 2003, 120,000 acres in 2008, and 100,000 acres in 2014.

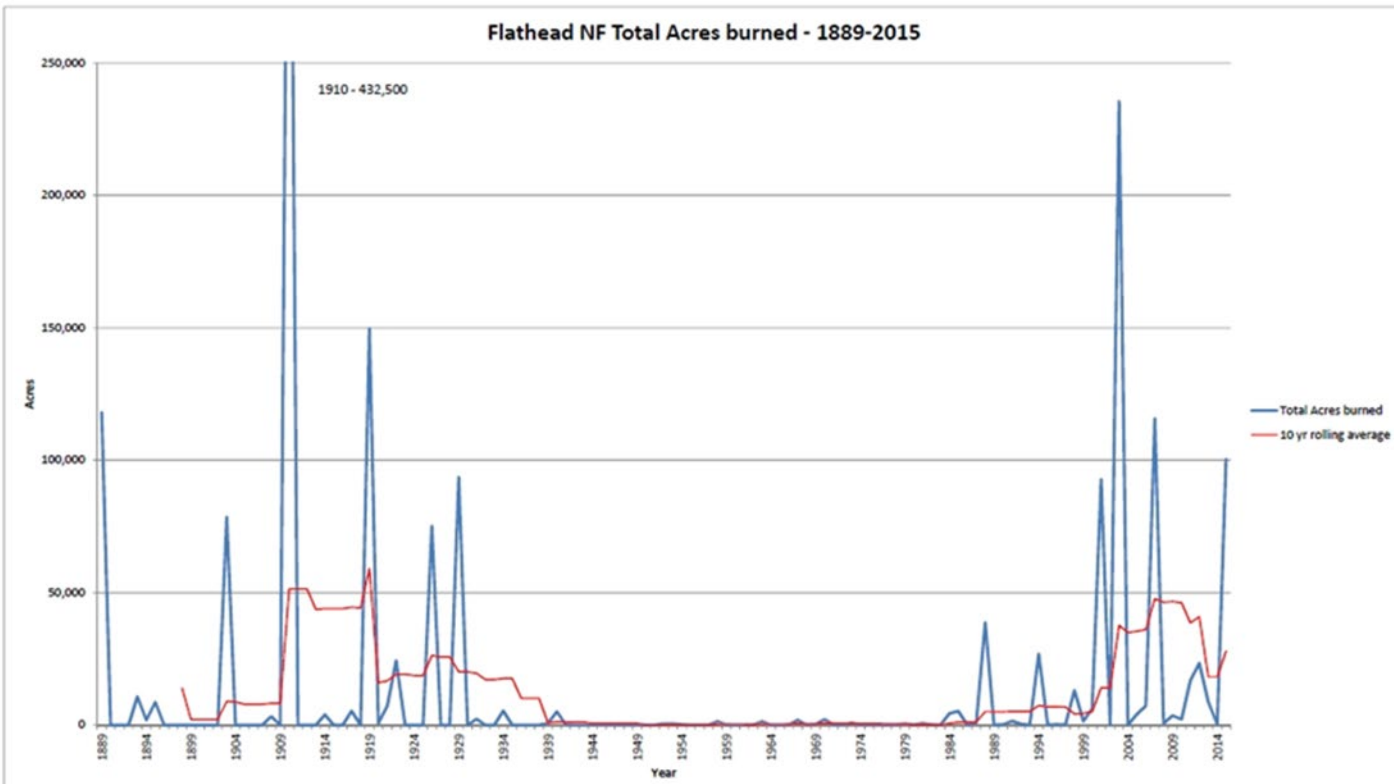

Figure 54. Flathead National Forest estimate of total acres burned, 1889-2015

Associated with the recent increase in the prevalence and extent of wildfires, about 381,336 acres (approximately 21 percent) of lynx habitat in lynx analysis units on NFS lands of the Forest were burned by wildfire within the last two decades. In the subalpine zone that provides lynx habitat, wildfires are typically stand-replacing events. For purposes of forestwide modeling, areas burned in the past 20 years are not yet providing snowshoe hare habitat in all seasons.

The SIMPPLLE model was also used to estimate the maximum and minimum amounts of the stand initiation structural stage (which may have provided hare habitat) that would have occurred historically due to naturally occurring fires. Modeling indicates that the stand initiation phase would have been a maximum of about 13 percent of all lynx habitat at the forestwide scale. There is a wide range of variation of about 180,000 acres between the maximum and minimum natural range of variation. This is because the stand initiation phase occurs for a relatively short period of time following major disturbances (e.g., stand-replacing fire); it typically begins once small trees and shrubs have regenerated but may only last another decade or two until the stand moves into stem exclusion condition (depending upon factors such as elevation and stem density). Some of the extremely dense lodgepole pine forests that regenerated after wildfires in 1910, 1919, and 1929 have stagnated in the stem exclusion stage and are lacking in food for snowshoe hare.

Since about 1950, the stand initiation structural stage has also been created in lynx habitat by vegetation management activities, including timber harvest. About 30,926 acres (approximately 2 percent) of lynx habitat in lynx analysis units was treated by regeneration harvest on NFS lands of the Flathead National Forest from 1994-2013. Observations suggest that, similar to the effects of wildfire, regeneration harvest units do not develop into stand initiation snowshoe hare habitat until 20 years post-harvest, on average. Telemetry locations of lynx on the Forest indicate that lynx begin to use the harvested stands for foraging once sufficient tree and shrub growth has occurred, and they will continue to frequent harvested stands if the stands develop a multistoried structure. In past harvest units in the cool-moist potential vegetation type of the Forest, tree density and composition often support lynx use. Tree density and composition are affected by natural factors as well as by post-harvest treatments (depending upon factors such as aspect, elevation, type of harvest, and whether the stand was precommercially thinned and/or planted with small trees after harvest).

Squires and others are conducting research evaluating how lynx and snowshoe hares respond to fire across a continuum of fire age and post-fire silvicultural treatment. A retrospective analysis of stand history (harvest prescription, fuels disposal, tree planting, precommercial thinning) is also underway to gain a better understanding of how silvicultural practices influence lynx habitat use, as determined using previously collected telemetry locations of lynx (J. Squires, personal communication to R. Kuennen, June 2016).

Existing vegetation conditions

To provide context, existing vegetation conditions are discussed here relative to NRLMD vegetation standards. Within the lynx analysis units on the Forest, an estimated 1.8 million acres provide potential lynx habitat where NRLMD management direction applies. The remainder of Forest lands occur at low elevations lacking in deep, fluffy snow or are inclusions that are not capable of producing boreal forest habitat (e.g., dry forest types, non-forested lands).

Under NRLMD standard VEG S1, if more than 30 percent of the lynx habitat in a lynx analysis unit is currently in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat, no additional habitat may be regenerated by vegetation management projects unless

- it meets criteria applicable to the wildland-urban interface (as discussed in the wildland-urban interface section) or
- a broad-scale assessment has been completed that substantiates different historic levels of stand initiation structural stages.

As of 2016, about 25 of the 109 (23 percent) lynx analysis units on the Flathead National Forest were modeled as having more than 30 percent of lynx habitat modeled as being in an early stand initiation

condition as a result of stand-replacing wildfires that does not yet provide winter snowshoe hare habitat (see table 85). Wildfire has clearly been the driver in creating substantial acreages on the Forest in a condition where they do not yet provide winter snowshoe hare and lynx habitat. None of the lynx analysis units are estimated to exceed VEG S1 due to regeneration harvest on NFS lands. Although a large percentage of some lynx analysis units is in the wildland-urban interface, as shown in table 85, the percentage of lynx habitat affected by regeneration harvest has generally been minor in comparison.

Under NRLMD standard VEG S2, no more than 15 percent of lynx habitat on NFS lands can be regenerated by timber management projects within a lynx analysis unit in a 10-year period unless it meets criteria applicable to the wildland-urban interface.

Table 85 displays the condition of lynx analysis units based on forestwide modeling. Since the forest plan was amended to include the NRLMD in 2007, none of the lynx analysis units has had more than 15 percent of its lynx habitat acres regenerated by timber management projects in the last decade. Only 5 of the 109 lynx analysis units have had 5 percent or more of the lynx habitat acres regenerated by vegetation management projects over the time period of 2007-2016.

Table 85. Existing conditions of lynx analysis units on the Flathead National Forest

Lynx analysis unit *	Percent of NFS lands in the lynx analysis unit	Acres of lynx habitat on NFS lands	Percent of lynx habitat on NFS lands affected by wildfire 1997-2016[a]	Percent of lynx habitat on NFS lands affected by regeneration harvest 1997-2016[a]	VEG S2—percent of lynx habitat regenerated by timber management projects on NFS lands over the past 10 years[b]	Approximate percentage of lynx habitat on NFS lands in the wildland-urban interface[c]
Albino Necklace	99%	14,269	13%	None	None	None
Ashley Herrig	30%	6,660	None	5%	5%	87%
Babcock Creek	100%	11,665	8%	None	None	None
Bear Creek	96%	21,039	28%	< 0.5%	< 1%	52%
Bent Whitcomb	100%	21,268	63%	1%	None	4%
Big Prairie Cayuse	100%	11,042	49%	None	None	None
Big Salmon Lake	97%	22,216	46%	None	None	None
Black Bear Helen	100%	14,766	79%	None	None	None
Blacktail	79%	13,680	< 0.5%	6%	6	80%
Bond	82%	10,903	None	None	None	37%
Buck	68%	9,854	16%	None	None	61%
Bunker Creek	100%	23,273	45%	< 0.5%	<1%	None
Canyon	96%	23,578	45%	3%	None	16%
Challenge Granite	100%	17,419	18%	< 0.5%	< 1%	None
Clayton Anna	100%	16,183	66%	4%	None	None

Lynx analysis unit *	Percent of NFS lands in the lynx analysis unit	Acres of lynx habitat on NFS lands	Percent of lynx habitat on NFS lands affected by wildfire 1997-2016[a]	Percent of lynx habitat on NFS lands affected by regeneration harvest 1997-2016[a]	VEG S2—percent of lynx habitat regenerated by timber management projects on NFS lands over the past 10 years[b]	Approximate percentage of lynx habitat on NFS lands in the wildland-urban interface[c]
Coram Abbot	84%	6,653	none	None	None	37%
Cox Creek	100%	19,936	4%	None	None	None
Dirtyface Spruce	100%	13,023	5%	None	None	6%
Dolly Varden Creek	100%	24,864	14%	None	None	None
Doris Creek	100%	24,118	24%	3%	None	9%
Dryad Miner	99%	16,882	< 0.5%	None	None	None
Elk	77%	18,879	7%	7%	1%	29%
Emery Creek	100%	12,844	None	1%	None	2%
Essex Java	99%	14,052	15%	< 0.5%	< 1	29%
Evers Reid	73%	9,586	< 0.5%	10%	3%	82%
Felix Logan	100%	17,471	13%	None	None	None
Foolhen Danaher	100%	25,440	10%	None	None	None
Glacier	92%	21,066	40%	6%	2%	20%
Graves Forest	100%	21,221	8%	None	None	< 0.5%
Haskill Mount	76%	7,885	None	5%	2%	37%
Hay	90%	22,318	None	None	None	11%
Holbrook Bartlett	100%	29,119	47%	None	None	None
Holland	81%	8,294	None	3%	3%	53%
Hungry Horse Creek	100%	11,537	None	None	None	None
Hungry Picture	100%	18,561	30%	None	None	None
Kah Soldier	100%	15,288	9%	1%	1%	8%
Krause	85%	13,308	< 0.5%	None	None	50%
Lakalaho	100%	21,148	< 0.5%	None	None	18%
Lake Five	58%	2,745	None	None	None	99%
Lion	98%	10,950	< 0.5%	4%	None	None
Little Salmon Creek	100%	27,766	11%	None	None	None

Lynx analysis unit *	Percent of NFS lands in the lynx analysis unit	Acres of lynx habitat on NFS lands	Percent of lynx habitat on NFS lands affected by wildfire 1997-2016[a]	Percent of lynx habitat on NFS lands affected by regeneration harvest 1997-2016[a]	VEG S2—percent of lynx habitat regenerated by timber management projects on NFS lands over the past 10 years[b]	Approximate percentage of lynx habitat on NFS lands in the wildland-urban interface[c]
Lodgepole Creek	100%	21,319	4%	None	None	None
Long Cy	100%	21,494	23%	None	None	none
Lost	78%	12,365	12%	None	None	< 0.5%
Lost Jack Mid	100%	13,182	91%	None	None	None
Lost Tally	89%	9,590	None	4%	3%	99%
Lower Beaver	86%	16,661	< 0.5%	7%	1%	39%
Lower Big	99%	18,543	93%	< 0.5%	None	9%
Lower Coal	53%	13,968	58%	None	None	17%
Lower Good	84%	19,746	< 0.5%	6%	2%	56%
Lower Gordon Creek	100%	15,795	42%	None	None	None
Lower Griffin	93%	17,622	57%	6%	1%	25%
Lower Whale	94%	18,341	27%	3%	< 1%	22%
Lower White River	100%	17,902	38%	None	None	None
Lower Youngs Creek	100%	18,885	50%	None	None	None
Martin Stillwater	90%	15,804	None	5%	None	16%
Meadow	87%	7,248	41%	5%	1%	4%
Moccasin Nyack	92%	13,427	2%	< 0.5%	< 1%	64%
Moose	82%	11,102	None	1%	< 1%	48%
Mud Lake	100%	10,488	62%	None	None	None
Murray Canyon	100%	12,625	None	0.50%	< 1%	None
North Crane	78%	10,258	None	2%	None	65%
North Trail	85%	26,722	1%	< 0.5%	< 1%	25%
Pale Clack	100%	13,956	3%	None	None	None
Paola Ridge	92%	9,534	< 0.5%	2%	< 1%	48%
Peters Crossover	100%	17,925	None	None	None	None

Lynx analysis unit *	Percent of NFS lands in the lynx analysis unit	Acres of lynx habitat on NFS lands	Percent of lynx habitat on NFS lands affected by wildfire 1997-2016[a]	Percent of lynx habitat on NFS lands affected by regeneration harvest 1997-2016[a]	VEG S2—percent of lynx habitat regenerated by timber management projects on NFS lands over the past 10 years[b]	Approximate percentage of lynx habitat on NFS lands in the wildland-urban interface[c]
Piper	91%	18,696	< 0.5%	7%	< 1%	15%
Porcupine	63%	8,087	None	None	None	1%
Quintonkon Creek	100%	15,888	7%	< 0.5%	None	2%
Rapid Basin	100%	29,821	25%	None	None	None
Red Meadow	87%	21,956	None	None	None	27%
Schmidt	83%	9,677	None	None	None	52%
Shadow Dean	100%	27,399	24%	None	None	None
Sheppard	94%	21,352	80%	17%	12%	22%
Silvertip Creek	100%	12,540	35%	None	None	None
Slippery Bill	100%	12,587	14%	< 0.5%	< 1%	None
Soup	18%	2,351	None	None	None	None
South Cold	93%	17,989	< 0.5%	2%	< 1%	13%
South Crane	97%	13,938	None	3%	None	36%
South Firefighter	100%	10,726	None	3%	3%	None
South Trail Tepee	93%	20,236	76%	3%	< 1%	40%
South Woodward	94%	13,370	1%	3%	1%	8%
Spotted Bear Mountain	100%	20,943	53%	< 0.5%	None	1%
Squeezer	51%	10,759	2%	1%	None	None
Stadium Gorge	100%	25,091	13%	None	None	None
Stanton Grant	95%	16,800	None	1%	< 1%	51%
Stony Jungle	100%	17,700	61%	1%	< 1%	3%
Strawberry Creek	100%	16,688	27%	None	None	None
Sullivan Creek	100%	27,743	16%	1%	None	None
Teakettle	59%	6,868	1%	None	None	70%
Three Sisters Bungalow	100%	27,654	18%	None	None	None

Lynx analysis unit *	Percent of NFS lands in the lynx analysis unit	Acres of lynx habitat on NFS lands	Percent of lynx habitat on NFS lands affected by wildfire 1997-2016[a]	Percent of lynx habitat on NFS lands affected by regeneration harvest 1997-2016[a]	VEG S2—percent of lynx habitat regenerated by timber management projects on NFS lands over the past 10 years[b]	Approximate percentage of lynx habitat on NFS lands in the wildland-urban interface[c]
Trail Bowl	100%	24,727	78%	None	None	None
Twin Creek	100%	18,890	5%	< 0.5%	None	< 0.5%
Upper Beaver	96%	10,684	< 0.5%	< 0.5%	< 1%	< 0.5%
Upper Big	98%	18,039	24%	None	None	None
Upper Coal	93%	23,894	7%	< 0.5%	None	None
Upper Good	98%	28,384	15%	9%	5%	23%
Upper Gordon Creek	99%	12,638	5%	None	None	None
Upper Griffin	81%	15,844	5%	5%	4%	1%
Upper Logan	80%	17,893	< 0.5%	9%	5%	15%
Upper Trail	100%	15,404	None	None	None	None
Upper Whale	100%	21,775	< 0.5%	None	None	None
Upper White River	100%	12,521	24%	None	None	None
Upper Youngs Creek	100%	26,021	59%	None	None	None
Vinegar Moose	100%	21,481	10%	None	None	4%
West Columbia	87%	7,851	None	None	None	86%
Wheeler Creek	100%	15,087	None	None	None	14%
Wildcat Mountain	100%	15,831	20%	1%	None	None
Woodward	21%	3,743	None	1%	None	1%

a. It is assumed that forests burned by stand-replacing wildfire from 1997-2016 are not yet winter snowshoe hare habitat Acres burned by wildfire are estimates for comparison with standard VEG S1. Burned areas may include areas with previous regeneration harvest, so wildfire and regeneration percentages are not additive. These percentages are estimates based upon Forest-scale data and need to be verified at the project level.

b. Acres are based on the Forest Service Activity Tracking System database, which does not include decisions not yet implemented. This percentage is shown for comparison to standard VEG S2, which requires 15% or less in a 10-year period unless exempted for fuels reduction projects in the wildland-urban interface.

c. The wildland-urban interface is based upon community protection plans as displayed in the USFS GIS database (see figure 1-13).

* Shaded lynx analysis units are estimated to have more than 30 percent of lynx habitat that is not yet winter snowshoe hare habitat due to stand-replacing wildfire. Estimates need to be verified at the project level.

In its biological opinion on the NRLMD (USFWS, 2007b), the USFWS concluded that there was potential for incidental take to occur in lynx habitat, mostly due to the exemptions and exceptions to the vegetation standards, which could diminish the value of lynx habitat and thereby impair feeding and reproduction by adult female lynx and survival of kittens. Because of the difficulty of determining the incidental take of lynx, the USFWS used the total estimated acreage of the exemptions and exceptions as a surrogate measure. The amount of incidental take thus was anticipated to be represented by fuels treatments on up to 6 percent of lynx habitat across the entire northern Rockies analysis area over 10 years (729,000 acres) and by precommercial thinning for other resource benefits on up to 64,320 acres (less than 0.5 percent) of snowshoe hare habitat (lynx foraging habitat) over a 10-year period. The USFWS provided reasonable and prudent measures and terms and conditions in order to minimize incidental take. Standards VEG S1, VEG S2, VEG S5, and VEG S6 include an exemption for fuels treatments to protect communities at risk in lynx habitat within the wildland-urban interface. Such fuels treatments may not occur on more than 6 percent of lynx habitat on each national forest considered "occupied," as defined in the NRLMD, which limits fuels treatments to about 103,800 acres on the Flathead National Forest (USDA, 2007c). (For additional discussion of the wildland-urban interface, see the Canada lynx critical habitat section below.)

Annual monitoring and reporting is a requirement of the NRLMD biological opinion (USFWS, 2007b) in order to ensure that the level of incidental take is not exceeded. During the period 2007-2016, the Flathead National Forest used the exemption for fuel treatment projects in the wildland-urban interface on about 10,079 acres of lynx habitat, about 9 percent of the limit allowed under the NRLMD consultation incidental take statement and less than 1 percent of lynx habitat on the Forest. None of the lynx analysis units exceeded the VEG S2 standard of 15 percent in the last 10 years (see table 85 and table 86).

Standard VEG S5 also contains six listed exceptions that allow for precommercial thinning in lynx habitat to meet other specific resource objectives. VEG S6 contains several listed exceptions for vegetation management projects that reduce snowshoe hare habitat in multistory mature or late-successional forests. The estimated acres that would possibly be treated through precommercial thinning exceptions are shown in appendix K of the final EIS for the NRLMD. For the Flathead National Forest, the estimated number of acres to be thinned under the exceptions to the vegetation standards was 1,460 acres over a 10-year period (less than 0.1 percent of the lynx habitat on the Forest). During the same period, the Flathead National Forest had decisions for 940 acres (including 939 acres treated under the VEG S5 exceptions and 1 acre treated under VEG S6 exceptions; see table 86). The vast majority of thinning completed under the exceptions was of western white pine, in which 80 percent of the winter snowshoe hare habitat was retained as required by the standard. The allowable level of incidental take has not been exceeded for the northern Rockies analysis area (Conway & Hanvey, 2017) nor for the Flathead National Forest (table 86).

Table 86. Acres of lynx habitat on the Flathead National Forest treated with exceptions and exemptions to the forest plan vegetation standards

Habitat	Estimated acres in the 2007 NRLMD final EIS	Sum of acres with decisions for treatment
Lynx habitat outside the wildland-urban interface with decisions for precommercial thinning using the VEG S5 exceptions (only 1 acre was treated using the VEG S6 exceptions)	1,460 (over 10 years)	672 (2007-2017)
Lynx habitat inside the wildland-urban interface with decisions for treatment using the fuels reduction exemption	103,800 (cumulative)	10,385 (2007-2017)

Note. Some decisions have not yet been implemented.

Winter recreation

Under some conditions, ski resorts and motorized over-snow vehicle use may have detrimental effects on lynx. Winter activity associated with ski resorts, including skiing, ski-lift operation, and grooming of ski runs, may cause disturbance or displacement of individual lynx and may also affect prey availability. Effects to lynx from Montana's ski resorts were assessed in 2000 and 2001 after the Canada lynx was listed as threatened under the Endangered Species Act in 2000 (USDA-USDI, 2000; USFWS, 2001). In 2007, when consultation on the NRLMD occurred, the effects of ski areas and other types of winter recreation on lynx were further analyzed. The Flathead National Forest has two ski resorts—Whitefish Mountain Resort (formerly known as Big Mountain) and Blacktail Mountain Resort. About 3,100 acres of the Lakalaho lynx analysis unit is in the Whitefish Mountain Resort permit area. The Blacktail Mountain Resort is located in the Blacktail lynx analysis unit, and winter operations occur on about 600 acres of NFS lands. The effects of both of these resorts on lynx were addressed in biological opinions (USFWS, 2001, 2007b), and there has also been subsequent site-specific consultation (USFWS, 2013b). In its 2007 biological opinion, the USFWS determined that although individual lynx may be adversely affected by recreation development, the management direction in the NRLMD would reduce potential impacts at the landscape scale, thus preventing an appreciable reduction in the reproduction, numbers, and distribution of lynx. Since 2007, the Forest has consulted on the effects of projects within the Whitefish Mountain Resort, including consultation for Canada lynx critical habitat (USDA-USFWS, 2016; USFWS, 2007a, 2011b, 2013b, 2015). The Blacktail Mountain Resort is not in critical habitat.

In November 2006, the Flathead National Forest issued the decision for its motorized winter recreation plan, also known as amendment 24 to the forest plan. The decision clarified where, when, and under what conditions motorized over-snow vehicles are allowable on the Flathead National Forest. The specific areas and routes that are suitable for motorized over-snow vehicle use are identified on maps that were incorporated into the forest plan (see figure 1-46). Under this decision, about 32 percent of lynx habitat on the Forest is open to motorized over-snow vehicle use or is in cross-country ski areas where trails are groomed. Across the Forest, there are about 1,098 miles of routes, in lynx habitat, open to motorized over-snow vehicle use at various times throughout the year, snow conditions permitting.

In their March 3, 2006, biological opinion on amendment 24 (USFWS, 2006b), the USFWS concurred with the Flathead National Forest's determination that the proposed Federal action was not likely to adversely affect the Canada lynx. The USFWS based their determination on (1) the proposal's compatibility with the Lynx Conservation and Assessment Strategy, (2) snow compaction that would occur in areas and routes remaining open for snowmobiling, (3) a decrease of more than 300,000 acres in the overlap between modeled lynx habitat and areas open to snowmobiling, (4) a decrease of about 220 miles in routes open for snowmobiling through lynx habitat, (5) the fact that no new snowmobile areas or routes would be opened under amendment 24, and (6) the possible indirect benefit of a reduced risk of inadvertent trapping. Lynx cannot be legally trapped in Montana, but trapping for other furbearer species does occur and is regulated by MFWP.

In the past, some researchers have speculated that compacted trails could indirectly affect Canada lynx by serving as travel routes that might enable competing predators (e.g., coyotes) to access snowshoe hare prey in lynx habitat (Murray & Boutin, 1991; Murray, Boutin, & O'Donoghue, 1994; Ruggiero et al., 1999). However, in its remanded determination (68 FR 40076), the USFWS (2003a) found no evidence of competition between lynx and other predators such as coyotes or, if competition exists, there is no evidence that it exerts a population-level impact on lynx. Therefore, the USFWS did not consider compacted trails to be a threat to lynx. Additionally, Kolbe, Squires, Pletscher, and Ruggiero (2007) completed a study of the effect of snowmobile trails on coyote movements in lynx habitat in northwest Montana. They reported that coyotes in their study area were primarily scavengers in winter (snowshoe hare kills composed only 3 percent of coyote feed sites). Furthermore, coyotes did not forage closer to

compacted snowmobile trails than random expectation, and the overall influence of snowmobile trails on coyote movements and foraging success appeared to be minimal (Kolbe et al., 2007). John Squires confirmed that Kolbe’s findings are the best available science for the Flathead National Forest (J. Squires, 2015; N. Warren, 2016b). However, because snow compaction results varied across the 18 national forests encompassed by the NRLMD, guideline HU G11 specified that designated over-the-snow routes or designated play areas should not be expanded outside baseline areas of consistent snow compaction unless designation serves to consolidate use and improve lynx habitat.

Squires and others (2010) reported on the effects of snowmobiling on Canada lynx in their Seeley Lake study area, south of the Forest. They were unable to quantify the number of snowmobiles using NFS roads in lynx home ranges, but one primary groomed trail was used by approximately 130 snowmobiles/day. They reported that they found no evidence that lynx selected areas away from NFS roads or groomed snowmobile trails during winter.

Habitat connectivity or linkage

The NRLMD identified lynx linkage areas, which are intended to maintain connectivity and allow for the movement of lynx between blocks of habitat that are otherwise separated by intervening non-habitat areas such as basins, valleys, and agricultural lands or places where habitat naturally narrows due to topographic features. These linkage areas were initially identified on the basis of expert opinion and were coarsely mapped at a broad scale. The group anticipated that linkage areas would be further refined as more information became available. Subsequently, Squires and others (2013) used telemetry data for 64 lynx monitored during 1998–2007 to create a broad-scale resource selection model that predicted probable lynx habitat and “putative movement corridors” across the species’ distribution in the northern Rocky Mountains. This analysis included quantification of the relative likelihood of lynx crossing major highways, one of the major hypothesized anthropogenic threats to lynx connectivity.

Squires et al. (2013) reported that the putative movement corridors they identified for lynx also showed reasonable correspondence with previously published models for wolverines (Michael K. Schwartz et al., 2009), for wolves (Oakleaf et al., 2006), and for grizzly bears (R. D. Mace et al., 1999). The Forest used the updated information published by Squires and others in 2013 in developing its plan components for habitat connectivity (Kuennen, 2017b).

Citing a 2002 article by Hansen et al., Squires and others (2013) stated, “Given that increased traffic and urbanization are projected for the northern Rockies, mitigation such as land purchases and conservation easements may be necessary to preserve connectivity among lynx populations” (p. 194). Private land development, especially along highway corridors in mountain valleys, may also fragment habitat and impede the movement of lynx. The Flathead National Forest does not have jurisdiction over State or Federal highways or lands on other ownerships (e.g., private, State, tribal). The Forest Service can support habitat connectivity through its management of NFS lands by encouraging or acquiring conservation easements along highways or cooperating in identifying appropriate locations for installation of highway crossing structures. Activities on other ownerships are discussed in the analysis of cumulative effects.

Environmental consequences—Canada lynx

The Lynx Conservation Assessment and Strategy (ILBT, 2013) identified anthropogenic influences that may affect lynx and lynx habitat, sorted into either the “upper tier” or the “lower tier.” The upper tier includes the anthropogenic influences that are of greatest concern to the conservation of the lynx: vegetation management, wildland fire management, fragmentation of habitat, and climate change. The lower tier of anthropogenic influences includes recreation (primarily snowmobiling), minerals and energy management, forest/backcountry roads and trails, grazing by domestic livestock, and mortality due to

incidental trapping or illegal shooting. It is thought that the lower-tier activities could affect individual lynx but are not likely to have a substantial effect on lynx populations; these are of less concern for conservation of the species (N. Warren, 2016b).

Key stressors

Key stressors are discussed in the "Affected environment" section and are summarized below.

Land management

Vegetation management activities such as timber harvest, fuels reduction, planting, and precommercial thinning can affect lynx habitat connectivity, forest composition and structure, the amount and distribution of dense horizontal cover providing snowshoe hare habitat, the amount and availability of large downed wood providing denning habitat, and the development of multistory hare habitat used by lynx for winter foraging (ILBT, 2013). Stand-replacing wildfires (the most common type within lynx habitat on the Forest) remove understory vegetation and tree canopy cover in the short term but can promote development of dense horizontal cover and recruitment of downed wood in the longer term. During the early post-fire period, a large stand-replacing fire may negatively affect the ability of a lynx to secure food resources within its home range. Lynx are known to use unburned patches in large, newly burned fire areas.

Fragmentation of habitat

Human-caused alterations of natural landscape patterns can reduce the total area of habitat, increase the isolation of habitat patches, and affect movement between those patches of habitat (ILBT, 2013). Habitat fragmentation may be permanent (e.g., converting forest habitat for residential developments or agricultural use) or temporary (e.g., creating a forest opening through timber harvest until trees and shrubs regrow).

Changing climate

The Lynx Conservation Assessment and Strategy did not provide management recommendations specific to changing climate, although it did identify several information needs. Possible effects on lynx as a result of future changes in climate have been hypothesized as (1) potential upward shifts in elevation or latitudinal distribution of lynx and their prey; (2) changes in the periodicity of when snowshoe hares change color or loss of snowshoe hare cycles in the north; (3) reductions in the amount of lynx habitat and associated lynx population size due to changes in precipitation, particularly snow suitability and persistence, and changes in the frequency and pattern of disturbance events (e.g., fire, insect outbreaks); (4) changes in the demography of lynx, such as survival and reproduction rates; and (5) changes in predator-prey relationships. There is a high level of uncertainty about some of these hypothesized effects.

Other stressors are as follows:

Recreation

Some kinds of recreational activities cause loss of habitat, behavioral responses to human disturbance, or snow compaction (ILBT, 2013). Permanent habitat loss can occur within ski resorts from the clearing of trees for permanent infrastructure. Changes in winter habitat can result from vegetation removal and grooming of ski runs. Some anecdotal information suggests that lynx are quite tolerant of humans, although this has not been well studied. A variety of behavioral responses may be expected from individual lynx and in different contexts (ILBT, 2013).

Minerals and energy

Impacts to lynx from minerals and energy activities could include the potential alteration or removal of lynx habitat, increased fragmentation, and the potential for human-caused mortality from high-speed traffic or high traffic levels on roads.

Forest/backcountry roads

Road construction results in a small reduction of lynx habitat by removing forest cover. On the other hand, if a road is closed, regrowth of dense vegetation may provide good snowshoe hare habitat, and lynx may use the roadbed for travel and foraging (Koehler & Brittell, 1990). Extensive backtracking studies in Montana found that lynx did not avoid gravel forest roads (J. R. Squires et al., 2010). Trails are typically narrow routes with a native surface; there is no information to suggest that trails have negative impacts on lynx (ILBT, 2013).

Livestock grazing

No existing research indicates that grazing or browsing by domestic livestock on Federal lands would reduce the snowshoe hare prey base or have a substantial effect on lynx (ILBT, 2013). However, it is possible that livestock browsing or grazing could reduce the forage and dense horizontal cover needed by snowshoe hares in some environments.

Mortality due to highways and high-speed forest roads

Mortalities of lynx due to vehicle collisions have been documented in Colorado (reintroduced animals on paved highways), in Minnesota (on paved highways), in Maine (on high-speed gravel roads), and in Montana (on highways). Collisions are unlikely to occur on NFS roads, which are traveled at slower speeds and have lighter traffic volumes than highways.

Mortality due to incidental trapping or illegal shooting of Canada lynx

Trapping, snaring, and shooting of lynx is currently prohibited in the contiguous United States. Lynx occasionally are captured in traps set for other species. A trapped lynx can be released, but there is a risk of injuries or unintended mortality, which is known to have occurred in Montana. Most trapping of other furbearer species occurs in winter.

Key indicators for analysis

Resource elements discussed in the analysis are based upon anthropogenic influences identified in the 2013 Lynx Conservation Assessment and Strategy, which relate to risk factors and habitat effectiveness (see table 87).

Table 87. Key indicators for assessing effects to Canada lynx

Resource element	Indicator
Vegetation and wildland fire management	• Terrestrial ecosystems and Canada lynx habitat diversity, vegetation change modeling.
Habitat fragmentation	• Canada lynx habitat connectivity, linkage areas, modeled travel corridors.
Recreation	• Developed ski areas and Canada lynx habitat; and • Suitability for motorized over-snow vehicle use and Canada lynx habitat
Minerals	• Suitability for minerals and Canada lynx habitat

Resource element	Indicator
Forest/backcountry roads	• Forest/backcountry roads and indirect effects of motorized access on the risk of trapping and shooting
Livestock grazing	• Livestock grazing and vegetation change in Canada lynx habitat
Driver/Stressor	• Anticipated changes in climate and effects on Canada lynx habitat

Consequences common to all alternatives

All of the alternatives would retain the management direction in the NRLMD for the conservation of lynx except for two Forest-specific changes that are assessed for the action alternatives. The effects of the NRLMD (appendix A) are discussed as consequences common to all alternatives, with the exception of a Forest-specific change to HUG 11 and an additional numbered exception to VEG S6, assessed under the consequences of alternatives B modified, C, and D (along with additional plan components associated with the forest plan).

Consequences of vegetation and fuels reduction treatments in the wildland-urban interface

As stated in forest plan appendix A, the wildland-urban interface is defined by the Healthy Forests Restoration Act (see glossary). The USFWS biological opinion on the NRLMD (USFWS, 2007b) stated that in recognition of the escalating monetary and societal costs associated with fires in the wildland-urban interface, fuels treatment projects in the wildland-urban interface would be exempted from compliance with VEG S1, VEG S2, VEG S5, and VEG S6 under certain conditions designed to protect communities at risk. For NRLMD analysis purposes, the wildland-urban interface was modeled in 2007 as a 1-mile buffer surrounding communities with more than 28 people/square mile. Over the entire northern Rocky Mountains Geographic Area analyzed by the USFWS, about 6 percent of lynx habitat was found to be within 1 mile of communities. The 2007 incidental take statement, updated in 2017, constrains wildland-urban interface exemption treatments to no more than 6 percent (cumulatively) of lynx habitat on an individual national forest. Although 6 percent was used in the NRLMD biological opinion for the purposed of estimating incidental take, the Forest has treated less than 1 percent of its lynx habitat through exemptions for fuels treatment projects in the wildland-urban interface. All action alternatives would carry forward the 6 percent exemption for vegetation treatments within the wildland-urban interface (which is 103,800 acres for the Flathead National Forest) for the life of the forest plan, which is anticipated to be 15 years (Kuennen et al., 2017).

Fuels treatments in the wildland-urban interface are anticipated to have adverse effects on lynx and their snowshoe hare prey because the intent would be to maintain lower tree density in these areas, resulting in less area of dense horizontal cover. Reductions in snowshoe hare habitat due to fuels treatments and precommercial thinning could lead to lowered reproduction and survival of lynx. However, adverse effects are limited in their extent and distribution. In its previous biological opinion on the NRLMD (USFWS, 2007b), the USFWS assumed that fuel treatments within the wildland-urban interface would not be excessively concentrated in adjacent lynx analysis units because fuel treatment projects may not result in more than three adjacent lynx analysis units exceeding standard VEG S1. Except to create defensible space, the exceptions may not be used in lynx analysis units that have more than 30 percent in stand initiation structural stage that does not yet provide winter snowshoe hare habitat. These limitations would continue to limit the concentration of impacts to Canada lynx in the future. On the Flathead National Forest, 48 of the 109 lynx analysis units (44 percent) do not contain any identified wildland-urban interface; these are mostly located within the Bob Marshall Wilderness Complex (Kuennen et al., 2017).

The wildland-urban interface on the Forest is defined by community protection plans (see figure 1-13). The Salish Mountains geographic area has the highest percentage of lynx habitat in the wildland-urban interface (ranging from 1 to 99 percent of individual lynx analysis units), followed by the North Fork of the Flathead River (ranging from 9 to 70 percent) and the Swan Valley geographic area (ranging from 0 to 61 percent). An analysis of wildland-urban interface boundaries on the Forest shows that much of the wildland-urban interface is at lower elevations and is relatively poor habitat for lynx, based upon modeling by Squires and others (J. R. Squires et al., 2013), which reduces the magnitude of effects.

Consequences of other vegetation management treatments

The USFWS biological opinion on the NRLMD (USFWS, 2007b) stated that limited exceptions to vegetation standards VEG S5 and VEG S6 could occur for other resource benefits, such as to restore whitebark pine, which is a candidate species for listing under the Endangered Species Act. Under all of the alternatives, the estimated acres that could have vegetation management treatments under the numbered exceptions to standards VEG S5 and VEG S6 (see appendix A in the forest plan) would be updated to reflect the anticipated 15-year life of the forest plan. The Forest consulted with the USFWS on the updated acres and types of treatments (Kuennen et al., 2017; N. Warren et al., 2017).

Plan components provide for the conservation of Canada lynx and their habitat. They are aligned with the conservation measures for vegetation management in core habitat listed in the 2013 Lynx Conservation and Assessment Strategy (ILBT, 2013, p. 91) at the forestwide scale, considering exceptions allowed by the incidental take statement (Kuennen et al., 2017).

In summary, standard VEG S1 limits regeneration by vegetation management projects if more than 30 percent of the lynx habitat in a lynx analysis unit is currently in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat, with certain exceptions or exemptions allowed under the incidental take statement. As a result of recent large wildfires, approximately 25 of the 109 lynx analysis units on the Forest exceed the 30 percent VEG S1 threshold (see the “Affected environment” section), which limits adverse effects to lynx because regeneration by vegetation management projects cannot occur until vegetation regrows into snowshoe hare habitat. Standard VEG S2 limits regeneration by vegetation management projects to no more than 15 percent of lynx habitat on NFS lands within a lynx analysis unit in a 10-year period, with certain exceptions or exemptions allowed under the incidental take statement. By limiting the rate of regeneration harvest in each lynx analysis unit, these standards would contribute to a mosaic of habitat over time, which would benefit lynx by supporting the distribution of prey resources within a lynx analysis unit and across the landscape.

Standard VEG S5 limits precommercial thinning projects during the stand initiation structural stage until the stand no longer provides winter snowshoe hare habitat, with certain exceptions or exemptions allowed under the incidental take statement. The intent is to maintain the habitat conditions that are expected to produce high densities of snowshoe hares, which would benefit lynx by supporting high-quality habitat. There are six exceptions to standard VEG S5 that could be used to meet other resource objectives (see appendix A). The exceptions to VEG S5 for precommercial thinning are anticipated to result in the short-term loss of lynx foraging habitat in some treated stands, which could have an adverse effect on lynx survival and reproduction by reducing prey resources, but this effect is limited in intensity and extent. Precommercial thinning at administrative sites and for research or genetic tests would generally have little or no adverse effect on lynx because few acres are involved and the acres impacted are widely distributed. Thinning to enhance whitebark pine and aspen would benefit other wildlife species and would occur on a limited number of acres of lynx habitat, resulting in a minor adverse effect on lynx. Daylight thinning would be allowed around individual western white pine in a manner that retains most winter snowshoe hare habitat. Daylight thinning might reduce lynx habitat quality in the short term but might allow the development of multiple, dense canopy layers in the long term. The Forest now has an abundance of acres

that have burned since 2000, creating many forest stands that are, or soon will be, providing stand initiation hare habitat, so the adverse effects of proposed precommercial thinning are expected to be minor.

Standard VEG S6 limits vegetation management projects that would reduce winter snowshoe hare habitat in multistory mature or late-successional forests, with certain exceptions or exemptions allowed by the standard. Timber harvest would be allowed in areas that have the potential to improve winter snowshoe hare habitat but that presently have poorly developed understories (and thus do not provide winter snowshoe hare habitat), thus benefiting lynx by developing forests with a dense understory to support their snowshoe hare prey. The effects of the numbered exceptions to VEG S6 would create short-term loss of hare habitat quality or quantity, but these are anticipated to be minor because they are limited in intensity and extent. Implementation of standard VEG S6 would benefit lynx by retaining and developing important winter habitat over much of the Forest.

As stated in the forest plan appendix A, VEG O1, VEG O2, and VEG O4 encourage management of vegetation to mimic or approximate natural succession and disturbance processes while maintaining lynx habitat components. Guideline VEG G1 encourages the development of projects that are designed to recruit a high density of conifers, hardwoods, and shrubs where such habitat is scarce or not available. Guideline VEG G5 is to provide habitat for alternative prey species, particularly red squirrel, in each lynx analysis unit. Guideline VEG G10 states that all the vegetation standards should be considered when designing fuel treatment projects within the wildland-urban interface to promote lynx conservation and that this should be explained in the project NEPA documentation. Guideline VEG G11 describes how denning habitat should be retained and distributed in each lynx analysis unit. These guidelines benefit lynx by encouraging practices that create or maintain lynx habitat components, and these guidelines would continue to be considered as site-specific projects are developed under all the alternatives. Plan components provide for a mosaic of habitat conditions over time that support dense horizontal cover and high densities of snowshoe hare, with winter snowshoe hare habitat provided by the stand initiation stage and by mature multistory conifer vegetation in support of lynx conservation. Analysis of Forest Inventory and Analysis data on snags and large downed woody material for the Flathead National Forest forest plan shows that the availability of snags and large downed woody material has increased due to an increase in wildfires. Plan components for snags and downed woody material promote their retention. Denning is not considered a limiting factor across the landscape.

Wildland fire management

As stated in the NRLMD, VEG O3 encourages fire use activities that restore ecological processes and maintain or improve lynx habitat. Under guideline VEG G4, prescribed fire activities should not create permanent travel routes that facilitate snow compaction, and permanent firebreaks should not be constructed on ridges or saddles. As displayed in the “Affected environment” section, fire has historically played a substantial role in creating forested landscape patterns on the Flathead National Forest, and fire continues to do so. Most of the boreal forest zone where lynx habitat occurs on the Forest has not been strongly influenced by past fire suppression efforts since these areas naturally burn with a frequency of about every 100 years or longer. Since the late 1980s, the Forest has experienced an increase in the number of large, stand-replacing wildfires. This is resulting in a spike in the amount of lynx habitat that is currently in a temporarily unsuitable condition. In the next 15 years or so, a substantial portion of burned forest is expected to develop sufficient height and density to provide dense horizontal cover of branches at the snow surface to provide snowshoe hare habitat under all alternatives.

Fragmentation of habitat

Many actions that fragment habitat, such as highway expansions and residential developments, are not under the authority of the Forest Service. However, forest plan components under all alternatives are

beneficial to Canada lynx by maintaining or improving habitat connectivity on NFS lands and would help to reduce or minimize adverse effects. Standard ALL S1 specifies that new or expanded permanent developments and vegetation management projects must maintain habitat connectivity in a lynx analysis unit and/or linkage area. In linkage areas, potential highway crossings will be identified (LINK S1), and Forest Service lands should be retained in public ownership (LINK G1). Guideline ALL G1 says that methods that avoid or reduce effects on lynx should be used when constructing or reconstructing highways or NFS highways across Federal land. Guideline HU G6 says that methods to avoid or reduce the effects on lynx in lynx habitat should be used when upgrading unpaved roads to maintenance levels 4 or 5 if the result would be increased traffic speeds and volumes or a foreseeable contribution to increases in human activity or development in lynx habitat. Guideline HU G7 states that new permanent roads should not be built on ridgetops or saddles or in areas identified as important for lynx habitat connectivity. New permanent roads and trails should be situated away from forested stringers. LINK O1 encourages working with landowners to pursue conservation easements, habitat conservation plans, land exchanges, or other solutions in mixed ownership areas to reduce the potential of adverse impacts on lynx and lynx habitat. These plan components help to reduce fragmentation of lynx habitat and provide for habitat connectivity.

Recreation—Developed ski areas

Downhill ski resorts typically are located at high elevations in areas with coniferous forests and deep snow, which coincides with lynx habitat. On the Flathead National Forest, two ski resorts, Whitefish Mountain Resort (formerly known as Big Mountain Resort) and Blacktail Mountain Resort contain lynx habitat, each located within one lynx analysis unit. In a 2000 consultation for 12 ski resorts in Montana, including Big Mountain and Blacktail Mountain Resorts, existing conditions, proposed expansions, and ongoing operations were determined to be likely to adversely affect lynx. However, given the small proportions of the lynx analysis units affected and other factors, USFWS concluded that ongoing and proposed actions were not likely to jeopardize the species nor to result in incidental take of individual lynx. The 2007 biological opinion on the NRLMD (USFWS, 2007b) reconfirmed the conclusion that individual lynx may be adversely affected through habitat avoidance, alteration, or loss but that the total area affected is limited and the objectives, standards, and guidelines would reduce the potential impacts. Under all the alternatives, the two ski resorts would continue to operate within their existing permit area boundaries.

As stated in the NRLMD, HU O1 discourages the expansion of snow-compacting activities in lynx habitat; HU O2 says to manage recreational activities to maintain lynx habitat and connectivity; HU O3 encourages concentrating activities in existing developed areas; and HU O4 says to provide for lynx habitat needs and connectivity when developing or expanding existing developed recreation sites or ski areas. No standards were adopted because recreational activities were not considered to be a threat to the population of lynx. Two guidelines in the NRLMD address ski area development or expansion: HU G1 says that provisions should be made for intertrail islands that maintain winter snowshoe hare habitat, and HU G2 encourages providing foraging habitat, consistent with the ski area's operational needs. Guideline HU G3 says that recreation development and operations should be planned to provide for lynx movement and to maintain the effectiveness of lynx habitat.

Minerals

At the present time, there is little mineral or energy exploration and development activity occurring on the Flathead National Forest. Existing oil and gas leases were suspended and would require further NEPA analysis and decisionmaking before any activity could occur. The final EIS for the NRLMD (USDA, 2007d) anticipated little or no effect on lynx related to mineral and energy activities, which would continue to be the case under this alternative (see section 3.23 for more details). As stated in forest plan

appendix A, HU O5 says to manage human activities, including minerals and oil and gas exploration and development, to reduce impacts to lynx and lynx habitat. Guideline HU G4 encourages remote monitoring of mineral and energy development sites and facilities to reduce snow compaction; guideline HU G5 addresses development of a reclamation plan to restore lynx habitat when mineral and energy development sites and facilities are closed. HU G12 limits winter access for non-recreation special uses and mineral and energy exploration and development to designated routes or designated over-the-snow routes. The application of these measures is expected to minimize adverse effects on lynx.

NFS and backcountry roads

On the Forest, implementation of road access management associated with amendment 19 has resulted in decreased road mileage, decreased road maintenance, and many miles of public road use restrictions, reducing potential risks to lynx associated with public road access (see section 3.7.5, subsection "Grizzly bear," for more details). As stated in forest plan appendix A, four forest plan guidelines concern NFS roads: HU G6 says to use methods that avoid or reduce effects on lynx when upgrading unpaved roads to maintenance levels 4 or 5; HU G7 discourages building new permanent roads on ridgetops, saddles, or forested stringers or in areas identified as important for lynx habitat connectivity; HU G8 says that brushcutting along low-speed, low-traffic-volume roads should be done to the minimum level necessary to provide for public safety; and HU G9 says that public motorized use should be restricted on new roads built for projects. These plan components would continue to limit the potential local impacts of roads on lynx and lynx habitat.

Livestock grazing

Very little livestock grazing occurs on the Flathead National Forest (see section 3.24 for more details). As stated in forest plan appendix A, four guidelines concern livestock grazing in lynx habitat. Objective GRAZ O1 is to manage livestock grazing to be compatible with improving or maintaining lynx habitat. Guideline GRAZ G1 says to manage livestock grazing in fire- and harvest-created openings so that regeneration of shrubs and trees is not prevented; under GRAZ G2, livestock grazing in aspen stands should be managed to contribute to the long-term health and sustainability of aspen; under GRAZ G3, livestock grazing in riparian areas and willow carrs should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages; and under GRAZ G4, livestock grazing in shrub-steppe habitats that are in the elevation ranges of forested lynx habitat in lynx analysis units should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages. With these components in place, the effects of livestock grazing on lynx and lynx habitat were judged to be minimal across the northern Rockies analysis area. Under this alternative, there would continue to be little or no effect on lynx attributable to livestock grazing.

Summary of modeled alternative consequences

In the Lynx Conservation and Assessment Strategy (ILBT, 2013), no conservation measures are identified for climate change due to the limited ability of Federal land management agencies to alter the current trajectory, but the conservation measures for vegetation include the following measure:

> Conduct a landscape evaluation to identify needs or opportunities for adaptation to climate change. Consider potential changes in forest vegetation that could occur as a result of climate change (e.g., Gärtner et al. 2008). Identify reference conditions relative to the landscape's ecological setting and the range of future climate scenarios. For example, the historical range of variability could be derived from landscape reconstructions (e.g., Hessburg et al. 1999, Blackwell et al. 2003, Gray and Daniels 2006). (p. 91)

Plan alternatives were analyzed using a landscape evaluation that considered reference conditions relative to the landscape's ecological settings and the range of future climate scenarios, considering the interaction of vegetation management, wildland fire, and possible effects on fragmentation of habitat.

Ecosystem Research Group modeled the effects of the alternatives (appendix 3). The natural range of variation was modeled going back about 1,000 years, and effects of the alternatives were projected for the next 50 years, including anticipated changes in climate and the fire suppression logic of the model. Effects of vegetation management associated with each alternative set of management areas, combined with modeling of natural processes such as wildfires, insects and disease, and forest succession, were modeled in 2015. Ecosystem Research Group modeled the effects of several future scenarios for comparison purposes, including a warmer and drier climate over the next five decades that would result in more acres burned (due to expected climate change), as well as continuing the current level of fire suppression into the future. Effects were modeled using the SIMPPLLE model (which simulates future pathways of natural vegetation change across the Forest) and the Spectrum model (which simulates future vegetation management associated with an alternative and its mix of management areas across the Forest). The SIMPPLLE and Spectrum models provide a probabilistic assessment of the subset of Federal actions that provide a programmatic framework for vegetation management activities across the Forest over a 50-year future time period. However, since the exact location, extent, and timing of future fires, timber harvest, thinning, and planting are unknown, future site-specific actions would be subject to the requirements of section 7 of the Endangered Species Act at a future time.

Ecosystem Research Group's modeling used the GIS layer of modeled and mapped lynx habitat for the Flathead National Forest. Two analyses for lynx were done to assess their habitat requirements: (1) a stand initiation habitat analysis and (2) a potential multistoried habitat analysis. Stand initiation hare habitat was modeled as any cover types within grand fir or subalpine fir/spruce habitat types (often mixed with other species). Grand fir (which is not abundant on the Forest) was included because it occurs in close juxtaposition to subalpine fir/spruce lynx habitat and is known to produce snowshoe hares. Stand initiation hare habitat was modeled as the seedling/sapling size class with a canopy cover class of 40–100 percent and 20 or more years since the previous stand-replacing disturbance (high-severity fire or regeneration harvest). Modeled multistoried habitat is limited to cover types that contain subalpine fir or Engelmann spruce (which may be mixed with other species) within subalpine fir/spruce habitat groups. Multistoried lynx habitat is provided by forests with a high proportion of trees in the diameter classes of 7-11 inches and 11+ inches (J. R. Squires et al., 2010; J. R. Squires et al., 2006) and a dense understory providing snowshoe hare habitat. Although snowshoe hares require a dense understory, the SIMPPLLE model is dependent on R1 VMap classes and did not allow the incorporation of understory density. To model lynx habitat, the assumption was made that all cover types with presence of subalpine fir/Engelmann spruce (which may be mixed with other species) in all diameter classes with an average above 10 inches and at least 40 percent VMap canopy cover provide habitat. VMap areas with spruce/subalpine fir and canopy cover classes greater than or equal to 40 percent accounted for 85 percent (5,515 of 6,505) of lynx telemetry locations on the Flathead National Forest.

To estimate the current condition, available Forest data sets are not able to estimate horizontal cover associated with snowshoe hare and lynx habitat, but overall density can be estimated based upon Forest Inventory and Analysis field measurements of canopy cover. A large portion of the Forest—about 65 percent of the area in the cool-moist potential vegetation type—is currently in a moderate- to high-density class. Over the first three decades, modeling estimates that this proportion remains steady but then declines, but the proportion of low-density forest increases. In the model, lower forest densities are largely driven by natural disturbances (fire, insects, disease) that convert large areas to early-successional forest in the latter modeled decades, with temporarily less canopy cover. The increasing proportion of forest with low canopy cover may temporarily reduce the quality and connectivity of lynx habitat;

however, this would improve over time with development of vegetation in the understory and midstory. According to the modeling of the natural range of variation, fire cycles affecting the amount of multistoried and stand initiation habitat have occurred in the past and are likely to occur in the future in the mid- to high-elevation subalpine fir and spruce forests of the Forest. This is a natural fluctuation over time associated with the characteristic fire regimes and disturbance processes.

Ecosystem Research Group modeled a multistory forest that provides snowshoe hare and lynx habitat over the next five decades. Since the model is not able to discern whether a dense understory is present or not, this should be interpreted as areas with a potential to provide winter snowshoe hare and lynx habitat. What the model depicts is the trend in forest stands that are most likely to have a multistoried structure, high canopy closure, and presence of subalpine fir and spruce. For potential multistory habitat, the range between maximum and minimum natural range of variation is very large, almost 650,000 acres. Since the model reduces harvest based upon lynx standard VEG S6 and applies fire suppression logic as well as forest succession for all alternatives, levels of modeled multistoried lynx habitat slightly exceed the maximum range of natural range of variation for the first two decades. By the third decade, modeled levels of fire and/or insects and disease increase, consistent with projected changes in climate. If insects and disease kill scattered patches of trees in the overstory of multistoried forests, that could increase the density of the understory, creating multistoried stands after a lag time of a few decades, provided the loss of canopy cover is not too great. In contrast, stand-replacing wildfires would create more stand initiation habitat after a lag time of a few decades. Over the next five decades, the acres of modeled stand initiation habitat fluctuates up and down decade by decade.

Despite plan components to maintain or increase multistoried hare and lynx habitat, modeled declines below current levels are projected to occur by the end of five decades due to natural disturbances, which were modeled as increasing with a warmer, drier summer climate. Modeling of vegetation management that would occur under the preferred alternative, in combination with natural processes, shows that potential multistory hare and lynx habitat is expected to stay within the natural range of variation.

Modeling results discussed above are believed to be a worst-case scenario with respect to changing climate, stand-replacing wildfire, and insects and disease. The Forest made updates to the SIMPPLLE model between the draft EIS and the final EIS based upon input from scientists that the model may have projected too much effect from spruce bark beetle and Douglas-fir beetle infestation. This resulted in differences in future projected conditions for some of the vegetation conditions. The magnitude of decline in multistoried habitat by the fourth and fifth decades would likely be less because the extent of tree mortality from Douglas-fir beetle and spruce bark beetle would decrease across about 150,000 acres per decade, on average.

In the updated modeling, the Forest also tested the effects of an earlier increase in stand-replacing wildfire. This resulted in stand-replacing wildfire occurring on about 80,000 more acres. This would initially create more temporarily unsuitable habitat for Canada lynx for about the first two decades, followed by an increase in stand initiation hare habitat for subsequent decades.

As stated in the 2013 Lynx Conservation and Assessment Strategy (ILBT, 2013), “There is some uncertainty about the rate and magnitude of impacts from climate change, and federal agencies may be limited in actions that can be taken to ameliorate those impacts. Nevertheless, those impacts will interact with and perhaps magnify the effects of vegetation management, wildland fire, and fragmentation of habitat” (p. 68). Monitoring items listed in chapter 5 of the forest plan include lynx habitat, wildland fire, and vegetation management activities. The plan can be modified in the future if warranted.

Alternative A

Under alternative A, there would be no change to the plan components for lynx, as listed in appendix A of the forest plan. The effects to lynx that were described in the 2007 final EIS (volumes 1 and 2), biological assessment, biological opinion, and record of decision for the NRLMD are incorporated by reference. Continued implementation of the forest plan is anticipated to maintain or improve lynx habitat in the long term, although some short-term adverse effects may occur, primarily due to the reduction of snowshoe hare habitat allowed under the exemptions to the vegetation standards. The forest plan direction as a whole will promote conservation of the lynx population.

Under alternative A, the Flathead National Forest's estimated acreages for the exceptions to vegetation standards VEG S5 and VEG S6, which were estimated for the period 2017-2021 for purposes of determining incidental take (Conway & Hanvey, 2017), would be carried forward unchanged, adjusted for a time period of 15 years following approval. Under alternative A, the estimate of the acres to be thinned under the VEG S5 and VEG S6 exceptions would be adjusted from 1,460 acres over a 10-year period to 2,190 acres over a 15-year period. The limitations on the acreage for numbered exceptions to VEG S5 and VEG S6 (2,190 acres over 15 years) represents less than 0.1 percent of lynx habitat on the Forest. The small acreage and circumstances where the numbered exceptions could be used makes it likely that there would be minor or undetectable adverse effects on the lynx population.

Under amendment 24, specific routes and areas were designated as suitable or not suitable for motorized over-snow motorized vehicles. About 68 percent of the lynx habitat on the Forest is closed to motorized over-snow vehicle use (see figure 1-42). Lynx are well distributed across the Forest, including areas such as Big Creek and Skyland Creek that receive substantial use by snowmobiles. As discussed previously, Kolbe et al. (2007) found that compacted trails from over-snow motorized vehicles in their study area (western Montana) did not promote a competitive interaction between coyotes and lynx. Mountain lions are a known source of mortality of lynx, accounting for roughly one third of documented mortalities in northwest Montana study areas, but all documented mountain lion predation on lynx occurred in the snow-free period (N. Warren, 2016b). Motorized over-snow vehicles provide access for trapping of other furbearers, which has the potential to increase the risk of incidental trapping of lynx. The biological opinion on amendment 24 (USFWS, 2006b) found that, overall, the level and distribution of winter recreation under this alternative is not likely to adversely affect the lynx population. Guideline HU G11 states that designated motorized over-snow vehicle routes or designated play areas should not expand outside baseline areas of consistent snow compaction unless designation serves to consolidate use and improve lynx habitat within a lynx analysis unit or a combination of immediately adjacent lynx analysis units. This would reduce the risk of human disturbance. Based on scientific findings on snow compaction, competing predators, and risk of accidental trapping mortality relevant to northwest Montana, there would be minimal risk to lynx.

Consequences common to the action alternatives

Consequences of other vegetation management treatments

Under alternatives B modified, C, and D, the estimate for exceptions and exemptions to the vegetation standards is increased in comparison to alternative A. The estimate for all of the numbered exceptions to vegetation standards VEG S5 and VEG S6 is given as a range of acres, from about 10,900 to 15,460 acres, and was updated in 2016 (Kuennen et al., 2017). The estimated acres are for purposes of a programmatic plan. Actual acres implemented would depend upon funding and site-specific analysis. For planning purposes, the upper end of the range reflects potential treatment needs anticipated over the 15-year time period following plan implementation, distributed as follows:

- about 500 acres for defensible space (VEG S5/S6 exception 1);

- about 1,510 acres for research studies and genetic tree tests (VEG S5/S6 exception 2);
- about 1,800 acres for conifer removal or daylight thinning of aspen (VEG S5 exception 4);
- about 4,750 acres for daylight thinning of planted, rust-resistant western white pine (VEG S5 exception 5);
- about 2,500 acres to restore whitebark pine in wildfire areas and forests with sapling-size trees (VEG S5 existing exception 6); and
- about 4,400 acres to restore whitebark pine in forests with trees larger than sapling size (VEG S6 new Forest-specific exception).

As previously analyzed in the biological assessment for the NRLMD (Bertram, 2007), the Forest anticipates that the overall acres for purposes of incidental take would be limited to no more than 15,460 acres (about 0.9 percent of lynx habitat on the Forest) but that there would be flexibility as to which exception categories are used in order to respond to changing budgets, conditions, and needs. For example, the Forest might do more vegetation treatments for defensible space but less for research studies. Additional consultation and site-specific analysis would occur at the project level to determine site-specific effects on Canada lynx and its habitat.

Wildland fire management

As a result of recent wildfires, there is a large pulse of lynx habitat in the early stand initiation stage on the Flathead National Forest. It is likely that these stands will develop into good-quality winter snowshoe hare habitat within about 20 years. However, burned areas that have regenerated into very dense monotypic stands (with densities of 20,000-50,000 trees per acre) are likely to stagnate in the stem exclusion stage. Recently burned areas provide an opportunity to test modified techniques for precommercial thinning with the aim of increasing tree species diversity, promoting development and retention of dense horizontal cover over longer time periods and shortening the time it takes for burned forests with very high densities of regenerating trees (often lodgepole pine and/or western larch) to develop into multistory mature forest with a dense understory of spruce and subalpine fir. The Forest is actively working with research scientists to design and conduct studies that clarify the relationships between stand treatments and the effects on lynx. Acres listed under VEG S5 exception 2 (see above) include about 1,260 acres of anticipated precommercial thinning that may occur for research studies. Some of this research may involve study of the effects of precommercial thinning in wildfire areas and/or alternative precommercial thinning treatments designed to provide long-term lynx habitat benefits. VEG S5 exception 3 may allow treatment of burned areas in the future, but this exception has not been included in the acreage estimates because use of this exception first requires peer review and acceptance by the regional level of the Forest Service and the State level of the Fish and Wildlife Service, with a written determination stating that a project would not be likely to adversely affect lynx or would be likely to have short-term adverse effects on lynx or its habitat but long-term benefits to lynx and its habitat.

Natural ecosystem processes such as wildland fire would contribute to denning habitat for Canada lynx (for example, in management areas such as management area 1), as would forestwide plan components for old growth, snags, and downed wood such as FW-STD-TE&V-01 and 03, FW-GDL-TE&V-06 and 07, and FW-GDL-TIMB-01 and 03).

New exception to standard VEG S6 for noncommercial thinning around mature whitebark pine trees

Standard VEG S5 has an exception that allows precommercial thinning to restore whitebark pine, but VEG S6 does not provide a comparable exception in multistory mature stands. Under alternative B

modified, standard VEG S6 would have an additional exception that would allow noncommercial felling of trees of any size that are growing within 200 feet of disease-resistant whitebark pine trees used for cone, scion, and pollen collection. Under the Forest's new VEG S6 exception, it is estimated that a total of about 4,400 acres would be treated with noncommercial thinning to protect and restore whitebark pine over the next 15 years. The acreage estimate is for the entire stand, although not all of the acres within a stand would be affected because only trees located within 200 feet of the selected whitebark pine trees would be felled. Preliminary analysis, subject to further site-specific analysis, suggests that 18 out of the 109 lynx analysis units distributed in all but the Salish Mountains geographic area may have treatments using this new exception. No more than 6 percent of the lynx habitat in any one lynx analysis unit is identified for possible treatment (estimated exception acres in lynx analysis units on the Forest for purposes of determining incidental take; see figure B-8 in Kuennen et al. (2017)).

Removal of the trees that surround selected mature, rust-resistant whitebark pine trees in mature multistory stands has the potential to decrease the habitat quality of lynx and snowshoe hare habitat. At this time, it is not known whether the stands that would be targeted for treatment actually provide the dense horizontal cover needed by snowshoe hares, and therefore the effects on lynx are uncertain, but site-specific consultation would be conducted when treatments are proposed. Since the felled trees would not be removed from the site, the downed logs would provide additional horizontal cover that might partially offset the effects of felling trees. Exceptions 2-6 to VEG S5 shall only be utilized in lynx analysis units where standard VEG S1 is met. Exceptions 2, 3, and 4 to VEG S6 shall only be utilized in lynx analysis units where VEG S1 is met. Overall, any adverse effects on individual lynx are anticipated to be minor because of the limited number of acres of lynx habitat that would be treated. It is not likely that there would be a detectable impact on the lynx population as a result of this new exception category.

Habitat connectivity, travel corridors, and linkage areas

Objectives, standards, and guidelines carried forward from the 2007 NRLMD under all alternatives, such as standard ALL S1 and guideline ALL G1, help to provide connectivity and minimize fragmentation (see appendix A). These, and additional plan components for the action alternatives, are aligned with conservation measures to minimize habitat fragmentation in core habitat listed in the 2013 Lynx Conservation and Assessment Strategy (ILBT, 2013, p. 93) at a forestwide scale (see Kuennen et al., 2017 for more details).

In addition to plan components that are common to all alternatives, additional plan components in the action alternatives (B modified, C, and D) address habitat connectivity and travel corridors on a Forest-specific basis. Forestwide plan components for riparian management zones (e.g., FW-STD-RMZ-06 and FW-GDL-RMZ-09) support connectivity of lynx habitat by providing for cover conditions that support lynx travel and access to foraging habitats and also provide for distribution of cover across the Forest (see figure 1-07). The following geographic area desired conditions provide emphasis on connectivity, incorporating putative travel corridors identified by Squires and others (2013): GA-HH-DC-03, GA-MF-DC-04, GA-NF-DC-06, GA-NF-DC-07, GA-SM-DC-03, GA-SV-DC-09 (see section 3.7.6 for more details). Plan components that would apply to summer corridors identified by Squires and others (2013) would also facilitate long-distance movements and potential range shifts.

Alternatives B modified, C, and D have a guideline stating that when conducting vegetation management projects, cover of trees and/or tall shrubs should be retained (if available) between areas of forest where cover is lacking (e.g., recent stand-replacement fire areas) so that connectivity between forested patches is not severed. This guideline is intended to benefit multiple wildlife species and would benefit lynx.

Connectivity of mature forest, percent composition of young regenerating forest, low perimeter-area ratio of young regenerating forest patches, and adjacency of mature to young regenerating forest types are

important for lynx reproduction and survival at the scale of a lynx home range (Kosterman, 2014). The perimeter-area ration of young regenerating forest patches is anticipated to be highly variable across the Forest, depending upon whether patches are created by wildfire or by vegetation management activities such as timber harvest. Plan components for old growth and riparian management zones, integrated with plan components for vegetation management, help to provide for adjacent mature and regenerating forests at the scale of a lynx home range; lynx are likely to travel through such habitat while accessing patches of boreal forest within their home range.

While many actions that fragment habitat, such as highway expansions and residential developments, are not under the authority of the Forest Service, plan components in the forest plan are beneficial in maintaining or improving habitat connectivity on NFS lands and would help to reduce or minimize adverse effects. Management direction allows for activities to occur to meet social, economic, and multiple-use objectives of the Forest while promoting the recovery of the Canada lynx population.

Motorized over-snow vehicle use and winter routes

Unlike some other national forests within the northern Rockies, under forest plan amendment 24 (USDA, 2006) the Flathead National Forest designated specific routes and areas, as well as seasons, for motorized over-snow vehicle use in accordance with § 212.81 of the Travel Management Rule. Under the action alternatives, changes in suitability for motorized over-snow vehicle use would occur in some site-specific areas. Under all action alternatives, the wording of HU G11 would be replaced with a Forest-specific guideline to maintain ecological conditions for recovery of Canada lynx, as shown in table 88, while also considering the Forest’s desired conditions for social and economic sustainability.

Table 88. NRLMD guideline HU G11

NRLMD, guideline HU G11	Flathead National Forest-specific modification of HU G11 under alternative B modified, C, and D
Designated over-the-snow routes or designated play areas should not expand outside baseline areas of consistent snow compaction, unless designation serves to consolidate use and improve lynx habitat. This is calculated on an LAU [lynx analysis unit] basis, or on a combination of immediately adjacent LAUs. This does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private inholdings, or to access regulated by Guideline HU G12.	To provide ecological conditions to support Canada lynx on NFS lands at a forestwide scale, there should be no net increase in miles of designated motorized over-snow vehicle routes, groomed routes, or areas where motorized over-snow vehicle use would be suitable. The “no net increase” is in comparison to suitability displayed in figure B-11. This guideline does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private inholdings, or to access regulated by guideline HU G12.

This guideline provides a strategy for management of over-snow motorized vehicle use that will be more adaptive in the future compared to the current guideline for addressing designated routes and play areas and areas of consistent snow compaction. Squires and others (2010) reported that they found no evidence that lynx selected areas away from NFS roads or groomed snowmobile trails during winter. Lynx are distributed across the Forest, with telemetry data documenting lynx use of areas such as Big Creek and Skyland Creek that receive relatively high levels of use by snowmobiles.

Increased competition from other predators due to snow compaction is a minor concern. As discussed previously, Kolbe et al. (2007) found that compacted trails from motorized over-snow vehicles in their study area (western Montana) had only minimal impacts on coyote movements and foraging success and that snowshoe hares were an insignificant portion of the winter diet of coyotes, indicating that snow compaction did not promote a competitive interaction between coyotes and lynx. Mountain lions are a known source of mortality of lynx, accounting for roughly one third of documented mortalities in

northwest Montana study areas, but all documented mountain lion predation on lynx occurred in the snow-free period (N. Warren, 2016a).

Although the Forest is closed to lynx trapping, a potential indirect effect of motorized over-snow vehicle use is that it could facilitate access to lynx habitat and increase the vulnerability of lynx to incidental or accidental trapping or illegal shooting. Since 2008, changes in trapping regulations by MFWP have greatly reduced the number of lynx caught in traps, as explained in the “Affected environment” section. Glacier National Park is closed to trapping and to public motorized over-snow vehicle use, greatly reducing the risk of mortality. Wilderness areas of the Forest are closed to motorized use. The Bob Marshall Wilderness Complex, due to its large size and its remoteness, also has a low risk of lynx mortality due to trapping. The combined area of Glacier National Park and the Flathead’s portion of the Bob Marshall Wilderness Complex is over 2 million acres. Shifting areas suitable for motorized over-snow vehicle use within the Forest would not increase the risk of accidental or incidental trapping. In summary, the level and distribution of winter recreation is not likely to negatively impact the overall lynx population, although there is some risk of injury or mortality to individual lynx.

Minerals and energy

The Forest has low potential for locatable minerals and low to high potential for leasable minerals (such as oil and gas). Many acres of NFS lands on the Forest are withdrawn from mineral entry (see figure B-37 in Kuennen et al. (2017) and the “Grizzly bear” subsection of section 3.7.5 for more details).

Withdrawal of large areas of the Forest from mineral development reduces the risk of Canada lynx habitat loss, disturbance, displacement, and mortality. All withdrawals are subject to valid existing rights. The Forest Service does not have the discretion to deny the exercise of an outstanding mineral right. However, the developer does not have unrestricted rights because the developer’s rights are limited to using only as much of the surface as is reasonably necessary to explore, develop, and transport materials. The developer must provide an operating plan to the Forest, and the Forest has some ability to manage surface resources. Forest Service Manual 2832 provides direction for administration of an outstanding mineral right (the source of minerals information is volume 2 of the 2014 Flathead National Forest assessment, as updated by the 2015 leasing withdrawal). Existing oil and gas leases were suspended and would require further NEPA analysis and consultation before any activity could occur. The action alternatives limit the area where new leasable mineral activities may occur (subject to valid existing rights) within 97 lynx analysis units because there would be a standard requiring no surface occupancy for new leases in the grizzly bear primary conservation area. Since a large portion of the grizzly bear primary conservation area is also lynx habitat, this benefits lynx.

NFS and backcountry roads

Standards to maintain baseline densities of motorized routes in the grizzly bear primary conservation area and Salish demographic connectivity area would limit potential risks to lynx associated with motorized public access (see section 3.7.5, subsection “Grizzly Bear,” for more details).

Livestock grazing

Very little livestock grazing occurs on the Flathead National Forest (see figure 1-69). The action alternatives further limit the amount of grazing allowed in the future within the lynx analysis units because grizzly bear standard FW-STD-GR-05 specifies that there will be no net increase in the number of active cattle grazing allotments above the baseline in the grizzly bear primary conservation area. In addition, a guideline for the Swan Valley geographic area (GA-SV-GDL-04) addresses closing open and active grazing allotments if the opportunity arises with a willing permittee (see section 3.7.5, subsection

"Grizzly Bear," for more details). There would continue to be little or no effects to lynx attributable to livestock grazing.

Effects of plan components related to potential vegetation types

Although standards and guidelines carried forward from the 2007 NRLMD provide direction for many aspects of land management, the action alternatives have additional plan components that integrate Canada lynx habitat with desired conditions for vegetation that are tied to potential vegetation types, within the context of the natural range of variation. The following paragraph discusses the effects of these plan components on Canada lynx.

Desired conditions in proposed alternative B modified are aligned with conservation measures for vegetation management in core habitat listed in the 2013 Lynx Conservation and Assessment Strategy (ILBT, 2013, p. 91; Kuennen et al., 2017). Under the action alternatives, desired conditions for vegetation pattern are tied to potential vegetation types. The majority of modeled Canada lynx habitat is in the cool-moist and cold groups, which correspond to boreal forest habitat types capable of growing spruce and fir trees. A desired condition is a description of specific social, economic, and/or ecological characteristics of the plan area, or a portion of the plan area, toward which management of the land and resources should be directed. Desired conditions are not commitments or final decisions approving projects and activities. The desired condition for some resources may currently exist, but for other resources they may only be achievable over a long time period.

Forestwide desired condition FW-DC-TE&V-19 promotes ecological conditions to support Canada lynx habitat and its connectivity because it is consistent with the vegetation conditions described in the section on the affected environment for Canada lynx habitat. Desired condition FW-DC-T&V-09 provides direction to maintain native plant species diversity, including conifers, in aspen stands.

Alternative B modified

In seven lynx analysis units, there would be an increase in the area suitable for motorized over-snow vehicle use, but this would be offset by a reduction in five other lynx analysis units. The change to HU G11 would result in no net increase in the area suitable for motorized over-snow vehicle use on the Forest, but areas would be shifted. In the North Fork geographic area, acres suitable for motorized over-snow vehicle use would increase by about 217 acres in the Lower Big lynx analysis unit and by about 7,660 acres in the Canyon lynx analysis unit (see figure 1-46; figure B-12 in Kuennen et al. (2017)). There would be an increase of about 485 acres in the middle of an existing route in the Upper Big lynx analysis unit and an increase of about 260 acres in the Upper Coal lynx analysis unit. In the Red Meadow lynx analysis unit, there would be an increase of about 235 acres adjacent to an existing area. In the Middle Fork geographic area, there would be an increase of about 1,548 acres adjacent to an existing open area in the Bear Creek lynx analysis unit and about 602 acres in the Challenge-Granite lynx analysis unit. Additional snow compaction would occur on some but not all of this acreage because there are portions where tree cover is too dense for snowmobiles to navigate. At a forestwide scale, the above increases would be offset by changing some areas in five different lynx analysis units to make them unsuitable for motorized over-snow vehicle use. These changes would total about 48 acres in the Bunker Creek lynx analysis unit, about 2,646 acres in the Kah Soldier lynx analysis unit, about 94 acres in the Stony Jungle lynx analysis unit, about 8,812 acres in the Sullivan lynx analysis unit, and about 344 acres in the Slippery Bill lynx analysis unit. In addition, there would be some very minor adjustments in suitable and non-suitable areas (generally less than 15 acres) scattered across about 30 lynx analysis units in order to clean up boundaries previously mapped in a raster format or to assist in the enforcement of closed areas. Thus, for the Forest as a whole there would be no net increase in the percentage of lynx habitat designated as suitable for motorized over-snow vehicle use.

In the lynx analysis units with an increase in acres suitable for motorized over-snow vehicle use, an increase in this use would be expected to occur. Although lynx are believed to be tolerant of many types of human activities, there is a potential for indirect effects to lynx due to disturbance, displacement, and/or mortality risk (from non-target trapping) in winter. In vicinities that are already heavily used by motorized over-snow vehicles, such as Canyon Creek, there is a potential for the additional suitable areas to result in an increase in the area of consistent snow compaction, as defined by the NRLMD. The effects of this increase on Canada lynx are anticipated to be minor, based upon findings by Squires and others (Kuennen, 2017a; J. R. Squires et al., 2010; J. R. Squires et al., 2013) and Kolbe and others (2007). In addition, not all of the acreage in the added suitable areas would be expected to have an increase in the area of consistent snow compaction because terrain and vegetation influence where motorized over-snow vehicles can physically go. Vegetation conditions are dynamic over time and change in response to disturbance and succession. Wildfire may initially open up dense forest for motorized over-snow vehicle use, but as high densities of dead trees fall or as succession occurs, areas previously open to motorized over-snow vehicle use become unavailable because the machines cannot physically maneuver between or over the trees.

In the future, there would be no net increase in routes, groomed routes, or areas that are suitable for motorized over-snow vehicle use across the Forest as a whole under alternative B modified. By limiting where snow compaction and disturbance could occur in the future, there might be a small benefit to lynx because some areas that would become unsuitable provide higher-quality habitat than some areas that would become suitable (see figure 1-47; figure 1 in Squires et al. (2013); Kuennen, Van Eimeren, and Trechsel (2017)). There would be no net increase in suitable areas, so the risk of accidental trapping would not increase. Some of the recommended wilderness areas (management area 1a) included in alternative B modified are large or increase the size of the Bob Marshall Wilderness Complex, further reducing the risk of accidental trapping of lynx because these areas are not suitable for motorized over-snow vehicle use. Changes to areas or routes suitable for motorized over-snow vehicle use would go through site-specific consultation at the project level.

On the whole, modified alternative B would promote conservation of the Canada lynx population because (1) the regulatory framework provided by the NRLMD would remain in place with two Forest-specific modifications that would have minor effects, (2) plan components for vegetation in the potential vegetation types that include boreal forest habitat types would support lynx habitat diversity over the long term, and (3) management area allocations and their effects have been modeled for lynx habitat (based on a worst-case scenario with respect to modeled changes in climate over five decades following plan implementation). Modeling has shown that anticipated combined effects would remain within the range of natural variation of the Forest's historically fire-dominated landscape.

Alternative C

Consequences of plan components in appendix A, other forestwide plan components, and other geographic area plan components are the same for all action alternatives. The primary difference in alternatives is in the mix of management areas. Alternative C has more acres of recommended wilderness than the other alternatives (see figure 1-03). It is anticipated that desired conditions for Canada lynx in these areas would be primarily affected by natural ecosystem processes such as wildfire, insects, and disease. Insects and disease would be anticipated to create small canopy gaps in the coniferous tree canopy over time. If this occurs in the cool-moist and cold potential vegetation types (see forest plan figure B-03), it would promote development of a dense understory and create multistoried hare and lynx habitat. If insect infestation is epidemic or if stand-replacing wildfire occurs that results in tree mortality in most of the canopy, multistoried hare habitat would be reduced and stand initiation hare and lynx habitat would develop over a period of about 20 years (and would provide this habitat condition for another 10-20 years, depending upon tree density).

As an indirect effect of recommended wilderness, fewer areas would be suitable for motorized over-snow vehicle use under alternative C compared to the other alternatives, and the distribution of suitable areas would change (see figure 1-48). Many additional areas, both large and small, that are within recommended wilderness would be designated as unsuitable for motorized over-snow vehicle use. This change would occur in 10 lynx analysis units within the North Fork geographic area, 7 lynx analysis units in the Middle Fork geographic area, 13 lynx analysis units within the Hungry Horse geographic area, 3 in the South Fork geographic area, 13 in the Swan Valley geographic area, and 1 in the Salish Mountains geographic area for a total of about 177,000 acres. In total, almost 10 percent of the Forest’s 1.8 million acres of lynx habitat would change from suitable to unsuitable for motorized over-snow vehicle use. In addition, under alternative C, most late spring motorized over-snow vehicle use areas (which also include lynx habitat) would be incorporated into recommended wilderness areas. Suitable areas added include an area in the Upper Big, Lower Big, and Canyon lynx analysis units (about 13,395 acres) and small linear areas adjacent to existing suitable areas in the Bear Creek, Challenge, and Slippery Bill lynx analysis units (about 385 acres). As explained in the “Affected environment” section, the effects of motorized over-snow vehicle use on Canada lynx in northwest Montana are believed to be minor, so these changes would be anticipated to have minor consequences for lynx.

Alternative D

This alternative does not have any recommended wilderness. It emphasizes more active vegetation management, including timber harvest, to achieve desired conditions. The consequences of vegetation management under alternative D would be similar to those described for alternative B modified, but there are more acres suitable for timber production in this alternative, particularly acres in management area 6c, where a higher level of vegetation management intensity is anticipated (see figure 1-04). Vegetation management standards for Canada lynx would apply regardless of management area. Under this alternative there would be more emphasis on frontcountry and dispersed mechanized recreation opportunities. This alternative has additional management area 7 (focused recreation) in lynx habitat. As explained in the “Affected environment” section, lynx are generally tolerant of human activity. The effects of nonmotorized recreation on Canada lynx in northwest Montana are believed to be minor, so these changes would be anticipated to have minor consequences for lynx.

Under alternative D, there would be a small net increase of 1 percent in the area suitable for motorized over-snow vehicle use of the Forest’s 1.8 million acres of lynx habitat (see figure 1-49). As with alternative C, an area in the Lower Big and Canyon lynx analysis areas would be added as suitable for motorized over-snow vehicle use (about 13,850 acres). Additional areas in the Canyon and Lakalaho lynx analysis units, totaling about 2495 acres, would also become suitable for motorized over-snow vehicle use. Two small areas totaling about 1,900 acres in the Bear Creek and Challenge-Granite lynx analysis units also would become suitable. Two small areas in the Glacier and the Slippery Bill lynx analysis units would become unsuitable for motorized over-snow vehicle use. These changes would result in a net increase in the area suitable for motorized over-snow vehicle use of about 19,594 acres on the Forest. In vicinities that are already heavily used by motorized over-snow vehicles, such as Canyon Creek, there is a potential for the additional suitable areas to result in an increase in the area of consistent snow compaction, as defined by the NRLMD. The effects of this increase on Canada lynx are anticipated to be minor, based upon findings by Squires and others (Kuennen et al., 2017; J. R. Squires et al., 2010; J. R. Squires et al., 2013) and Kolbe and others (2007). In addition, not all of the acreage in added suitable areas would be expected to have an increase in the area of consistent snow compaction.

Consequences of management areas allocations

Management area allocations provide the on-the-ground framework that guides which allowable uses may occur in a particular area of the Forest. Table 89 summarizes the approximate percentage of management

areas in lynx habitat by alternative (see figures 1-01 through 04). This section characterizes the management areas in Canada lynx habitat and discusses the effects of the resulting management direction on the species. A more detailed description of the management areas can be found in chapter 3 of the forest plan.

Table 89. Canada lynx habitat in each Forest management area by alternative

Management Area	Alternative A Potential Lynx Habitat (%)	Alternative B modified Potential Lynx Habitat (%)	Alternative C Potential Lynx Habitat (%)	Alternative D Potential Lynx Habitat (%)
1a Designated wilderness	43	43	43	43
1b Recommended wilderness	4	9	24	0
2a Designated wild and scenic rivers	< 1	< 1	< 1	< 1
2b Eligible wild and scenic rivers	0	1	1	1
3b Special areas	0	< 1	< 1	<1
4a Research natural areas	< 1	< 1	< 1	< 1
4b Experimental and demonstration forests	< 1	< 1	< 1	< 1
5a, 5b, 5c, 5d Backcountry	18	15	7	22
6a General forest low-intensity vegetation management	4	6	10	6
6b, 6c General forest medium- and high-intensity vegetation management	30	23	15	24
7 Focused recreation areas	< 1	2	1	2

Wilderness (management area 1a)

About 43 percent of lynx habitat on the Forest is in existing wilderness in the Mission Mountains Wilderness and the Bob Marshall Wilderness Complex (table 89). Natural ignitions are allowed under all alternatives and contribute to desired vegetation conditions in these areas. Periodic wildfires create a mosaic of forest conditions. This management area maintains large, remote habitats for lynx that are likely to have a lower amount of human presence due to the lack of wheeled or motorized over-the-snow vehicle use and limited nonmotorized access. The wilderness management area provides habitat connectivity with Glacier National Park and, from there, to the international border with Canada, helping to provide linkage with lynx populations in British Columbia and Alberta.

Recommended wilderness (management area 1b)

Recommended wilderness ranges from 0 percent of potential lynx habitat under alternative D to about 9 percent of lynx habitat, distributed across 46 of the Forest’s 109 lynx analysis units, under alternative B modified and 22 percent under alternative C (table 89). Effects are similar to those for management area 1a. The recommended additions to the Bob Marshall, Great Bear, and Scapegoat Wildernesses would provide habitat for lynx in 38 lynx analysis units. The recommended Tuchuck addition would help provide a large block of habitat in seven lynx analysis units in close proximity to lynx habitat in Canada, contributing to habitat connectivity as well as genetic connectivity.

Designated and eligible wild and scenic rivers (management area 2)

Approximately 1 percent of potential lynx habitat is located within these management areas in all alternatives (table 89). The Forest has one designated river with three forks (the North, Middle, and South Forks of the Flathead), and an additional 24 rivers are eligible. Wild and scenic river segments are

classified as wild, scenic, or recreational segments (see section 3.17 for more details). Timber harvest is not allowable in river segments classified as wild. River segments classified as scenic or recreational are not suitable for timber production, but timber harvest may be allowed to meet desired social, economic, or ecological conditions. Management area 2 management direction helps to maintain wide forested corridors along major waterways that may facilitate lynx movement through the landscape, providing connectivity.

Special areas (management area 3b)

Less than about 1 percent of lynx habitat is located within this management area under all the alternatives (table 89). This management area provides protection for areas with unique botanical features such as fens, sloughs, *Howellia* sites, and groves of cedar, larch, or ponderosa pine. This management area is not suitable for timber production, nor is it suitable for commercial use of non-timber forest products. Vegetation management may be allowed to maintain desired ecological conditions and values. Effects to lynx are minor due to their small size and low percentage. These areas may or may not provide the kind of vegetation conditions that provide lynx foraging, denning, or habitat connectivity.

Research natural areas (management area 4a)

Approximately 1 percent of potential lynx habitat is located within this management area under all the alternatives (table 89). The Forest has six research natural areas in three geographic areas. Research natural areas are generally natural appearing, and human influence on their ecological processes is limited and is guided by the Rocky Mountain Research Station. This management area is not suitable for timber production. Vegetation management may be allowed for study and research purposes or if needed to protect the values for which the research natural area was designated. Although very limited in their number and size, research natural areas help provide a continuum of security habitat and connectivity for lynx.

Experimental forest and demonstration forest (management area 4b)

Less than about 1 percent of lynx habitat is located within this management area under all the alternatives (table 89). The Forest has one experimental forest in the Hungry Horse geographic area and one demonstration forest in the Salish Mountains geographic area. In experimental forests and demonstration forests, vegetation management for research purposes is likely, with exceptions for research allowed under the vegetation standards for lynx. Periodic wildfires, prescribed fires, and other types of vegetation management, including timber harvest, precommercial thinning, commercial thinning, and planting, may create a mosaic of forest conditions, benefiting lynx. Wheeled motorized travel may occur on designated routes and motorized over-snow vehicle use may occur, subject to other forestwide plan components (discussed under effects of alternative A and effects common to all action alternatives).

Backcountry (management area 5)

This management area ranges from about 22 percent of lynx habitat under alternative D to about 7 percent of lynx habitat under alternative C. Alternatives A and B modified have about 15 and 18 percent of backcountry, respectively (table 89). In management area 5a, motorized use is not allowed. Year-round motorized use is allowed in management area 5b, motorized over-snow vehicle use is allowed in management area 5c, and summer wheeled motorized use is allowed in management area 5d. Motorized use in management area 5d is generally dispersed trail use, whereas motorized over-snow vehicle use in management area 5c includes dispersed trail use as well as larger areas. Mechanized transport (e.g., mountain bikes, game carts) are allowed in this management area. Lynx are generally tolerant of human presence and the types of uses that occur in backcountry areas. However, motorized over-the-snow vehicle use may be great enough to cause disturbance or displacement of individual lynx in some circumstances. The action alternatives limit areas where motorized over-snow vehicle use can occur,

reducing the risk of population-level effects (see also the discussion under effects common to all action alternatives). This management area is not suitable for timber production, but timber harvest may be allowable under some circumstances to meet desired ecological, social, or economic conditions. Because most of management area 5a is in inventoried roadless areas where road building is not allowed, timber harvest would be likely to occur at low levels. Periodic wildfires, prescribed fires, and other types of vegetation management, including precommercial thinning, commercial thinning, and planting, may contribute to a mosaic of forest conditions, benefiting lynx.

General forest (management area 6)

Approximately 4 percent of lynx habitat is located within management area 6a for alternative A, about 6 percent for alternatives B modified and D, and about 10 percent for alternative C (table 89). Management area 6a is anticipated to have the lowest intensity of timber harvest because it is not suitable for timber production, followed by management area 6b, which is suitable for timber production but also contributes to habitat connectivity in key areas for lynx. In the North Fork, Hungry Horse, and Swan Valley geographic areas, some of management areas 6a and 6b is located in areas along putative travel corridors identified by Squires and others (2013).

Approximately 15 percent of lynx habitat is located within management areas 6b and 6c under alternative C, about 23-24 percent under alternatives B modified and D, and about 30 percent under alternative A. Lynx habitat located within general forest management areas 6b and 6c has a mosaic of successional stages in a roaded environment due to past timber harvest and road construction. In this management area, active management activities, including prescribed fire, timber harvest, fuels reduction, precommercial thinning, commercial thinning, and planting, are most likely to continue to create a mosaic of forest conditions. Within management areas 6b and 6c, riparian management zones are not suitable for timber production, providing an interconnected network that contributes to habitat connectivity for lynx. Much of management area 6c is in the wildland-urban interface, where timber harvest intensity is anticipated to be higher. Management area 6c is where exemptions to the vegetation standards for lynx are most likely to result in short-term adverse effects but long-term benefits to hare habitat by creating a mosaic of successional stages. Grizzly bear management direction prescribes no net increase to baseline densities of roads open to public motorized use during the non-denning season, which would also reduce the potential for disturbance to lynx. In the grizzly bear primary conservation area, total road densities would also be subject to a standard of no net increase to baseline densities, and there would be no net decrease in secure core, providing large areas of relatively high habitat connectivity.

Focused recreation area (management area 7)

Approximately 2 percent of lynx habitat is located within management area 7 under alternative B modified (table 89). The percentage is similar for D and is about 1 percent for alternatives A and C. Focused recreation areas typically have recreational uses such as a large lake or reservoir, large campgrounds, or trail systems for featured recreational activities such as hiking, mountain biking, cross-country skiing, and/or wheeled motorized vehicle use on designated routes and areas. There are two developed ski areas or year-round resorts in this management area. Focused recreation areas may have a relatively high level of human activities and associated infrastructure near roads. There may be roads, utilities, and trails as well as signs of past and ongoing activities of actively manage forest vegetation in these areas. Although individual lynx may be adversely affected by recreation developments, the management direction in the NRLMD would reduce potential impacts to lynx.

Cumulative effects on Canada lynx

As described previously, the Lynx Conservation Assessment and Strategy (ILBT, 2013) identified four anthropogenic influences (the upper tier) as being of greatest concern to the conservation of the lynx:

climate change, vegetation management, wildland fire management, and fragmentation of habitat. These are therefore considered in some detail in this section to evaluate the potential for cumulative adverse effects. The lower tier of anthropogenic influences include recreation, minerals and energy management, forest/backcountry roads and trails, grazing by domestic livestock, and mortality due to incidental trapping or illegal shooting. Although these lower-tier activities could affect individual lynx, they are not expected to have a substantial effect on the overall lynx population and are unlikely to cause cumulative adverse effects. Therefore, they are not discussed in detail. The analysis of cumulative effects considers the previous analysis and decision under the NRLMD final EIS (USDA, 2007d).

The cumulative effects analysis area is predominantly NFS lands and also includes Glacier National Park, State-managed lands, tribal lands, and private lands. Two national forests make up the bulk of the lands in this area—the Flathead and the Kootenai National Forests (the Kootenai is adjacent to the Flathead to the west). There are 47 lynx analysis units on the Kootenai National Forest, encompassing about 1,151,000 acres of lynx habitat (i.e., boreal forest habitat types). To the south, the Seeley Lake District on the Lolo National Forest and the Lincoln District on the Helena National Forest also provide lynx habitat in the cumulative effects analysis area, as does a small portion of the Idaho Panhandle National Forest, which is in critical habitat unit 3. Lynx habitat on these national forests is managed through implementation of a consistent set of forest plan objectives, standards, and guidelines (USDA, 2007c). Habitat management on these units, in concert with the Flathead National Forest, promotes the conservation of lynx.

Future changes in climate

The preliminary Northern Region Adaptation Partnership risk assessment for the Canada lynx (McKelvey & Buotte, in press) states that lynx have little or no adaptive capacity to live in areas lacking snow and limited ability to shift their diet away from snowshoe hares. There is a potential that climate change will reduce the extent of deep snow habitats preferred by lynx. McKelvey et al. (in press) estimated that contiguous areas of spring snow cover would become smaller and more isolated throughout the Columbia River Basin, with greatest losses at the southern periphery but possible increases in snow at higher elevations in the lynx core (including the Flathead National Forest). Regardless of snow depth, the timing of snowmelt has been occurring about two weeks earlier in recent decades. Mills and Johnson (2013) used an ensemble of locally downscaled climate projections and forecasted that the annual average duration of snowpack will decrease by 29–35 days by midcentury. Unless snowshoe hares show enough plasticity to adapt to earlier snowmelt, the reduced snow duration will increase the number of days that white hares will be mismatched on a snowless background. This lack of camouflage coloration may make lynx more successful in detecting their primary prey, but in the long term it may also reduce snowshoe hare numbers, especially at relatively lower elevations where snow reductions in the northern Rockies are anticipated to be greatest. McKelvey and Buotte (in press) estimate that the likelihood of future climate change effects is high, with a moderate magnitude of effects by 2030 and a high magnitude of effects by 2050.

Large wildfires in lynx habitat are also believed to be strongly associated with changing climate factors. Westerling et al. (2006) compiled information on large wildfires in the western United States from 1970–2004 and found that large wildfire activity increased suddenly and markedly in the mid-1980s, with higher frequency of large wildfire, longer wildfire durations, and longer wildfire seasons. The greatest increases occurred in mesic, mid- and high-elevation forest types in the northern Rocky Mountains. Westerling stated that fire exclusion (suppression) has had little impact on the natural fire regimes of these higher-elevation forest types in this area; instead, climate appears to be the primary driver of forest wildfire risk.

As discussed above, stand-replacing wildfires on the Forest have created a greater amount of early stand initiation habitat in recent decades. Increases in wildfire may initially create more habitat that is

temporarily unsuitable for snowshoe hares and lynx foraging but may greatly increase suitable habitat within a few decades (Vanbianchi, Murphy, & Hodges, 2017). Plan components for fire would allow the Forest to adapt its future management to changing conditions.

Vegetation management

In the past, timber harvest removed all size classes of trees, snags, and downed logs in mixed-species forests containing spruce and subalpine fir, resulting in loss of multistory stands as well as fragmentation of cover. On cool-moist habitat types, forests that were regenerated in the 1950s and 1960s, including those that had precommercial thinning following harvest, are now developing into forests with a multistoried canopy structure, in some cases containing a dense understory. During the same time period, an extensive insect and disease outbreak killed large-diameter spruce. Salvage harvest of scattered mature spruce trees, or dead trees creating canopy gaps, allowed a dense understory of subalpine fir and shrubs to grow in many of these areas.

National forests in the cumulative effects analysis area manage lynx habitat to provide boreal forest landscapes supporting a mosaic of differing successional forest stages and containing the presence of snowshoe hares and their preferred habitat conditions. These Forests follow management direction in the NRLMD. During the last decade, timber harvest practices have been more favorable for lynx as a result of forest plan amendments, with fewer acres impacted by temporary loss of multistory stands that provide snowshoe hare and lynx habitat. Outside the wildland-urban interface, precommercial thinning practices have also been more favorable for lynx, with fewer acres experiencing short-term reductions in snowshoe hare habitat. In response to increases in stand-replacing wildfires, fuels reduction programs have increased in recent decades and are expected to continue on managed portions of Forest Service, State, tribal, and private lands within the boundaries of Forest geographic areas, particularly in the wildland-urban interface. On national forests in the cumulative effects analysis area, the wildland-urban interface has vegetation treatments using the exceptions and/or exemptions to the NRLMD vegetation standards, which may adversely affect stand initiation or multistory hare and lynx habitat. Table 90 shows the approximate acres of exceptions or exemptions used by the Forests (or portions of Forests) in the cumulative effects analysis area through 2016.

Table 90. Acres of hare habitat treated in critical habitat unit 3 through 2016

Exception or exemption category	Flathead National Forest (acres)	Kootenai National Forest (acres)	Seeley Ranger District, Lolo National Forest (acres)	Lincoln Ranger District, Helena-Lewis and Clark National Forest (acres)
VEG S5 exceptions	940	1,860	0	0
wildland-urban interface exemptions	6,456	3,095	0	954

- exemptions for fuels management in the wildland-urban interface is no more than 57,052 acres. Exceptions for precommercial thinning projects for resource benefits could affect another approximately 11,862 acres. Thus far, the level of effects related to vegetation management on the national forests is substantially lower than that anticipated in the 2007 record of decision for the NRLMD (USDA, 2007c) and the USFWS biological opinion (USFWS, 2007b). From 2007-2012, approximately 7,271 acres were burned by wildfires in lynx habitat within lynx analysis units on the Kootenai National Forest (J. Anderson, personal communication, August 9, 2013).

- On the Helena-Lewis and Clark National Forest, the maximum acres of lynx habitat that could be affected by the wildland-urban interface exemption is 26,400 acres. Exceptions for precommercial thinning projects for resource benefits are limited to 730 acres. Combined, the exemptions and exceptions could affect about 6 percent of the lynx habitat on the Forest. To date, the level of effects to lynx is substantially lower than that anticipated in the record of decision for the NRLMD because the actual amount of treatments on the Helena National Forest total only about 200 acres under the wildland-urban interface exemption (D. Pengeroth, personal communication, March 29, 2016).
- On the Lolo National Forest as a whole, the maximum acres of lynx habitat that could be affected by exemptions for fuels management in the wildland-urban interface is no more than 16,900 acres. Exceptions for precommercial thinning projects for resource benefits could affect another approximately 2,200 acres of lynx habitat. To date, the level of effects to lynx are substantially lower than that anticipated in the record of decision for the NRLMD because the actual amount of treatments on the Lolo National Forest total only about 300 acres under the wildland-urban interface exemption (E. Roberts, personal communication, April 26, 2016).

Glacier National Park and the Confederated Salish and Kootenai Tribes incorporated the Lynx Conservation Assessment and Strategy into their management plans. Glacier National Park does not conduct commercial timber sales but does use fire as a vegetation management tool. Vegetation management in lynx habitat on the Confederated Salish and Kootenai Tribes reservation is similar to that on the national forests.

The Montana Department of Natural Resources and Conservation manages the Stillwater State Forest in the Salish Mountains geographic area, the Coal Creek State Forest in the North Fork geographic area, and the Swan State Forest, as well as sections acquired from Plum Creek Timber Company, in the Swan Valley geographic area. The Montana Department of Natural Resources and Conservation manages lynx according to their Habitat Conservation Plan (MTDNRC, 2011). In their record of decision on the proposed issuance of a permit to Montana Department of Natural Resources and Conservation authorizing incidental take of endangered and threatened species on forested trust lands in western Montana, the USFWS concluded that the removal of winter foraging habitat from scattered parcels in occupied habitat would not result in adverse effects on lynx for the following reasons: (1) scattered parcels in occupied lynx habitat support about 13 percent (11,600 acres) of the total winter foraging habitat in the Habitat Conservation Plan project area, (2) the anticipated 230 acres of annual harvest of winter foraging habitat would be spread across more than 11,600 acres of winter foraging habitat on scattered parcels in occupied habitat, (3) the amount of occupied habitat treated would likely represent a small proportion of a lynx home range and would not be enough to measurably reduce snowshoe hare productivity in the home range, and (4) viable lynx habitat would be retained through implementation of the Habitat Conservation Plan commitments combined with the availability of habitat on adjacent lynx analysis units where standards on Federal lands regulate treatments of winter foraging habitat in multistoried stands (MTDNRC, 2011). Where practicable, Montana Department of Natural Resources and Conservation will consider harvest unit designs at the project level to maintain a connected network of suitable lynx habitat along riparian areas, ridgetops, and saddles that connect third-order drainages. Measures for grizzly bears that will limit the size of forest openings that can be created through timber harvesting, as well as measures for secure cover, will also provide habitat connectivity for Canada lynx.

Most private lands within the Forest's geographic area boundaries are at elevations too low to be lynx habitat, but lynx do travel through some of these areas. Some private parcels in the Middle Fork and North Fork of the Flathead River, as well as in the Swan Valley and Stillwater Valley near Olney, are at elevations suitable for lynx. Some of these landowners are clearing vegetation to reduce the risk of wildfire, which may reduce the potential for lynx foraging, although whether lynx would forage in close proximity to human dwellings, dogs, etc., is unknown. Fuels treatments in lower montane forests (that

burned naturally with mixed severity) may help to prevent uncharacteristically severe fires from occurring or spreading to lynx habitat at higher elevations.

Wildland fire management

On all lands, large wildfires in lynx habitat are believed to be strongly associated with changing climate factors. Wildland fires are likely to be actively suppressed to prevent loss of infrastructure and investments on all lands. Wildfires are likely to play a natural role in large portions of Glacier National Park.

Fragmentation of habitat due to loss of cover

Although lynx are known to cross openings, Squires and others (2013) found that lynx generally use habitat within about 300 feet of cover. Most of northwest Montana is heavily forested, with the largest non-cover areas occurring in agricultural valleys (such as the Flathead Valley) and in areas recently burned by stand-replacing wildfire on all lands (see figure B-21 in Kuennen et al. (2017) for more details). Because cover is altered by wildfire, insects, disease, and actions on other land ownerships, it is difficult to predict when or where these effects to cover would occur.

Fragmentation of habitat due to highways

Various studies have documented lynx crossings of highways, but highways pose a risk of direct mortality to lynx, and two-lane or four-lane highways with high traffic volumes, or impediments such as fences on both sides of a highway, may impede lynx movement. According to Alexander and others in 2005 (ILBT, 2013), traffic volumes between 3,000 and 5,000 vehicles per day may be the threshold above which successful crossings by carnivores are impeded. There are no four-lane highways in the cumulative effects analysis area, and Squires's radiotelemetry data indicates that lynx cross the existing two-lane highways (Kuennen, 2017d). There are no known highway mortalities in critical habitat unit 3 (Broderdorp, 2016).

If traffic volume in the cumulative effects analysis area greatly increases, the construction of wildlife crossing structures could be considered (Clevenger & Waltho, 2005; J. R. Squires et al., 2013). To address these potential changes on private lands, alternatives B modified, C, and D have a forestwide desired condition stating that land ownership adjustments, through purchase, donation, exchange, or other authority, will be considered to improve national forest management by consolidating ownership, reducing wildlife-human conflicts, providing for wildlife habitat connectivity, improving public access to public lands, and retaining or acquiring key lands for wildlife and fish and within wild and scenic river corridors. Because these actions require a willing landowner, it is difficult to predict when or where they may actually occur.

Connectivity to Canada

Connectivity to source populations of lynx in Canada is considered critical to the persistence of populations in most parts of the range in the United States (68 FR 40076; J. R. Squires et al., 2013). Connectivity from the Forest to Canada is currently high, with cover conditions that facilitate lynx travel. Glacier National Park provides high levels of connectivity to Canada and, on the National Forests, only two-lane gravel roads occur near the Canadian border within most of the cumulative effects analysis area.

Mortality due to incidental trapping or illegal shooting of Canada lynx

Trapping and snaring of lynx is currently prohibited across the contiguous United States. Incidental trapping or snaring of lynx is possible in areas where regulated trapping for other species overlaps with lynx habitat (J. R. Squires & Laurion, 2000). State wildlife management agencies regulate the trapping of furbearers. On all lands, areas open to motorized over-snow vehicle use occur in lynx habitat, and these areas may have increased risk of incidental trapping of lynx because trapping seasons for other species

occur in the winter. However, many areas of lynx habitat have limited accessibility for off-route motorized over-snow vehicle use due to high tree densities and rugged topography. On the Kootenai National Forest, there are approximately 120 miles of groomed motorized over-snow vehicle routes and approximately another 46 miles of designated motorized over-snow vehicle routes in lynx habitat within lynx analysis units. One lynx was reported trapped on the Kootenai National Forest in December 2012 and was released unharmed (J. Zelenak, personal communication to Jeremy Anderson, August 26, 2013). Glacier National Park is closed to trapping and to motorized over-snow vehicle use, greatly reducing the risk of mortality. Incidental trapping-related mortality of radio-collared animals has been documented to occur in the Seeley-Swan study area (N. Warren, 2016b).

Recreational activities

Scientific evidence to date indicates that most recreational activities pose a low risk of having negative effects on lynx (ILBT, 2013).Within the cumulative effects analysis area outside the Flathead National Forest, there is one ski area on the Kootenai National Forest (Turner Mountain). This is a very small ski area with only one lift and very little development at the base. The ski area affects about 263 acres of lynx habitat, with 164 acres of cleared ski runs and 98 acres of gladed skiing, so any effects to lynx are minor. In addition, the Snowbowl ski area is located on the Lolo National Forest and affects about 1,190 acres of lynx habitat in the Rattlesnake lynx analysis unit. Over 90 percent of this lynx analysis unit is within the Rattlesnake National Recreation Area and Wilderness. Although the Turner Mountain and Snowbowl ski areas may have some local adverse effects, they would not be expected to contribute to cumulative adverse effects on the lynx population. Additionally, on the Kootenai National Forest there are approximately 5 miles of groomed cross-country ski trails in lynx habitat within lynx analysis units and another 5 miles that are designated for cross-country ski use. These mileages are less than what was analyzed in the NRLMD final EIS due to better mapping and some routes being dropped due to lack of snow (USDA, 2013a, p. 224).

Minerals and energy exploration and development

On the Kootenai National Forest, no leasable minerals (e.g., oil, gas, coal, geothermal resources, etc.) are being produced. As on the Flathead National Forest, all leases are currently suspended in accordance with the 1985 court decision of Conner v. Burford (848 F. 2d 1441 (9th Cir. 1988). The Troy copper and silver mine was in operation for over 20 years on the Kootenai National Forest and affects approximately 50 acres on NFS lands and an additional 400 acres of private lands. In 2006, the USFWS issued a biological opinion for the restart of the Troy silver mine (USFWS, 2006d) that concluded that the mine would not have adverse effects on lynx. This mine has now been shut down and is moving into the reclamation phase. Various analyses have also been prepared for the Rock Creek Mine, which determined that the mine is not likely to adversely affect lynx or lynx habitat (USFWS, 2006c). There are no plans of operation or notices of intent to explore or operate any commercial mines in lynx habitat on the Lolo National Forest. The Cotter Basin Mine on the Helena National Forest produced copper and silver in the past. In its biological opinion on the NRLMD, USFWS (2007b) concluded that the application of the amendment guidelines would result in no or only minor adverse effects to lynx due to minerals and energy development. No adverse cumulative effects are anticipated.

Forest roads

Much of the lynx habitat on the Kootenai, Lolo, and Helena-Lewis and Clark National Forests overlaps with grizzly bear habitat, where road construction and motorized use is constrained (see chapter 6.5.5). Additionally, the objectives and guidelines related to lynx in the amended forest plans reduce or minimize any potential adverse effects (USFWS, 2007b), and no adverse cumulative effects are anticipated.

Livestock grazing

The effects of livestock grazing were anticipated to be minimal under the NRLMD (USFWS, 2007b), and there is no new information to suggest that this has changed. No adverse cumulative effects are anticipated.

Canada lynx critical habitat

Introduction

On September 12, 2014, the USFWS issued a final rule revising the critical habitat designation and the distinct population boundary for the contiguous United States distinct population segment of the Canada lynx (USFWS, 2014a). Under the Endangered Species Act, specific areas within the geographical area occupied by the species at the time it was listed are included in a critical habitat designation if they contain physical or biological features that (1) are essential to the conservation of the species and (2) may require special management considerations or protection. Areas outside the geographical area occupied by the species at the time it is listed could also be designated as critical habitat if a designation limited to its current range would be inadequate to ensure the conservation of the species.

In its designation of critical habitat, the USFWS stated, “We consider lynx habitat to include forested areas with the potential, through natural succession, to produce high-quality snowshoe hare habitat, regardless of their current stage of forest succession” (79 FR 54808). This is consistent with the Flathead’s mapping and modeling of potential lynx habitat. The USFWS also stated,

> When determining critical habitat boundaries, we made every effort to avoid including developed areas such as lands covered by buildings, pavement, and other structures because such lands lack physical or biological features necessary for lynx. The scale of the maps we prepared under the parameters for publication within the Code of Federal Regulations may not reflect the exclusion of such developed lands. Given the scale of the lynx critical habitat units, it was not feasible to completely avoid inclusion of water bodies, including lakes, reservoirs, and rivers; grasslands; or human-made structures such as buildings, paved and gravel roadbeds, parking lots, and other structures that lack the PCE [primary constituent element] for the lynx. These areas, including any developed areas and the land on which such structures are located, that exist inside critical habitat boundaries are not intended to be designated as critical habitat. Any such lands inadvertently left inside critical habitat boundaries shown on the maps of this final rule have been excluded by text in this rule. Therefore, a Federal action involving these lands would not trigger section 7 consultation with respect to critical habitat and the requirement of no adverse modification unless the specific action would affect the physical or biological features in the adjacent critical habitat. (USFWS, 2014a, p. 54823)

In 2017, the USFWS issued a biological opinion on the effects of the NRLMD on Canada lynx critical habitat, which stated that “it is the Service’s biological opinion that the effects of the NRLMD are not likely to result in the destruction or adverse modification of designated Canada lynx critical habitat” (USFWS, 2017c). The USFWS stated that under the NRLMD, adverse effects on primary constituent element 1a (see definition in the section on “Key indicators” below) would be “limited in severity and in scale to the extent that critical habitat would continue to produce adequate densities of snowshoe hares and adequate levels of cover to support persistent lynx populations” across critical habitat unit 3 and that “the proposed action will not alter the physical or biological features of critical habitat to an extent that appreciably diminishes the value of critical habitat for the conservation of lynx. The alterations will not preclude or significantly delay development of such features. The critical habitat units would retain their current ability for the primary constituent element to be functionally established” (p. 34). The conclusion

in this biological opinion was based primarily on the biological assessment of the effects of the NRLMD on lynx critical habitat (Conway & Hanvey, 2017).

Affected environment—Critical habitat

The Flathead National Forest lies within Canada lynx critical habitat unit 3 (see figure 1-51). Lynx critical habitat unit 3 consists of about 9,783 square miles in the northern Rocky Mountains. Lynx are known to be widely distributed throughout this unit, and breeding has been documented in multiple locations. Lynx critical habitat unit 3 coincides with the lynx core area in northwest Montana/northeast Idaho. National Forest System lands account for about 74 percent of critical habitat unit 3, including portions of the Kootenai, Flathead, Idaho Panhandle, Lolo, and Helena-Lewis and Clark National Forests. According to the USFWS, critical habitat unit 3 appears to support the highest-density lynx populations in the northern Rockies. It likely acts as a source population and provides connectivity to other portions of the lynx's range in the Rocky Mountains. This area contains the physical and biological features essential to the conservation of the lynx (the primary constituent elements and its components) laid out in the appropriate quantity and spatial arrangement.

Critical habitat for lynx occurs on about 3,425 square miles of Flathead National Forest lands, which is about 35 percent of critical habitat unit 3. About 49 percent of the critical habitat on the Flathead National Forest is in wilderness. There are only two lynx analysis units on the Flathead National Forest that do not include some critical habitat: the Haskill Mount and Blacktail lynx analysis units west of Flathead Lake and Highway 93.

Key indicators

Federal projects within designated critical habitat areas are analyzed under the section 7 consultation process. To determine whether an action would result in the destruction or adverse modification of critical habitat, this analysis of resource elements important to Canada lynx critical habitat focuses on the primary constituent element.

The USFWS determined that the primary constituent element for lynx critical habitat is

1. Boreal forest landscapes supporting a mosaic of differing successional forest stages and containing:

   a. Presence of snowshoe hares and their preferred habitat conditions, which include dense understories of young trees, shrubs or overhanging boughs that protrude above the snow, and mature multistoried stands with conifer boughs touching the snow surface;

   b. Winter snow conditions that are generally deep and fluffy for extended periods of time;

   c. Sites for denning that have abundant coarse woody debris, such as downed trees and root wads; and

   d. Matrix habitat (e.g., hardwood forest, dry forest, non-forest, or other habitat types that do not support snowshoe hares) that occurs between patches of boreal forest in close juxtaposition (at the scale of a lynx home range) such that lynx are likely to travel through such habitat while accessing patches of boreal forest within a home range. (73 FR 10867)

In matrix habitat, activities that change vegetation structure or condition would not be considered an adverse effect to lynx critical habitat unless those activities would create a barrier or impede lynx movement between patches of foraging habitat and between foraging and denning habitat within a potential home range or would adversely affect adjacent foraging or denning habitat.

Environmental consequences

Primary constituent element

The designation of critical habitat does not prohibit development or forest management activities, but Federal agency actions must not result in destruction or adverse modification of critical habitat. All Federal actions must be separately evaluated for their effects on lynx and on its critical habitat.

In its final rule designating lynx critical habitat, USFWS identified the following Federal actions that potentially could adversely modify critical habitat. Briefly, these are as follows:

1. Actions that would reduce or remove understory vegetation within boreal forest stands on a scale proportionate to the large landscape used by lynx. . . . These activities could significantly reduce the quality of snowshoe hare habitat such that the landscape's ability to produce adequate densities of snowshoe hares to support persistent lynx populations is at least temporarily diminished.

2. Actions that would cause permanent loss or conversion of the boreal forest on a scale proportionate to the large landscape used by lynx. . . . Such activities could eliminate and fragment lynx and snowshoe hare habitat.

3. Actions that would increase traffic volume and speed on roads that divide lynx critical habitat. . . . These activities could reduce connectivity within the boreal landscape for lynx, and could result in increased mortality of lynx. (73 FR 10876)

The NRLMD was completed in 2007, prior to the final designation of lynx critical habitat, and therefore did not include an analysis of the effects on lynx critical habitat. Nevertheless, the NRLMD amendment to 18 national forest plans adopted plan components that maintain the physical and biological features that provide lynx critical habitat and directly or indirectly contribute to the primary constituent element, the key indicator for analysis of critical habitat. Table 91 shows how the management components of the NRLMD contribute to or support the critical habitat primary constituent element. A detailed discussion of these plan components and their effects can be found in the section above on Canada lynx and in the biological assessment for Canada lynx designated critical habitat (Conway & Hanvey, 2017).

Table 91. Canada lynx critical habitat primary constituent elements and associated plan components in the NRLMD

Primary Constituent Element	Primary Constituent Element Description	Associated NRLMD Objectives, Standards, and/or Guidelines[1]
1.	Boreal forest landscapes supporting a mosaic of differing successional forest stages and containing:	VEG O1, VEG O2, VEG O3, VEG O4
a	Presence of snowshoe hares and their preferred habitat conditions, including dense understories of young trees, shrubs, or overhanging boughs that protrude above the snow and mature multistoried stands with conifer boughs touching the snow surface;	VEG O1, VEG O2, VEG O3, VEG O4; VEG S1, VEG S2, VEG S5, and VEG S6; VEG G1, VEG G4; GRAZ G1, GRAZ G2, GRAZ G3; HU G1, HU G2, HU G8 (and VEG G10 in the wildland-urban interface)
b	Winter snow conditions that are generally deep and fluffy for extended periods of time;	VEG G4; HU G4, HU G11, HU G12
c	Sites for denning that have abundant coarse woody debris (downed trees and root wads);	VEG O1; VEG G11; HU G1

Primary Constituent Element	Primary Constituent Element Description	Associated NRLMD Objectives, Standards, and/or Guidelines[1]
d	Matrix habitat (e.g., hardwood forest, dry forest, non-forest, or habitat types that do not support snowshoe hares) that occurs between patches of boreal forest in close juxtaposition (at the scale of a lynx home range) such that lynx are likely to travel through such habitat while accessing patches of boreal forest within a home range.	ALL 01, ALL S1, ALL G1; GRAZ G1; HU G3, HU G7, HU G8; LINK 01; LINK S1; LINK G1

1. Some objectives, standards, or guidelines are not listed because they do not apply to the site-specific conditions of the Flathead National Forest.

Primary constituent element 1a

Primary constituent element 1a is dense understories of young trees, shrubs, or overhanging boughs that protrude above the snow. Conservatively, areas where regeneration timber harvest has occurred since 1990 may not yet have developed primary constituent element 1a. About 2 percent of lynx critical habitat on the Forest has had regeneration timber harvest since 1990 (including lands in the wildland-urban interface as well as lands outside it). In addition, areas that have been burned by wildfire since 1990 may not yet have developed dense understories of young trees, shrubs, or overhanging boughs that protrude above the snow. About 24 percent of critical habitat on the Forest has been burned by stand-replacing wildfires since 1990, also temporarily reducing primary constituent element 1a.

The forest plan standard VEG S1 limits regeneration by vegetation management projects in a lynx analysis unit if wildfire creates a situation where more than 30 percent of a lynx analysis unit does not yet provide winter snowshoe hare habitat. This standard helps to ensure that actions that would reduce or remove understory vegetation within boreal forest stands do not occur on a scale proportionate to the large landscape used by lynx. The forest plan standard VEG S2 promotes development of primary constituent element 1a but limits regeneration harvest on NFS lands to 15 percent of lynx habitat in each lynx analysis unit per decade in order to provide for distribution of hare habitat over time and space. All alternatives for the forest plan would protect existing lynx habitat that provides primary constituent element 1a, except for allowed exemptions to the vegetation standards within the wildland-urban interface and allowed exceptions for other resource purposes listed under VEG S5 and VEG S6. Exemptions to standards are allowed for fuels treatment projects within the wildland-urban interface as defined by the Healthy Forests Restoration Act (see glossary), subject to a cumulative limit of no more than 6 percent of lynx habitat on the Forest under the incidental take estimate for the 2007 NRLMD. Additionally, fuels treatment projects may not result in more than three adjacent lynx analysis units exceeding the standards. This requirement helps to ensure that actions that would remove understory vegetation and reduce the quantity or quality of hare habitat within boreal forest stands do not occur disproportionately in one portion of Canada lynx critical habitat. Figure 1-13 displays the wildland-urban interface, and figure B-20 in Kuennen (2017) displays the wildland-urban interface in relation to critical habitat.

The Forest proposes that the same acreage for fuels treatment under the wildland-urban interface exemption would be continued under all alternatives. The maximum wildland-urban interface exemption estimate is 103,800 acres for the Flathead National Forest out of approximately 2.2 million acres of critical habitat on NFS lands on the Forest. National Forest System lands in the Salish geographic area that are west of Kalispell and south of U.S. Highway 2 are not in critical habitat, so cumulative wildland-urban interface exemptions could be used on a maximum of about 5 percent of critical habitat across the Forest. As of 2015, about 0.4 percent of critical habitat had been affected by wildland-urban interface exemptions. Fuel treatments under the wildland-urban interface exemption would reduce the density of the understory that provides primary constituent element 1a.

The Forest estimates that the acreage that could be treated under the exceptions to VEG S5 and VEG S6 might be higher under the action alternatives compared to the estimates under alternative A. Under alternative B modified, exceptions to the vegetation standards would be estimated to occur on up to 15,460 acres, compared to about 1,460 acres under alternative A. For programmatic planning purposes, potential treatment needs, updated in 2016, are as follows:

- about 500 acres for defensible space (VEG S5/S6 exception 1)
- about 1,510 acres for research studies and genetic tree tests (VEG S5/S6 exception 2)
- about 1,800 acres for conifer removal or daylight thinning of aspen (VEG S5 exception 4)
- about 4,750 acres for daylight thinning of planted, rust-resistant western white pine (VEG S5 exception 5)
- about 2,500 acres to restore whitebark pine in wildfire areas and forests with sapling-size trees (VEG S5 existing exception 6)

The listed vegetation exceptions under alternative A would remain in place under alternatives B modified, C, and D except for one forest-specific change. An additional exception to VEG S6 would allow the felling of trees within 200 feet of disease-resistant whitebark pine trees used for cone, scion, and pollen collection. This new exception to VEG S6 would be anticipated to reduce primary constituent element 1a within about 4,400 acres of boreal forest stands, affecting about 0.2 percent of Canada lynx critical habitat, a minor amount.

The Forest anticipates that the overall acres will be constrained but that the exception categories that are used might change in order to respond to changing conditions and needs. Standards VEG S1 and VEG S2 limit the amount of habitat that can be treated at any given time and also limit the distribution of treatments. Use of exceptions to standards would require additional site-specific consultation at the project level.

Primary constituent element 1b (see table 91)

It is not possible to reliably predict the effects of future winter climate change on deep, fluffy snow at the Forest scale (see discussion below for the scale of critical habitat unit 3). The effects of proposed changes in plan components for winter recreation on deep, fluffy snow are discussed. Under the action alternatives, there would be new, integrated plan components to replace those in alternative A (amendment 24 adopted in 2006) and a new Forest-specific guideline to replace the previous NRLMD guideline HU G11 (adopted in 2007). Amendment 24 designated specific areas, routes, and seasons of use for motorized over-snow vehicle use. Seasons of use would not be changed under the action alternatives. Many of the areas and routes suitable for motorized over-snow vehicle use would not be changed under the action alternatives, but some routes and areas suitable for motorized over-snow vehicle use would be changed to respond to changing forest conditions and public input (see figures 1-46 through 1-49).

As described in detail in the section on Canada lynx, the action alternatives would have a guideline that limits future increases in motorized over-snow vehicle use. The forest plan forestwide guideline FW-GDL-REC-03 states,

> To provide ecological conditions to support Canada lynx on NFS lands at a forestwide scale, there should be no net increase in miles of designated routes for motorized over-snow vehicle use, groomed routes, or areas where motorized over-snow vehicle use is identified as suitable.

> This guideline does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private inholdings, or to access regulated by guideline HU G12 (see appendix A).

Under alternatives B modified and D, motorized over-snow vehicle use would be suitable on approximately 28 percent of critical habitat. Under alternative A, approximately 27 percent would be suitable, and under alternative C approximately 20 percent would be suitable. Designated cross-country ski areas would occur on < 1 percent of Canada lynx critical habitat. Based upon the findings of Squires and others (2010) and of Kolbe and others (2007) for northwest Montana, proposed changes in management direction for motorized over-snow vehicle use are anticipated to have minor effects on critical habitat. Even in areas where motorized over-snow vehicle use is suitable, dense forest cover limits access and prevents snow compaction in some suitable areas. As direction in the forest plan is implemented, proposed changes in routes, groomed routes, or areas open to motorized over-snow vehicle use would undergo additional site-specific consultation at the project level, so if changes in primary constituent element 1b occur due to a changing climate, they could be assessed at that time.

Nonmotorized over-snow vehicle use also occurs across the Forest but is generally dispersed, except in designated cross-country ski areas. Designated cross-country ski areas are included in management area 7 under the action alternatives. Two of these areas, Round Meadow and Essex, are located in Canada lynx critical habitat. The boundaries of these areas are not proposed to change with the action alternatives, so there would be no effects to primary constituent element 1b.

Primary constituent element 1c (see table 91)

Lynx dens in northwest Montana are typically found in mature multistory stands of spruce-fir forests with dense horizontal cover and abundant coarse woody debris (downed wood), although they may also be located in mid-seral, regenerating stands (J. R. Squires et al., 2008). Young stands that are either naturally sparse or mechanically thinned are seldom used for denning. Denning habitat is generally abundant across the coniferous forest landscape of northwest Montana and is not likely to be limiting for lynx (J. R. Squires et al., 2008, 2010; J. R. Squires et al., 2006). Table 92 displays the current estimates for the amount of downed wood across the potential vegetation types (see forest plan figures B-03 to B-09) that have the potential to provide boreal forest landscapes supporting a mosaic of differing successional forest stages (a critical habitat primary constituent element).

Table 92. Current estimates in average total tons per acre of downed wood, as averaged across all forested acres within each potential vegetation type on the Forest

Potential Vegetation Type	Current Estimate (total tons per acre)[1]
Cool-moist	18.6
Cold	12

1. Source: Forest Inventory and Analysis data using R1 Summary database (Hybrid 2011) analysis tools.

Downed woody material providing primary constituent element 1c is highly variable in amount, sizes, species, and stages of decay, both across the landscape and over time. Management areas that emphasize natural ecosystem processes (such as management area 1) and forestwide plan components for old growth, snags, and downed wood would provide for downed woody material. Recent stand-replacing fires have increased, and as the snags fall there will be a period of time where downed woody material will be especially high in these fire areas. About 20-30 years (on average) following a wildfire on the Forest, dense horizontal cover is abundant in lynx habitat. Denning habitat is anticipated to be abundant in burned areas and in old-growth forest. Salvage harvest of dead trees could reduce downed woody material

in some portions of critical habitat. However, in areas with vegetation management, the forest plan alternatives B modified, C, and D have guideline FW-GDL-TE&V-08, which states, “To contribute to maintenance of soil function and provide desired habitat and forest structural diversity for wildlife within timber harvest units, a minimum of approximately eight tons per acre of downed woody material greater than 3 inches in diameter should be retained within the unit. Retained material should consist of the longest and largest pieces present.” Exceptions may occur, such as when there is insufficient material of suitable size prior to harvest, within developed recreation sites, or where fuels reduction is desired to decrease expected fire behavior and protect identified assets (e.g., within the wildland-urban interface). Under alternative A, amendment 21 specifies that an average of 30-32 pieces per acre that are 9-20 inches diameter should be retained and an average of 15 pieces per acre that are greater than 20 inches should also be retained. In addition, guideline VEG G11 in appendix A addresses the distribution of denning habitat for Canada lynx and ensures that it would be assessed site-specifically. On the heavily forested Flathead National Forest, management activities are not likely to result in a shortage of primary constituent element 1c at the large landscape scale discussed in the critical habitat rule.

Primary constituent element 1d (see table 91)

- Matrix habitat, by definition, is habitat that is important to lynx for movement. However, the vegetative condition and structure of matrix habitat is not relevant to its value. Therefore, in matrix habitat, activities that change vegetation structure or condition would not be considered an adverse effect to lynx critical habitat unless those activities would create a barrier or impede lynx movement between patches of foraging habitat and between foraging and denning habitat within a potential home range (USFWS, 2014a). Under all alternatives, standards ALL S1 and LINK S1 and guidelines ALL G1 and LINK G1 would provide for matrix habitat, which is primary constituent element 1d. ALL S1 requires that new or expanded permanent development and vegetation management projects must maintain connectivity in a lynx analysis unit and/or linkage area and ensures that connectivity would be assessed site-specifically during project level consultation in critical habitat. Guideline ALL G1 states that methods to avoid or reduce effects on lynx should be used when constructing or reconstructing highways, including forest highways across Federal land. In addition to lynx plan components, alternative B modified includes the following plan components related to habitat connectivity:
- plan components that provide for riparian connectivity (FW-DC-WTR-02,; FW-STD-RMZ-01, 05, and 06; FW-GDL-RMZ-09 and 12);
- plan components for forest vegetation connectivity (FW-DC-TE&V-14 and 19; FW-GDL-TE&V-03, 06, and 07; MA6a-DC-02, MA6b-DC-02, and MA6c-DC-02);
- plan component FW-GDL-IFS-12, which states that within areas specifically identified as important for wildlife connectivity across highways, the USFS should cooperate with highway managers and other landowners to implement crossing designs that contribute to wildlife and public safety.
- plan components for connectivity in areas that have been modeled as important for several wide-ranging carnivores or big game species, including Canada lynx, wolverines, grizzly bears, and elk (GA-HH-DC-03, GA-MF-DC-04, GA-NF-DC-06 and 07, GA-SM-DC-03, and GA-SV-DC-09). For example, GA-HH-DC-03 states that the Coram connectivity area provides habitat connectivity for a north-south movement corridor for wide-ranging species (e.g., grizzly bear, Canada lynx, wolverine) moving between the southern and northern watersheds on the Forest.
- plan components to retain NFS lands in public ownership or acquired lands by purchase, donation, exchange, or other authority as opportunities arise to improve national forest management (FW-DC-LSU-01).

Plan components for connectivity and linkage areas are designed to provide for multiple species, would allow continued movement of lynx along the putative travel corridors identified by Squires and others in 2013, and would address the objectives of matrix habitat (J. R. Squires et al., 2013).

Actions that have the potential to adversely modify critical habitat

Effects common to all alternatives

Permanent loss or conversion of boreal forest

There are no actions contemplated under the forest plan alternatives that would cause permanent loss or conversion of boreal forest at the large landscape scale discussed in the critical habitat rule. Standard ALL S1 requires that new or expanded permanent developments and vegetation management projects in a lynx analysis unit and/or a linkage area must maintain habitat connectivity.

Traffic volume and speed

None of the alternatives contemplate increasing traffic volume or speed on roads that divide critical habitat. Under guideline HU G6, methods to avoid or reduce the effects on lynx in lynx habitat should be used when upgrading unpaved roads to maintenance levels 4 or 5 if the result would be increased traffic speeds and volumes or a foreseeable contribution to increases in human activity or development in lynx habitat.

Highway construction and expansion are not under the authority of the Forest Service, but several forest plan components address highway coordination, particularly in linkage areas. These include objective LINK O1, which encourages working with landowners to pursue conservation easements, habitat conservation plans, land exchanges, or other solutions in mixed ownership areas to reduce the potential of adverse impacts on lynx and lynx habitat. In linkage areas, potential highway crossings will be identified (LINK S1), and Forest Service lands should be retained in public ownership (LINK G1). These forest plan components are beneficial in maintaining or improving habitat connectivity on NFS lands and would help to reduce or minimize adverse modification of critical habitat.

Actions that would reduce or remove understory vegetation within boreal forest stands on a scale proportionate to the large landscape used by lynx

Vegetation standards VEG S1, VEG S2, VEG S5, and VEG S6 are specifically aimed at providing adequate amount and arrangement of foraging habitat over time. All alternatives would protect existing lynx habitat that provides primary constituent element1a, except for allowed exceptions or exemptions within the wildland-urban interface. Fuels treatments in the wildland-urban interface would occur under all alternatives (as discussed in the section above on primary constituent element 1a). Although some treatments in the wildland-urban interface would reduce or remove understory vegetation within boreal forest stands and result in reductions in the quality or quantity of snowshoe hare and lynx habitat, they would not occur on a scale proportionate to the large landscape used by lynx. There are no actions contemplated under the forest plan alternatives that would reduce understory vegetation within boreal forest stands in critical habitat at the large landscape scale discussed in the critical habitat rule.

Alternatives B modified, C, and D

The action alternatives are very similar to alternative A in protecting understory vegetation within boreal forest stands (see forest plan, appendix A). An additional exception to VEG S6 would allow the felling of trees within 200 feet of disease-resistant whitebark pine trees used for cone, scion, and pollen collection. This could result in short-term adverse effects to critical habitat that would be greater under alternatives B modified, C, and D than under alternative A but would occur on very few acres of critical habitat.

Although some treatments would reduce or remove understory vegetation within boreal forest stands and would result in short-term reductions in the quality or quantity of snowshoe hare and lynx habitat, they would not occur on a scale proportionate to the large landscape used by lynx. The Forest consulted with the USFWS on anticipated wildland-urban interface treatments (Kuennen et al., 2017; USFWS, 2017b).

Consequences of management area allocations in lynx critical habitat

Table 93 lists Canada lynx critical habitat in each management area, by alternative (see figures 1-01 through 04). Management area allocations and lands suitable for timber production also have potential consequences. Existing and proposed wilderness areas (management area 1), inventoried roadless areas (located within management areas 5a or 4a, for example), some special areas (management area 3b), and other management areas (such as management area 6a) are not suitable for timber production. The effects for each management area are described in detail in the section above on Canada lynx.

Table 93. Acres and percentages of Canada lynx critical habitat in each Forest management area, by alternative

Management Area	Alternative A Critical Habitat (%)	Alternative B modified Critical Habitat (%)	Alternative C Critical Habitat (%)	Alternative D Critical Habitat (%)
1a Designated wilderness	49	49	49	49
1b Recommended wilderness	4	9	23	0
2a Designated wild and scenic rivers	< 1	< 1	< 1	< 1
2b Eligible wild and scenic rivers	0	1	1	1
3b Special areas	< 1	< 1	< 1	< 1
4a Research natural areas	< 1	< 1	< 1	< 1
4b Experimental and demonstration forests	< 1	< 1	< 1	< 1
5a, 5b, 5c, 5d Backcountry	17	14	6	20
6a General forest low-intensity vegetation management	4	5	8	5
6b, 6c General forest medium- and high-intensity vegetation management	25	20	12	20
7 Focused recreation areas	< 1	2	< 1	2

Under all alternatives, about 49 percent of critical habitat would be in wilderness. Recommended wilderness ranges from 0 percent under alternative D to 23 percent under alternative C. Under alternative B modified, the preferred alternative, about 57 percent of critical habitat, which is distributed across 78 of 109 lynx analysis units, would be in wilderness or recommended wilderness. Wilderness and recommended wilderness areas have had stand-replacing wildfires as well as trees killed by insect or disease activity, creating abundant denning habitat as trees fall down. In the future, these natural processes are expected to create an abundance of snags and downed wood in critical habitat, providing denning habitat and abundant stand initiation habitat as trees regrow (primary constituent elements 1a and 1c). No motorized vehicle use or mechanized transport and no commercial timber harvest would occur in these management areas. No effects to primary constituent elements 1b or 1d are anticipated.

Management areas with lands that are suitable for timber production (management areas 4b, 6b, 6c, and portions of 7) are likely to have vegetation management, including timber harvest, which could affect primary constituent elements 1a and 1c. In total, these management areas occur on no more than 13 percent of lynx critical habitat under alternative C, no more than 26 percent of lynx critical habitat under alternative A, and no more than 23 percent under alternative D. Under alternative B modified, these lands comprise 21 percent of lynx critical habitat distributed across 68 of 109 lynx analysis units on the Forest. Timber harvest could also occur on lands that are not suitable for timber production but where timber harvest is allowable. All timber harvest must be consistent with desired conditions, standards, and guidelines of the forest plan. Many of the forests in management areas suitable for timber production and within wildland-urban interface areas could be anticipated to have less understory vegetation and less downed wood after vegetation treatments. However, as explained in the Canada lynx "Affected environment" section, downed wood for denning habitat is not a limiting factor for lynx in northwest Montana. On the heavily forested Flathead National Forest, there are no actions contemplated in management areas that would reduce or remove understory vegetation within boreal forest stands on a scale proportionate to the large landscape used by lynx. Additional site-specific consultation would occur at the project level.

Adequacy of plan components for Canada lynx and their critical habitat

The 2012 planning rule requires the Forest to determine whether or not the plan components provide the ecological conditions necessary to contribute to the recovery of federally listed threatened and endangered species that occur within the plan area (36 CFR 219.9(b)(1)). Key ecosystem characteristics for the Canada lynx are deep, fluffy snow and a mosaic of forest habitats to provide foraging and denning habitat, arranged in such a manner to provide for connectivity, reproduction, and survival. The preferred alternative has plan components, including standards and guidelines, to maintain, improve, and restore ecological conditions within the plan area to contribute to the recovery of the Canada lynx (36 CFR § 219.9).

On September 12, 2005, the USFWS issued a recovery outline for Canada lynx (USFWS, 2005b). The outline is to serve as an interim strategy to guide and encourage recovery efforts until a recovery plan is completed. In the recovery outline, USFWS categorizes lynx habitat as core areas, secondary areas, and peripheral areas. The areas with the strongest long-term evidence of the persistence of lynx populations within the contiguous United States are defined as "core areas." Core areas have both persistent verified records of lynx occurrence over time and recent evidence of reproduction. The Flathead National Forest is in a core area. According to the USFWS, focusing lynx conservation efforts on these core areas will ensure the continued persistence of lynx in the contiguous United States by addressing fundamental principles of conservation biology (USFWS, 2007b). The recovery outline says "Recovery of the lynx will be achieved when conditions have been attained that will allow lynx populations to persist long-term within each of the identified core areas" (USFWS, 2005b).

Ecosystem and species-specific plan components in the forest plan, including standards and guidelines, will maintain, improve, and restore habitat conditions relative to vegetation management, habitat connectivity and linkage areas, human uses, and livestock grazing while allowing for ecosystem services and multiple uses. The vegetation management direction set forth in the preferred alternative (alternative B modified) conserves the most important components of lynx habitat: a mosaic of early-successional, mature, and late-successional forests with high levels of horizontal cover and structure. These components ensure that the habitat maintains its inherent capability to support both snowshoe hare prey base and adequate lynx foraging and denning habitat during all seasons. These standards are required for vegetation management actions on at least 93 percent of the lynx habitat in the plan area. According to the biological opinion of the USFWS on the effects of the NRLMD on Canada lynx critical habitat, (2017c),

> The Forest Service designed the NRLMD to address those risk factors to lynx that were relevant in terms of Forest Plan direction. Overall, the NRLMD reduces or avoids the potential for adverse effects to lynx critical habitat. The benefits of the NRLMD to lynx critical habitat come primarily from the vegetation management objectives and implementation of the standards and guidelines. As stated by the USFWS, This suite of objectives, standards, and guidelines clearly conserve snowshoe hare and lynx habitat (PCE [primary constituent element] 1a) in all occupied, mapped lynx habitat in the action area. However, the NRLMD is likely to result in adverse effects to lynx critical habitat, with the main influence from actions that impact snowshoe hare habitat or PCE 1a. The majority of adverse effects to lynx critical habitat from the NRLMD would be a result of the exemptions from (fuel treatment projects in the WUI [wildland-urban interface]), and exceptions to (activities for other resource benefit), the vegetation standards. . . . Although the exemptions from, and exceptions to, the NRLMD vegetation management standards may result in some adverse effects to lynx critical habitat, vegetation objectives, standards, and guidelines overall would contribute to creating and maintaining landscape patterns that sustain snowshoe hare and lynx populations. The habitat would retain its inherent capacity to regenerate. Vegetation management under the NRLMD may adversely affect areas of critical habitat, specifically PCE 1a. However, any affected LAUs [lynx analysis units] are expected to remain capable of producing adequate densities of snowshoe hares to support continual lynx presence and would continue to serve their intended conservation role for lynx. (p. 29)

No cumulative adverse effects to lynx are anticipated to occur as a result of management actions on other national forests within the cumulative effects analysis area. Glacier National Park and the Confederated Salish and Kootenai Tribes incorporated the Lynx Conservation Assessment and Strategy into their management plans, and Montana Department of Natural Resources and Conservation manages their lands in accordance with their Habitat Conservation Plan (MTDNRC, 2011). These plans help to minimize adverse effects on those lands. Only a small fraction of lynx habitat occurs on private lands, and there is little potential for adverse cumulative impacts. Mortality due to incidental trapping or illegal shooting has the potential to cause cumulative adverse effects, but the magnitude of this mortality is unknown and MFWP has implemented several programs and regulations aimed at reducing this risk. Climate change has the potential to cause adverse cumulative effects due to larger or more frequent disturbances than were typical in the past and to the potential reduction in the amount and persistence of deep, fluffy snow. At this time, the magnitude of effects of future climate change across the cumulative effects analysis area is uncertain. Vegetation management standard VEG S1 would limit regeneration harvest in lynx analysis units with recent and large stand-replacing wildfires on NFS lands. The effects of winter climate changes on lynx depend upon whether more winter precipitation falls as rain or as snow.

Although the Forest does not have authority over all the stressors that may affect the Canada lynx and its critical habitat, the preferred alternative includes plan components that would maintain, improve, and restore Canada lynx habitat, including but not limited to the primary constituent element described in the final rule designating critical habitat. This would be accomplished by plan components, including standards and guidelines, to retain diverse ecosystems and their integrity, as detailed in section 3.7.4. While meeting the requirements of the 2012 planning rule (36 CFR §§ 219.8 and 219.9), the plan must provide for ecosystem services and multiple uses, including outdoor recreation, range, timber, watershed, wildlife, and fish. Plan components for the Canada lynx have been integrated with plan components for ecosystem services and multiple uses (36 CFR § 219.10). Broadscale monitoring of vegetation conditions will occur on the Forest and broad-scale monitoring of mesocarnivores (including Canada lynx) is anticipated to occur in the Northern Region, so changes in vegetation conditions can inform the forest plan and project implementation in the future.

Cumulative effects—Canada lynx critical habitat unit 3

In June of 2017, the Northern Region submitted a biological assessment (Conway & Hanvey, 2017) analyzing the potential impacts of implementing the programmatic guidance in the NRLMD on Canada lynx critical habitat, including critical habitat unit 3. The Region determined that the programmatic management direction may affect and is likely to adversely affect critical habitat due to the potential for adverse effects on primary constituent element 1a. Effects to the other primary constituent elements were determined to be insignificant (for anticipated treatment acres on each national forest, see Conway and Hanvey (2017).

Primary constituent element 1a: The Flathead National Forest and other national forests in critical habitat unit 3 are managed in accordance with the NRLMD, which provides for primary constituent element 1a. Tribal lands within the proposed critical habitat Unit 3 include about 370 square miles of the Flathead Indian Reservation in Montana, which is managed by the Confederated Salish and Kootenai Tribes. In their 2014 Final Environmental Assessment: Revised Designation of Critical Habitat for the Contiguous United States Distinct Population Segment of the Canada Lynx, the USFWS (2014d) stated:

> In accordance with Secretarial Order 3206, “American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act” (June 5, 1997); the President’s memorandum of April 29, 1994, “Government-to-Government Relations with Native American Tribal Governments” (59 FR 22951); Executive Order 13175 “Consultation and Coordination with Indian Tribal Governments;” and the relevant provision of the Departmental Manual of DOI (512 DM 2), the Service [USFWS] believes that fish, wildlife, and other natural resources on Tribal lands are better managed under Tribal authorities, policies, and programs than through Federal regulation wherever possible and practicable. We excluded Tribal lands from the final designation in 2009, and we are again considering excluding Tribal lands from the final revised designation. (p. 46)

Natural disturbance processes have historically played an important role in maintaining a mosaic of boreal forest successional stages (primary constituent element 1) that provides habitat for both snowshoe hare and Canada lynx. Glacier National Park occupies portions of lynx critical habitat between the Bob Marshall Wilderness Complex and Canada. In these areas, there is a high potential for natural disturbance processes to play a continued role in maintaining a vegetation mosaic, supporting lynx, and providing connectivity to Canada. In Glacier National Park, an increase in wildfires since about 1990 has affected about 12 percent of lynx critical habitat. These burned areas will provide primary constituent element 1a, described above, once trees and shrubs have grown tall enough and dense enough to support snowshoe hares and lynx.

Primary constituent element 1b: On all lands, there is a potential for future changes in climate to reduce the extent of deep snow habitats preferred by lynx. According to the Canada lynx species status assessment (Bell et al., 2016), climate models project that the northwest Montana/northeast Idaho unit will maintain snow into the future. McKelvey et al. (in press) estimated that contiguous areas of spring snow cover would become smaller and more isolated throughout the Columbia River Basin, with greatest losses at the southern periphery but with possible increases in snow at higher elevations in the core. Effects on critical habitat will depend upon the elevation at which precipitation falls as rain vs. snow. In addition, spring snowmelt is already occurring about two weeks earlier in recent decades. Mills and Johnson (2013) forecasted that the annual average duration of snowpack will decrease by 29–35 days by midcentury. This may result in a contraction of the area where lynx have a competitive advantage in deep snow, but lynx could adapt to what is essentially more abundant summer snowshoe hare and lynx habitat. Downscaled winter climate and precipitation models have a higher level of uncertainty than summer climate models (Joyce, Talbert, Sharp, Morissette, & Stevenson, in press).

Primary constituent element 1c: In Glacier National Park, on tribal wilderness lands, and in wilderness areas on all national forests, wildfires, insects, and disease are likely to provide abundant downed trees for primary constituent element 1c. Denning habitat is generally abundant across the coniferous forest landscape of critical habitat unit 3 and is not likely to be limiting for lynx (J. R. Squires et al., 2008, 2010; J. R. Squires et al., 2006).

Primary constituent element 1d: Federal transportation-related projects within designated critical habitat areas would be analyzed under the section 7 consultation process for potential effects to the primary constituent element of lynx critical habitat. (USFWS, 2014d). Conservation efforts for lynx might include remote monitoring, construction of habitat structures such as overcrossings or underpasses, bridge lengthening, fencing, or development of databases to track key habitat linkages. Private lands are generally found at elevations that are too low to provide critical habitat. Where they overlap, development will likely continue and may reduce habitat connectivity across valleys that are located between blocks of lynx habitat on public lands.

Wolverine

Introduction

When the Forest’s assessment was published (April 2014), the USFWS had recently published a proposed rule to list the North American wolverine as a threatened distinct population segment in the contiguous United States (USFWS, 2013a). However, on August 13, 2014, the USFWS withdrew its previous proposal (USFWS, 2014b). On April 14, 2016, the Court remanded the matter to the USFWS for further consideration consistent with order CV 14-246-M-DLC (consolidated with case nos.14-247-M-DLC and 14-250-M-DLC). The wolverine is now listed as a proposed threatened or endangered species for the Flathead National Forest, pending a status review by the USFWS (USFWS, 2016a, 2017e).The USFWS is currently preparing a new species status review to inform its listing determination for the North American wolverine. The species status assessment will incorporate additional information about the species from new studies, as well as new climate modeling results for Glacier National Park (adjacent to the Forest).

Information sources and incomplete or unavailable information

The Forest completed a thorough review of scientific information to inform the planning process, develop plan components, and assess consequences of alternatives, but some information is incomplete or unavailable. The USFWS wolverine status review is not yet available. Some research on the future risks of climate change or the effects of winter recreation on the wolverine population is incomplete. Data and information gaps exist, but the breadth and depth of the available scientific information are sufficient to assess potential effects of alternatives.

Analysis of effects of alternatives on wolverines and their habitat is based upon several models that are designed and updated by researchers. Current wolverine models include persistent spring snow as a factor in modeling habitat suitability, but different models assess and use this factor in different ways. The USFWS initially modeled wolverine habitat across the United States in 2013 (USFWS, 2013a, 2013e, 2014b) incorporating the work of two groups of scientists (Copeland et al., 2010; R. M. Inman et al., 2011). Since that time, Inman produced a more refined model that delineated areas of the western United States predicted to be maternal wolverine habitat (suitable for use by reproductive females), primary wolverine habitat (suitable for survival and use by resident adults), female dispersal habitat (suitable for relatively brief female dispersal movements), and male dispersal habitat (suitable for relatively brief male dispersal movements). This model is based on a resource selection function developed with wolverine telemetry locations from 2001-2010 in the Greater Yellowstone Ecosystem of Montana, Idaho, and Wyoming (Robert M. Inman et al., 2013). The model by Copeland and others used satellite data to

classify areas of persistent spring snow based upon coarse-scale satellite data collected over a seven year time period from 2000-2006, in which snow cover varied from year to year. This model displayed the number of years out of seven that a GIS pixel was classified as snow (e.g., seven years out of seven, one year out of seven). Copeland and others studied all known wolverine dens in Norway and Sweden, finding that areas with persistent spring snow at least five years out of seven were preferred (Copeland et al., 2010, p. figure 4). Weaver reported on wolverine habitat on the Forest by producing his own model that combined the model of Copeland and others and the 2013 model of Inman and others. Weaver reported that about 90 percent of the 62 known den sites in North America occurred in areas that had persistent spring snow for at least five years out of seven (Weaver, 2014). Weaver's model ranked wolverine habitat on the Forest as very high (maternal habitat) or high (current or future primary habitat).

Wolverine habitat models may be refined in the future as more scientific information becomes available. As Magoun and others (2017, p. 381) pointed out, "To manage wolverines and their habitat and incorporate persistent spring snow in models of future wolverine habitat, we must understand the relationship of wolverines to snow and measure persistent spring snow at an appropriate resolution and scale that is biologically meaningful for the species." As summarized by Magoun and others (2017), the spatial and temporal coarseness of the model and analysis by Copeland and others (2010) introduced uncertainty regarding the obligatory nature of the relationship between persistent spring snow through May 15 and wolverine habitat. This uncertainty resulted in the USFWS selecting a panel of scientists to review the specific relationship of wolverines to persistent spring snow (Woods, Morey, & Mitchell, 2014). The panel agreed that an obligatory relationship probably exists at the den-site scale but was less certain that a relationship existed at the scale of home range or species distribution. The panel came to no consensus on how much snow is needed for denning or how long it needs to last. Magoun and others (2017) stated: "Use of snow-covered den sites may not be obligatory through 15 May, or may not be obligatory at the scale in Copeland et al. (2010); nevertheless, wolverines may continue to use snow-covered sites as long as they are available" (p. 385). Magoun and others (2017) discuss that at the den-site scale, scattered patches of snow that are not detectable by remote sensing techniques may persist long enough in spring to provide cover for wolverines, even when considering future climates. These authors encouraged more research on the relationship of wolverines to smaller patches of spring snow at the den-site scale to determine if snow is necessary for successful reproduction, if it must be present for the entire denning season, if other structures (such as boulders or down trees) afford protection for wolverine kits near the end of the denning season, if wolverine distribution is tied to factors that have not yet been measured and defined, or if other possible uses of snow are an important component of wolverine habitat.

Snow in wolverine habitat may be affected by changes in climate. For this final EIS, the Forest used a compilation of climate change effects published for the Northern Region Adaptation Partnership (Halofsky et al., in press) that summarizes climate change projections by subregions (see figure 1-05). Downscaled climate models are used to predict the effects of a changing climate. Downscaled winter climate and precipitation models have a higher level of uncertainty than summer climate models (Joyce et al., in press). Future climate uncertainty and anticipated variability is associated with scale. Potential effects of future changes in snow cover and persistence are uncertain or variable due to geographic location, atmospheric circulation patterns (such as the Pacific Decadal Oscillation), and elevation (see sections 3.1.1 and 3.7.4, subsection "High-elevation habitat" for more details). A finer scale model for anticipated changes in wolverine habitat within Glacier and Yellowstone National Parks, considering differences based upon elevation, is currently being developed by NOAA and Colorado University at Boulder, but is not yet available. A new study by Webb and others (2016) found that wolverines in the boreal forest region of northern Alberta were not as closely associated with persistent spring snow as wolverines in the Rocky Mountains and suggested that these two very different habitats should be separated for analysis purposes and for the study of climate change effects.

Methodology and analysis process

The Forest considered the peer-reviewed models of Copeland and others (2010) as well as Inman and others (2013)for analysis of alternatives (USDA, n.d.). The Forest also considered Weaver's analysis, which used both models (2014). The model of primary wolverine habitat (suitable for survival and use by resident adults) from Inman and others (2013) was used to assess effects to wolverine habitat. The model by Copeland and others (2010) was used to assess effects to maternal and natal denning habitat, including areas providing persistent spring snow at least five years out of seven (on average), referred to as "maternal denning habitat" throughout the analysis in this final EIS (see figures 1-18 through 1-21 and Kuennen (2017) for more details). Maternal denning habitat is a smaller area within primary wolverine habitat, which in turn is within dispersal habitat modeled by Inman and others (2013).

Spatial and temporal analysis

The analysis area for indirect effects of the forest plan is the areas of modeled habitat encompassed by the geographic areas of the Forest. Because wolverines are wide-ranging, the analysis of cumulative effects is discussed in the context of the northern Rocky Mountains area identified by the USFWS (see USFWS, 2013e).

Affected environment

Population, life history, and distribution

Wolverines are year-round residents across Alaska and Canada. The southern portion of the species' range extends into high-elevation alpine portions of Washington, Idaho, Montana, Wyoming, California, and Colorado. Wolverines occur at low densities, range widely, inhabit remote and rugged landscapes away from human populations, and are difficult to detect, so conducting research on wolverines is challenging (IDFG, 2014). Wolverine populations in Montana were heavily trapped in the early 1900s and were near extinction by 1920. However, numbers increased in the western part of the state from 1950 to 1980 (Hornocker & Hash, 1981). Wolverine population growth and expansion has been documented in the North Cascades and northern Rocky Mountains (USFWS, 2013a). The Western Association of Fish and Wildlife Agencies is currently conducting a multi-state occupancy study to address conservation of the wolverine including restoring, connecting, and monitoring wolverine populations and their habitat in the U.S. Rocky Mountains and Cascade Mountains. Preliminary results for the 2016/17 monitoring season indicate there were 157 detections of wolverine in grid cells across Montana, Idaho, Wyoming, and Washington, but genetic identification of individuals has not yet been completed.

According to the USFWS (2013a), "Wolverine records from 1995 to 2005 indicate that wolverine populations currently exist in the northern Rocky Mountains and that the bulk of the current population occurs here. Within the area known to currently have wolverine populations, relatively few wolverines can coexist due to their naturally low population densities, even if all areas were occupied at or near carrying capacity. Given the natural limitations on wolverine population density, it is likely that historic wolverine population numbers were also low" (p. 7868).

Wolverine populations fluctuate in response to prey availability, juvenile dispersal, and mortality of adult females. The USFWS stated that the northern Rocky Mountains portion of the North American wolverine distinct population segment is thought to be the largest subpopulation and the most genetically resilient of the current subpopulations within the United States (USFWS, 2013a). Inman and others (2013) estimated the current population as well as the population capacity for regions of the western United States. The Forest is in the Northern Continental Divide region. They estimated that the current population in the Northern Continental Divide region is at its capacity, with the highest capacity in the Bob Marshall Wilderness.

Current information for wolverine occurrence on the Forest is based on (1) reported trapping records; (2) non-invasive monitoring, including remote cameras and DNA analysis of hair or scat; and (3) observations/sightings of either the species or tracks recorded in Forest or State databases (USDA, n.d.). Wolverine detections are distributed across suitable habitats on the Forest (USDA, n.d.). No recent research that would estimate population levels has been conducted for wolverine on the Forest. The Forest and other cooperators detected a minimum of 13 individual wolverines within Forest geographic areas (based upon genetic analysis of samples collected during non-invasive carnivore monitoring in areas accessible by snowmobile from 2012-2015) (Curry et al., 2016; Pilgrim & Schwartz, 2015; Ruby et al., 2016; Swanson, 2017; SWCC, 2014, 2015).

Hornocker and Hash conducted telemetry research on 24 individual wolverines over a five-year period within a study area making up about 1,300 square kilometers of the Flathead National Forest (Hornocker & Hash, 1981). Their study area was primarily located in the South Fork of the Flathead River watershed and, secondarily, portions of the Sun, Swan, and Middle Fork of the Flathead River watersheds. About one half of the study area had timber harvest and a wide variety of types of recreation, and the other half was wilderness. Hornocker and Hash found wolverines at relatively high densities in the South Fork of the Flathead River watershed, and they concluded the population was stable (Hornocker & Hash, 1981). Research on wolverines has been conducted in the last decade or so in Glacier National Park (adjacent to the Forest) (Copeland & Yates, 2006; J. R. Squires, Copeland, Ulizio, Schwartz, & Ruggiero, 2007). Wolverines are constantly on the move and are known to make long-distance movements that are not impeded by topography or deep snow (Copeland & Yates, 2006; J. R. Squires et al., 2007). Copeland and Yates estimated that adult female wolverines have home ranges averaging 55 square miles. Adult males ranged over an even larger area, including lands outside the park, with home ranges that averaged 193 square miles (Copeland & Yates, 2006). Home range boundaries are dynamic, as are population demographics.

Habitat

For wolverine habitat across the western United States, Inman and others (2013) reported that, in general, wolverines are distributed in areas of higher elevation, where there is steeper terrain, more snow, fewer roads, and less human activity and in areas closer to high-elevation talus, tree cover, and snow cover persisting to April 1. Year-round habitat includes rocky alpine habitats, glacial cirque basins, and avalanche chutes that provide food sources such as marmots, voles, and carrion (Copeland et al., 2007; Hornocker & Hash, 1981; Robert M. Inman et al., 2007; Audrey J. Magoun & Copeland, 1998). Wolverines appear to rely on the cold and snow to cache carrion (Robert M. Inman, Magoun, Persson, & Mattisson, 2012). Wolverines also travel through the area where snow persists, and they minimize travel through low-elevation habitat (McKelvey et al., 2011). Persistent spring snow cover is also correlated with gene flow because this is where the wolverine’s within-home-range movements and dispersal occur year-round (Michael K. Schwartz et al., 2009). The area modeled by Inman and others (2013) as providing for male dispersal encompasses the whole Forest, whereas the area modeled as providing for female dispersal is more limited.

Magoun and Copeland (1998) described two types of reproductive dens: natal dens where young are born and maternal dens where the mother may move the kits if conditions are no longer suitable at the natal den. Abandonment of natal and maternal dens may be a preemptive strategy that confers an advantage to females if prolonged use of the same den makes a den more evident to predators (USFWS, 2013a). Sites used for maternal dens are often close to the natal den and have a similar structure. Prior to the Glacier National Park study, not much was known about the den sites of reproductive female wolverines in Montana because den sites are often in remote terrain that is very difficult to study. During the first three years of the study, data was collected for 19 wolverines, and information about reproductive dens was obtained for two adult females that raised four offspring (kits). Copeland and others found that dens were

excavated in the snow and were on upper slopes in sparse timber beneath downed woody debris or rocks. Dens are typically used through late April or early May. Females used two to three different dens prior to the weaning of kits at six to seven months of age. Kits gather at rendezvous sites that are primarily in boulder, talus, and cliff areas (Copeland et al., 2010). Survival of young was low, even in the national park setting where trapping is not allowed and motorized disturbance does not occur in winter or spring. Wolverine den sites may not occur in the same exact spot year after year, and specific maternal and/or natal den sites on the Forest are unknown.

Primary wolverine habitat is also characterized by low levels of human development (Copeland, 1996; Hornocker & Hash, 1981; Krebs, Lofroth, & Parfitt, 2007; USFWS, 2013a). This negative association with frequent human presence is sometimes interpreted as active avoidance of human disturbance, but it may reflect the wolverine’s preference for cold, snowy, and high-elevation habitat that humans do not often develop. The USFWS assessed the effects of a variety of human activities that can affect wolverines and their use of habitat. The USFWS stated:

> Few effects to wolverines from land management actions such as grazing, timber harvest, and prescribed fire have been documented. Wolverines in British Columbia used recently logged areas in the summer and moose winter ranges for foraging (Krebs et al., 2007, pp. 2189-2190). Males did not appear to be influenced strongly by the presence of roadless areas (Krebs et al., 2007, pp. 2189-2190). In Idaho, wolverines used recently burned areas despite the loss of canopy cover (Copeland, 1996). . . .
>
> Intensive management activities such as timber harvest and prescribed fire do occur in wolverine habitat; however, for the most part, wolverine habitat tends to be located at high elevations and in rugged topography that is unsuitable for intensive timber management. . . . Wolverines are not thought to be dependent on specific vegetation or habitat features that might be manipulated by land management activities, nor is there evidence to suggest that land management activities are a threat to the conservation of the species. (USFWS, 2013a, p. 7879)

The USFWS also stated that it is unlikely that wolverines avoid the type of low-use forest roads that generally are found in wolverine habitat. Based on the best available science, the USFWS concluded that wolverines do not avoid human development of the types that occur within suitable wolverine habitat and that there is no evidence that wolverine dispersal is affected by infrastructure development (USFWS, 2013a).

Krebs and others (2007) modeled male vs. female wolverine habitat selection in British Columbia, hypothesizing that food, predation risk, and human disturbance affected habitat selection. Krebs and others based their model on 39 adult wolverines (23 females and 16 males) that were located a total of 2,125 times within two study areas. These authors modeled selection in two time periods: winter and nonwinter. The winter season was defined as the period when there was persistent snow cover at treeline. Human use variables included in the models they tested included those associated with winter recreation activity, roads, and timber harvesting. Winter recreation data included estimates of snowmobile primary use sites, locations of runs for two helicopter skiing companies in the Columbia Mountains study area, and backcountry ski use centered on the Trans-Canada Highway corridor within and adjacent to Mount Revelstoke and Glacier National Parks. These authors stated that extensive timber harvesting had occurred within a large portion of the study area. Krebs and others (2007) concluded that male wolverines were most closely associated with food availability in both summer and winter. Moose winter ranges, valley bottom forests, and avalanche terrain were positively associated with winter male wolverine use. The authors stated:

> Habitat associations of females were more complex; combinations of variables supporting food, predation risk, or human disturbance hypotheses were included in most supported models from both summer and winter in both study areas. Females were associated with alpine and avalanche environments where hoary marmot and Columbia ground squirrel prey are found in summer. Roaded and recently logged areas were negatively associated with female wolverines in summer. In the Columbia Mountains, where winter recreation was widespread, females were negatively associated with helicopter and backcountry skiing. Moose winter ranges within rugged landscapes were positively associated with females during winter. Our analysis suggests wolverines were negatively responding to human disturbance within occupied habitat. The population consequences of these functional habitat relationships will require additional focused research. Our spatially explicit models can be used to support conservation planning for resource extraction and tourism industries operating in landscapes occupied by wolverines. (abstract)

Recreational use in wolverine habitat

The threshold for the amount of human activity that can occur before it affects male and female wolverine habitat selection is unknown. Some scientists have expressed concern about the effects of human activities on female wolverines with young kits during the mid-February to mid-May time period because food resources are scarce for foraging females. As the kits mature, the mother will leave them for longer periods of time to find food, but until the kits are at least 10 weeks old, they cannot travel with their mother. If a female needs to move kits to a new location, or to another den, she must carry them in her mouth. If the female needs to move the kits very far, the probability of kits dying increases. Reproductive females and kits are at risk of predation (Audrey J. Magoun & Copeland, 1998), and, according to Persson in 2005, females are most vulnerable to energetic pressures due to the high cost of lactation during this period (Krebs et al., 2007). The predominant activity in some portions of wolverine habitat during this time period is backcountry recreation.

Winter backcountry recreation opportunities in the northern Rocky Mountains include snowshoeing, snowboarding, skiing, snowcat- or trackster-assisted skiing and snowboarding, snow bikes, and snowmobiling. Heinemeyer and Squires (2015) are investigating winter recreational use (primarily skiing, snowboarding, and snowmobiling) in wolverine habitat in central Idaho and the Yellowstone region of Idaho, Montana, and Wyoming. Heinemeyer and Squires stated that wolverines appear to tolerate many types of winter recreation in their home ranges. Wolverines have been documented to persist and reproduce in habitats with high levels of human use and disturbance, including developed alpine ski areas and areas with motorized snowmobile use (Heinemeyer, 2012; Heinemeyer & Squires, 2013). Heinemeyer and Squires (2014) stated, “Wolverines appear to tolerate winter recreation in their home ranges, including denning females. Based on our preliminary findings, potential wolverine habitats that have even high levels of winter recreation may support resident wolverines despite the potential human disturbance” (p. 4). This suggests that wolverines can survive and reproduce in areas that experience human use and disturbance; however, there is uncertainty with respect to the amount, type, and timing of human recreational use and its effects on female wolverines.

Heinemeyer and Squires (2014) indicated there may be increasing avoidance of winter recreation areas as the amount of an individual wolverine’s home range affected by winter recreation increases. They also noted that the reproductive status of the females may affect their potential response to winter recreation, with reproductive females having higher movement rates when in a high-use recreation zone. In their 2015 annual report, Heinemeyer and Squires (2015) stated that the field data collection for the wolverine winter recreation project was completed and they were focused on analyzing the responses of wolverines to winter recreation (p. 12). The response of individual wolverines to human disturbance is still being analyzed.

The Flathead National Forest has approximately 1.4 to 1.7 million acres of modeled wolverine habitat, depending upon which model is used (USFWS, 2013a, 2014b; Woods et al., 2014). The majority of the modeled habitat occurs in the Bob Marshall Wilderness Complex in the South Fork and Middle Fork geographic areas, with lesser amounts in the Swan and Mission Mountain portions of the Swan Valley geographic area as well as the Whitefish Range portion of the North Fork and Salish Mountains geographic areas. On the Forest, about 59-64 percent of modeled wolverine habitat is in designated wilderness, where motorized uses (including snowmobiling, helicopter-assisted skiing or snowboarding, and trackster-assisted skiing or snowboarding) are not allowed. Nonmotorized uses such as backcountry skiing are not restricted, but because much of the wilderness area on the Forest is large and remote, it is also difficult to access for nonmotorized winter recreation. Wilderness areas provide habitat where the risk of human disturbance to wolverines is very low during the time period when females have dependent young. In addition, about 25 percent of modeled wolverine habitat is in inventoried roadless areas, where road building is not allowed and timber harvest is restricted. Glacier National Park, adjacent to the Forest, provides over 1 million acres that is closed to motorized over-snow vehicle use. In combination with wilderness areas on the Forest to the south, there are over 2 million acres of habitat available to wolverines where there is no motorized over-snow vehicle use allowed and where ungulates are present to provide sources of carrion. I

Some of the modeled wolverine habitat on the Forest has developed recreation and motorized access. Much of Whitefish Mountain Resort is in modeled wolverine habitat and skiers riding the lift observed a wolverine as it fed on carrion. Outside wilderness areas, restrictions on motor vehicle and motorized over-snow vehicle use provide habitat for wolverines with a low risk of human disturbance during time periods when wolverines may be sensitive—particularly in the North Fork geographic area, where use of motorized over-snow vehicles is restricted to specific routes in much of the area (table 94). In areas open to motorized over-snow vehicle use, the amount of use has likely increased over the last few decades due to technical advances in motorized over-snow vehicles and human population growth in the Flathead Valley. Backcountry skiing has also increased in popularity.

Connectivity and wolverine habitat

Inman and others (2013) reported that the U.S. northern Rockies include most of the major core areas, the majority of the current population, and connections to larger populations in Canada. They identified six regions that can likely function as major population cores where primary habitats exist as large blocks of relatively contiguous, publically owned lands that include significant portions of designated wilderness or national park and are capable of supporting 50 or more wolverines. These are the Northern Cascade, Northern Continental Divide, Salmon-Selway, Greater Yellowstone, southern Rockies, and Sierra-Nevada regions. Recent research in Glacier National Park has demonstrated that habitat connectivity between Glacier National Park, the Forest, and Canada currently provides for wolverine movement (Copeland & Yates, 2006).

Key stressors

Land management

Some commenters expressed concern about winter recreation activities in wolverine habitat. As discussed in the "Affected environment" section above, wolverines are adaptable and generally tolerant of human recreation activities, but there is scientific uncertainty about the types of winter recreation activities and the amount of disturbance that may affect female wolverines with young kits (Heinemeyer & Squires, 2015; USFWS, 2013a; Woods et al., 2014). Winter motorized access can also indirectly affect accessibility for trapping.

Trapping

MFWP has authority to set regulations for wolverine trapping. The Forest is within wolverine management unit 1 (northwest Montana), which had a trapping quota of three wolverines (with a maximum of one female) in 2010 and has had a quota of 0 since then (MTFWP, 2017).

Highways

Montana Department of Transportation has authority to manage highways on the Forest. Wolverine mortality from collisions with vehicles has occurred, but at low levels. Wolverines do not usually come into contact with high-traffic-volume roads except in those areas where highways cross over mountain ranges (such as major passes). Wolverines killed on roads in valleys between mountain ranges are likely the result of dispersal attempts by wolverines, but these appear to be rare occurrences (USFWS, 2014b).

Changing climate

The 2013 proposed rule for the North American wolverine identified threats to the long-term persistence of the species. The primary threat at that time was determined to be potential changes in climate (USFWS, 2013a), including effects on connectivity of meta-populations. The USFWS is currently evaluating potential changes in climate within wolverine habitat based upon more refined models.

Key indicators

Coarse-filter plan components addressed in section 3.7.4 provide for habitat diversity that benefits wolverines. The wolverine indicators, plan components, and alternatives were developed after considering key indicators addressed in other sections of the final EIS, key stressors, public comments, and issues identified during scoping. The biological basis for key ecosystem characteristics and impacts of human activities is described in detail in the "Affected environment" section. Key stressors on all lands are discussed in the section on cumulative effects to the wolverine. In addition to the indicators and effects of alternatives on habitat described in section 3.7.4, subsection "High-elevation habitat," the following species-specific indicator applies to indirect effects of alternatives for the wolverine:

- Risk of human disturbance to female wolverines with young in areas of modeled wolverine maternal denning habitat.

Environmental consequences

Effects common to all alternatives

All alternatives include plan components designed to maintain or restore diverse, resilient vegetation conditions that would provide for wolverine prey species. As described in the "Affected environment" section above, research results suggest that wolverines are generally tolerant of human disturbance associated with recreation developments and activities (Heinemeyer & Squires, 2014, p. 4). The thresholds for the amount of development or human recreational use that individual wolverines will tolerate in their home ranges is unknown but is being investigated. With all alternatives, plan components would support key ecosystem characteristics for wolverines because about 59-64 percent of modeled wolverine habitat is in designated wilderness (the range varies based upon which model is used (as explained in the section on the methodology and analysis process used for wolverine). In designated wilderness, the risk of human disturbance is low because motorized uses and mechanized transport such as snowmobiling, helicopter-assisted skiing or snowboarding, and snow bikes are not allowed. Nonmotorized and non-mechanized transport on the Forest are not restricted, but because much of the designated wilderness area on the Forest is remote, it is difficult to access for nonmotorized and nonmechanized winter recreation.

Summary of modeled alternative consequences

To assess effects of the risk of human disturbance to female wolverines with young, the Forest used the model developed by Copeland and others to model maternal denning habitat (2010). Modeled maternal denning habitat encompasses about 655,000 acres or about 27 percent of all Forest lands. Table 94 displays the consequences of the alternatives resulting from suitability of areas for motorized over-snow vehicle use within modeled maternal denning habitat (see figures 1-18 through 1-21).

Table 94. Modeled wolverine maternal denning habitat by alternative

Motorized over-snow vehicle use suitability in modeled denning habitat with persistent snow at least five years out of seven	Alternative A	Alternative B modified	Alternative C	Alternative D
Acres where motorized over-snow vehicle use is suitable	74,048	71,547	18,051	77,257
Acres where motorized over-snow vehicle use is not suitable	580,644	583, 145	636,641	577,435
percent of total where motorized over-snow vehicle use is suitable	11%	11%	3%	12%

As shown in table 94, alternative C would have the lowest percentage of modeled maternal denning habitat where motorized over-snow vehicle use would be suitable, and alternative D would have a slightly higher percentage. Alternatives A and B modified both maintain the existing percentage but shift where it is located on the Forest (see figures 1-18 through 1-21). Motorized over-snow vehicle use would be suitable on no more than 12 percent of modeled maternal denning habitat under alternative D, 11 percent under alternatives A and B modified, and 3 percent under alternative C.

With alternatives A, B modified, and C recommended wilderness would also be added, contributing to the future percentage of the forest with a low risk of human disturbance in areas of modeled wolverine maternal denning habitat, as discussed in the following sections.

Alternative A

Amendment 24 (USDA, 2006) designated specific routes, areas, and seasons for motorized over-snow vehicle use (Travel Management Rule § 212.81). Motorized over-snow vehicle use would be suitable on no more than 11 percent of modeled maternal denning habitat (see figure 1-18). About 9 percent of modeled maternal denning habitat is in recommended wilderness (management area 1b) and would not be suitable for motorized use, so the risk of disturbance to female wolverines with dependent offspring would be low (see figure 1-01 and section 3.15 for more details).

Alternative B modified

In comparison with alternative A, there would be a slight net decrease in modeled maternal denning habitat that is suitable for motorized over-snow vehicle use (see figure 1-19). Alternative B modified would change an area in Big Creek to suitable for motorized over-snow vehicle use, but the majority of the area added is not in modeled maternal denning habitat. An area in Sullivan Creek would become unsuitable and is in modeled maternal denning habitat.

The forest plan also includes guidelines that would benefit the wolverine by limiting the risk of human activities that might cause disturbance in modeled maternal denning habitat in the future. FW-GDL-WL-04 states, “New projects or activity authorizations involving low-altitude helicopter flights or landings in areas of modeled wolverine maternal denning habitat (identified in cooperation with USFWS and the USFS Rocky Mountain Research Station) should not occur from February 15 to May 15 unless they

include strategies or design features to mitigate disturbance to wolverines. Exceptions to this guideline may occur for public health and safety, emergency activities, or other approved administrative activities, such as site maintenance.” FW-GDL-REC-04 states, “To limit the risk of cumulative impacts to female wolverines with dependent young, there should be no net increase in percentage of modeled wolverine maternal denning habitat where motorized over-snow vehicle use is identified as suitable on NFS lands at a forestwide scale. Specific locations of routes or areas suitable for motorized over-snow vehicle use are specified in figure B-11.”

Under alternative B modified, about 15 percent of modeled wolverine maternal denning habitat is in recommended wilderness (management area 1b) (see figure 1-02), and it would not be suitable for motorized uses or mechanized transport (see section 3.15 for more details).

Alternative C

Under alternative C, three of the areas open to motorized over-snow vehicle use during the time period when female wolverines with offspring may be more sensitive to human disturbance would be virtually eliminated due to changes in suitability and management direction for recommended wilderness (management area 1b) in areas that are currently open (see figure 1-20). This alternative has the largest amount of wolverine maternal denning habitat in recommended wilderness (management area 1b), about 31 percent, which would not be suitable for motorized uses or mechanized transport (see figure 1-03; also see section 3.15 for more details). This alternative has the lowest risk of human disturbance to female wolverines with dependent offspring of all the alternatives.

Alternative D

Under alternative D, changes in areas suitable for motorized over-snow vehicle use would slightly increase the risk of disturbance to female wolverines with dependent offspring as future site-specific decisions are implemented (see figure 1-21). Alternative D has no recommended wilderness (management area 1b) but has more acres in a variety of backcountry management areas (management area 5) (see figure 1-04 and section 3.15 for more details).

In summary, scientific information about the effects of human disturbance indicates that wolverines are generally tolerant of many types of human recreational developments and use, as described in the “Affected environment” section. The thresholds for levels of human disturbance in habitats where female wolverines give birth to and raise dependent offspring are unknown at this time, but plan components for all alternatives would limit the risk of human disturbance.

Cumulative effects

Land management

The majority of wolverine habitat is located in higher-elevation areas that are largely designated wilderness, recommended wilderness and inventoried roadless areas, or lands that are relatively unavailable for development. Forest plan direction for other national forests in the northern Rocky Mountains (for activities such as timber harvest, livestock grazing, and motorized use of forest roads and trails) are not expected to negatively affect wolverines or their habitat. Diverse prey items are available for wolverines throughout the cumulative effects analysis area, so prey should continue to be available. The USFWS concurred with the Northern Region determination that management activities commonly conducted on the national forests would not jeopardize the wolverine (USFWS, 2014e).

Lands managed by the Confederated Salish and Kootenai Tribes include the Mission Mountains Tribal Wilderness Area and the South Fork Jocko Primitive Area. Cumulative adverse effects to the wolverine

are not expected as a result of management actions on tribal lands. Private lands are not generally located in modeled wolverine habitat on the Flathead National Forest.

Highways

With respect to connectivity and highways on the Forest, there is one high-elevation paved highway (U.S. Highway 2) along the border between the Forest and Glacier National Park. Since 2011, two wolverines have been killed by vehicles in MFWP Region 1 (T. Thier, MFWP, personal communication, 2016). Squires and others concluded that wolverine movements are unpredictable and are therefore not easy to incorporate in the planning of structural highway mitigation projects (J. R. Squires et al., 2007).

Trapping

In 2008, further analysis tied to the genetic makeup of the Montana wolverine population, the issue of maintaining population connectivity, and recognizing the core population areas of three major ecosystems led to additional regulation changes. These adjustments included delineating four wildlife management units and reducing quotas to a statewide total of five animals, to promote population connectivity among the three major ecosystems in the state where harvest is allowed (Giddings, 2009, pp. 35-39). In December 2012, a state district court judge in Helena granted a temporary restraining order that blocked the opening of Montana's 2012-2013 wolverine trapping season, and it remained closed with a quota of 0 in 2013–2014, 2014–2015, and 2015-2016. The future of wolverine trapping is unknown. The Forest is within wolverine management unit 1 (northwest Montana), which had a quota of three wolverines (with a maximum of one female) in 2010 and has had a quota of 0 since then (MTFWP, 2017). Since trapping was suspended in 2011, there has been one wolverine trapped accidentally (T. Thier, MFWP, personal communication, 2016). Glacier National Park, encompassing about one million acres adjacent to the Forest, is closed to trapping. Access during the winter season (discussed under sections on effects of alternatives) may indirectly affect the area accessible for trapping. Any cumulative effects to the wolverine resulting from trapping and winter recreation access on all lands are not available at this time, but investigations by multiple states in the Rocky Mountains are ongoing.

Changing climate

According to the models used in an assessment by McKelvey and others (2011), northern Montana (including the Forest), the southern Bitterroot Mountains, and the Greater Yellowstone Ecosystem retain significant spring snow in the next 50 years, whereas central Idaho is projected to lose significant spring snow. There are variations in climate models, but models generally indicate earlier snowmelt in the northern Rockies in the future, a pattern that has been ongoing since at least the 1950s. Although wolverines are known to spend the majority of their time at high elevations, the degree to which earlier snowmelt may affect wolverines and the connectivity of metapopulations is uncertain.

At a regionwide scale, the preliminary Northern Rockies Adaptation Partnership risk assessment for the wolverine (NRAP, 2015) states that there is no evidence that wolverines in the northern Rocky Mountains can persist in areas distant from extensive areas of spring snow, and thus their adaptive capacity appears to be low. The authors estimated that the magnitude of effects would be low in 2030 and moderate in 2050, with a high likelihood of effects across all time periods. Across the northern Rockies as a whole, losses of current levels of persistent spring snowpack are estimated to be around 30 percent by mid-century (NRAP, 2015). However, it is likely that snow will persist on some slopes and aspects at higher elevations. Due to the low density of wolverine populations, there may continue to be sufficient snow to meet the needs of the population as a whole. There may be microsites important to wolverines (such as mountain cornices, shaded cirque basins, or talus areas) that retain snow during most years or retain snow longer into the spring than surrounding areas. McKelvey and others (2011) stated: "Although wolverine distribution is closely tied to persistent spring snow cover, we do not know how fine-scale changes in

snow patterns within wolverine home range may affect population persistence" (p. 2895). The USFWS concurred with this finding, stating that "an improved understanding of how microclimatic variation alters the habitat associations of wolverines at fine spatial scales is needed" (USFWS, 2014b, p. 47527).

Some members of the public expressed a concern about the cumulative consequences of climate change upon connectivity of wolverine metapopulations. Wolverines are a highly wide-ranging species. Recent research in Glacier National Park has demonstrated that habitat connectivity between Glacier National Park, the Forest, and Canada currently provides for wolverine movement (Copeland & Yates, 2006). Plan components provide for connectivity of wolverine habitat by (1) providing for ecological conditions that meet subsistence and movement needs in connectivity areas, (2) limiting mortality risk through management of motorized access on NFS lands (see section 3.7.5, subsection "Grizzly bear," for more details), and (3) working with adjacent landowners and other interested parties to improve connectivity and linkage opportunities across multiple jurisdictions (e.g., cooperative agreements, highway approaches and crossings, and land consolidations, exchanges, acquisitions, and easements). Some of the key plan components for connectivity are FW-GDL-IFS-12; GA-HH-DC-03, GA-MF-DC-04, GA-NF-DC-06 through 08, GA-SM-DC-03, and GA-SV-DC-09. For example, GA-HH-DC-03 states that the Coram connectivity area provides habitat connectivity for a north-south movement corridor for wide-ranging species (e.g., grizzly bear, Canada lynx, wolverine) moving between the southern and northern watersheds on the Forest. On private lands, increasing residential development along highways that cross wolverine habitat may result in habitat fragmentation. Squires and others suggested that connectivity for wolverines may be facilitated by limiting permanent developments through conservation easements and land purchases (J. R. Squires et al., 2007). The Forest and Montana Department of Natural Resources and Conservation recently completed the Montana Legacy Project land acquisition in the Swan Valley geographic area of the Forest. This acquisition and other conservation easements on private lands may benefit wolverines in the future by limiting the density of permanent human developments and facilitating movement between mountain ranges.

The natural range of variation for persistent spring snowpack on the Forest is unknown, but variation from year to year is common. High-elevation areas with persistent spring snow at least five years out of seven are more likely to retain snow as the climate changes, whereas lower-elevation areas that retain persistent spring snow only one year out of seven are more likely to lose snow in the future as the climate changes. Some members of the public expressed a concern about the cumulative consequences of climate change on the Forest combined with increases in recreational activities. Glacier National Park provides over 1 million acres that is closed to motorized over-snow vehicle use, and much of the Park provides wolverine habitat. In combination, Glacier National Park, wilderness areas on adjacent national forests and tribal lands, and designated wilderness areas on the Flathead National Forest provide over 2 million acres of habitat available to wolverines that is remote and difficult to access by any means during the time periods when wolverines may be sensitive to disturbance.

The 2012 planning rule requires the Forest to determine whether the plan components provide the ecological conditions necessary to conserve proposed and candidate species (§ 219.12(a)(5)(iv). Key ecosystem characteristics for the wolverine, a proposed species, include high elevations with persistent spring snow, habitat for dispersal, and features such as rocky alpine areas, glacial cirque basins, and avalanche chutes that provide food sources such as marmots, voles, and ungulate carrion. Maternal and natal denning habitat with relatively low levels of human development are important, although the thresholds are unknown.

The northern Rocky Mountains portion of the North American wolverine distinct population segment is thought to be the largest subpopulation and the most genetically resilient of the current subpopulations (USFWS, 2013a). Alternative B modified, the preferred alternative, has plan components, including

standards and guidelines, to maintain, improve, and restore ecological conditions within the plan area to contribute to maintaining a viable population of the species within its range (2012 planning rule, 36 CFR § 219.9). In their concurrence letter for the programmatic biological assessment on the North American wolverine for the USDA Forest Service Northern Region, the USFWS (2014e) concurred that potential projects routinely conducted on National Forest Service lands are not likely to jeopardize the wolverine. All action alternatives include monitoring items MON-WL-14 and 17, which address the wolverine and its habitat (see chapter 5 of the forest plan for more details). The Forest does not anticipate substantial changes to wolverine maternal or natal denning habitat over the anticipated life of the plan, but if conditions change in the future, or if research or monitoring indicates there is a need to address specific threats that are within Forest Service authority or capability to manage, the forest plan may be amended or revised in the future if necessary.

3.7.6 Wildlife habitat connectivity

Introduction

Connectivity is an important part of the concept of ecological integrity. During the planning process, the distribution and connectivity of ecosystems and associated wildlife was examined at multiple scales, in multiple ways, using multiple models and analyses (see Kuennen, 2017b). Information on connectivity is abundant, but more information is needed to determine the most appropriate use of each publication, model, or data set (T. Graves, Chandler, Royle, Beier, & Kendall, 2014; McClure et al., 2016).

The 2012 planning rule defines connectivity as follows:

> Ecological conditions that exist at several spatial and temporal scales that provide landscape linkages that permit the exchange of flow, sediments, and nutrients; the daily and seasonal movements of animals within home ranges; the dispersal and genetic interchange between populations; and the long distance range shifts of species, such as in response to climate change. (36 CFR § 219.19).

Haber and Nelson (2015) stated that it is useful to think of connectivity as contributing to both the structure and function of ecosystems and landscapes. Structural connectivity is the physical relationship between patches of habitat or other ecological units; functional connectivity is the degree to which landscapes actually facilitate or impede the movement of organisms and processes of ecosystems (Ament, Callahan, McClure, Reuling, & Tabor, 2014).

Connectivity can take several forms, from linear corridors to stepping stones of suitable habitat and from managing for specific linkage areas to managing the landscape as a whole so that movement is facilitated without the need for a “corridor.” As summarized by Haber and Nelson (2015), key terms related to connectivity and wildlife movements are

- **corridor**. A distinct component of the landscape that provides connectivity (such as a linear patch).
- **linkage area or zone**. Broader regions of connectivity important to maintain ecological processes and facilitate the movement of multiple species.

As summarized by Ament and others (2014):

- **permeability**. The degree to which landscapes are conducive to wildlife movement and sustain ecological processes.

Wildlife and natural ecosystem processes occur irrespective of political boundaries. The Flathead National Forest is contiguous with the Kootenai National Forest to the west, Canada to the north, the

Helena-Lewis and Clark National Forest to the east, the Lolo National Forest and tribal lands of the Confederated Salish and Kootenai Tribes to the south, and Glacier National Park to the north and east. On the Flathead National Forest, connectivity has been influenced by natural ecosystem processes as well as by human developments such as road construction, ski area development, timber harvest, utility corridors, and private land development.

As recommended in Haber and Nelson (2015), the Forest's planning process takes connectivity into account by:

- recognizing that sustainability depends in part on how the plan area influences and is influenced by the broader landscape (36 CFR § 219.8(a)(1)(ii) and (iii)) (see cumulative effects and landscape context sections throughout the Forest's assessment (USDA, 2014a); sections 3.7.4 and 3.7.5 and chapter 6 of this final EIS);
- assessing conditions, trends, and sustainability in the context of the broader landscape (36 CFR § 219.5(a)(1)) (see the Forest's assessment; cumulative effects and landscape context sections throughout sections 3.7.4 and 3.7.5 and chapter 6 of this final EIS; and MFWP (2014));
- evaluating system drivers (e.g., climate change) and stressors (e.g., barriers to connectivity) (36 CFR § 219.6 (b)(3) (see sections 3.7.4 and 3.7.5 and appendices 2, 3, and 7; and USDA (2014a, pp. 48-87; 2016d));
- including plan components to coordinate with other land managers relevant to populations of at-risk species (36 CFR § 219.9(b)(2)(ii)) (see forest plan section "Partnerships and Coordination" and chapter 5);
- including plan components that address key characteristics for connectivity, composition, structure, and function (36 CFR § 219.8 (a)(1) (see forest plan sections "Aquatic Ecosystems," "Terrestrial Ecosystems and Vegetation" and "Wildlife"; sections 3.2, 3.3, 3.7.4, and 3.7.5 in this final EIS);
- modeling and assessing the natural range of variation for vegetation on the Forest (36 CFR § 219.19) (the Forest modeled the natural range of variation over the past 1,000 years and modeled the effects of the alternatives for 50 years into the future, considering potential future climate—see sections 3.3, 3.7.4, 3.7.5, and appendices 2 and 3 of this final EIS); and
- assessing the cumulative effects of the plans and land use policies of others (36 CFR § 219.4(b)) (see sections 3.2.12 and 3.3.11 in this final EIS; see the cumulative effects sections throughout 3.7.4 and 3.7.5 and also chapter 6).

Connectivity models and analyses

Several connectivity models and analyses were considered in assessing connectivity (Kuennen, 2017b). A variety of models showed that the same or similar areas were often important for multiple species. The Forest reviewed connectivity models, identified key areas for connectivity, and evaluated where it would be important to provide for habitat connectivity as a conservation strategy to promote population resiliency and adaptability in the face of climate change, considering ecosystems as well as specific species. The natural range of variation analysis is the source for both current and historical conditions related to the evaluation of alternatives upon forest connectivity, which is one aspect of connectivity (see appendices 2 and 3). The Forest also addressed permeability between Forest lands and adjacent lands and assessed the cumulative effects of activities on other land ownerships within the plan area, including permanent developments on private lands and public highways (Kuennen, 2017b) (see also appendices 2, 3, 4, 5, and 7).

Key stressors on connectivity include:

- Vegetation and fire management (e.g., timber harvest, fuels reduction, fire suppression) on NFS lands and other lands
- Access and human disturbance on NFS lands and other lands
- Private land development
- Changing climate

Key indicators for analysis

The effects of vegetation and fire management, access, private land development, and changing climate are discussed throughout sections 3.7.4 and 3.7.5, for key ecosystems as well as for specific species. The following section discusses the results of modeling for connectivity of forest cover.

Environmental consequences

Summary of modeled alternative consequences

Ecosystem Research Group modeled connectivity of forest cover within areas (called polygons) identified and defined by American Wildlands (see appendix 3 for more details). These areas represent about 1.16 million acres, including NFS, State, and other lands. Additionally, changes in mean patch size were modeled to show how disturbances (fire, insects, disease, or human activities) might affect the size of those patches over time.

Recognizing that connectivity for some species is affected by a lack of or loss of habitat components that take a long period of time to restore (Haber & Nelson, 2015), connectivity across the Forest was modeled using the query design for marten because marten is a species that is more limited by the amount and arrangement of mature tree cover. As a means of assessing long-term habitat connectivity and the benefits of permanent cover reserves, sample landscapes at years 2015 and 2065 were compared by acres of marten habitat, average patch size, and percent habitat occurring in 2015 against the modeled habitat that still remained fifty years in the future at 2065 (see appendix 3 for more details). Figure B-30 in the forest plan and figure 2 in appendix 3 display the geographic connectivity areas in the vicinity of the Forest and those selected for this analysis. These areas were selected because they span the valleys where lands managed by the Forest are intermingled with other landownership.

Within the American Wildlands areas used for analysis, NFS lands total about 782,000 acres (about 33 percent of the Forest). Mature forest is currently present on about 35 percent of the connectivity areas at present, and modeling indicates it would drop to about 28 percent in the fifth decade, based upon a worst-case scenario for the combined effects of wildfire and insects and disease. Levels of mature forest cover within the American Wildlands areas declines by about 75,000 acres out of about 400,000 acres by the end of decade 5 for all alternatives. The model predicts that alternatives A, B modified, C, and D provide approximately the same levels of habitat in all decades, indicating that vegetation management activities associated with each alternative play a minor role compared to natural disturbances (see appendix 3 for more details).

In addition, Ecosystem Research Group modeled the number of mature forest patches and the mean patch size within the American Wildlands areas used to assess connectivity of forest cover. These modeled results suggest that the current mix of patch sizes is likely due to a century-long absence of stand-replacing fire, which has allowed stands to reach large or very large size classes and high densities where the boundaries between them become relatively indiscernible. Mean patch size for mature forest cover declines in decades 3 through 5, with a corresponding increase in the number of patches. Declines in patch size, accompanied by an increase in the number of patches, are presumed to have negative effects on some interior forest species (e.g., marten) because patches have more edge where these species may be

more vulnerable to predation. Mature forest patch sizes in alternatives B modified, C, and D show little difference between alternatives by the end of the fifth decade. Alternative A shows slightly less of a decline in mature forest patch size, presumably because alternative A was modeled without prescribed burning to match the 1986 forest plan.

Prescribed fire and mixed-severity wildfires often create a small-patch mosaic and are anticipated to be present in the warm-dry and warm-moist potential vegetation types. Modeling indicates that larger, more severe stand-replacing wildfires could result in some very large, even-aged, early seral patches and reduce the size of mature forest patches, especially in the cool-moist and cold potential vegetation types which make up most of the Forest. Modeling suggests that wildfire coverage and severity, as affected by slope, aspect, and fire suppression, often cumulatively result in a small-patch mosaic. Modeling over several decades indicates that disturbances tend to reoccur on previously disturbed acres, which adds additional complexity to existing patterns of forest cover. For instance, severe burns may be followed by re-burns 15-25 years later, after fuels accumulate on the forest floor. Moderate-severity burns are often followed by bark beetle attacks on weakened, surviving trees, which may add to the patchiness of forest patterns. Additionally, most of the area in the American Wildlands areas is in the wildland-urban interface (see figure 1-13). The wildland-urban interface is where vegetation management would be emphasized and where wildfires would be likely to be suppressed. But even if wildfires are suppressed, the model estimates that disease and insect infestations will increase with expected warmer, drier climates. Insects and disease within mixed-species forests tend to create numerous small patches.

Alternative A

Management direction provides for key ecosystem characteristics for wildlife connectivity. Management direction specific to connectivity is included in the lynx standards and guidelines ALL 01, ALL S1, ALL G1, LINK 01, LINK S1, LINK G1, and LINK G2, the old-growth standards, and the riparian habitat conservation area standards.

Alternatives B modified, C, and D

Management direction incorporated throughout the action alternatives provides for key ecosystem characteristics for wildlife connectivity, as discussed in sections 3.7.4 and 3.7.5 and Kuennen (2017b).

In addition to the lynx standards and guidelines, key plan components for alternative B modified are as follows:

- Infrastructure standard FW-STD-IFS-02 limits increases in motorized access, and guideline FW-GDL-IFS-12 specifies that within areas specifically identified as being important for wildlife connectivity across highways (see table 18 in the forest plan), the Forest should cooperate with highway managers and other landowners to design approaches and crossings that contribute to wildlife and public safety.
- Desired condition FW-DC-TE&V-14 provides for connectivity of old-growth forests, and FW-DC-TE&V-19 specifies that forest patterns contribute to the connectivity of habitat for wildlife (e.g., Canada lynx, marten), movement within and between home ranges, and dispersal between populations. FW-STD-TE&V-01 and 03 and guidelines FW-GDL-TE&V-06 through 09 provide for connectivity of old growth, large live trees, snags, and downed woody material. Downed woody material, for example, contributes to habitat connectivity for amphibian and small mammal species.
- Wildlife guideline FW-GDL-WL DIV-06 provides for retention of cover so that connectivity of cover is not severed between areas of forest where cover is lacking (e.g., recent, large stand-replacement fire areas until succession creates new cover).

- Energy and minerals standards FW-STD-E&M-08 and 09 contribute to connectivity. For example, new leases for leasable minerals in the grizzly bear recovery zone/primary conservation area shall include a no surface occupancy stipulation and development is not allowed in areas withdrawn from mineral entry.
- Desired condition FW-DC-LSU-01 specifies that land ownership adjustments, through purchase, donation, exchange, or other authority, improve national forest management by consolidating ownership, reducing wildlife-human conflicts, providing for wildlife habitat connectivity, improving public access to public lands, and retaining or acquiring key lands for wildlife and fish and lands within wild and scenic river corridors.
- Desired condition FW-DC-P&C-01 specifies that the Forest work towards an all-lands approach to management, in cooperation with other land managers, such as by mitigating threats or stressors, providing for wildlife and fish habitat connectivity, and providing social, economic, and ecological conditions that contribute to mutual objectives.
- Several geographic area plan components provide for connectivity, incorporating areas where connectivity across highways is emphasized in several models: GA-HH-DC-03, GA-MF-DC-04, GA-NF-DC-06 and 07, GA-SM-DC-03, and GA-SV-DC-09, GA-MF-OBJ-01, GA-NF-OBJ-03, and GA-SM-OBJ-04.
- Several plan components provide for riparian connectivity (FW-DC-WTR-02 and FW-DC-RMZ-06; FW-STD-RMZ-01, 05, and 06; FW-GDL-RMZ-08 through 15; FW-SUIT-RMZ-01). For example, FW-RMZ-GDL-09 states that if new openings are created in riparian management zones through even-aged regeneration harvest or fuels reduction activities, the created opening's distance to cover (see glossary) should not exceed 350 feet to provide wildlife habitat structural diversity, connectivity, and cover. This guideline is consistent with findings by Squires and others (2013) regarding lynx avoidance of areas more than 364 feet to cover and so would benefit lynx as well as meeting distances to cover for marten.
- Management area suitability also contributes to connectivity. For example, management areas 1a, 1b, 2a, 2b, 4a, 5a, and 5c are not suitable for permanent road construction, wheeled motor vehicles, or timber production (see forest plan table 34).

For key differences between alternatives B modified, C, and D see the sections on individual species.

Cumulative effects

In the southern end of the Salish Mountains and Swan Valley geographic areas, many sections of forest land (a section is one square mile of land, which is 640 acres) that were managed by a private timber company were treated with regeneration harvest during the last few decades, resulting in a high density of roads in those sections and a “checkerboard” pattern of cover and non-cover, reducing connectivity. As discussed in detail in section 3.7.5, subsection “Grizzly bear,” the Forest has now acquired thousands of acres of these lands in the Swan Valley through the Montana Legacy Project, so connectivity is anticipated to improve in the future.

In the cool-moist and cold potential vegetation types of the North Fork geographic area, NFS lands as well as adjacent lands in Glacier National Park were regenerated by very large wildfires, also reducing connectivity for species associated with forest cover but in this case in a pattern of much larger openings. Vegetation modeling has shown that these effects will persist for the next one to three decades but that regrowth of cover due to forest succession would then occur and forested connectivity would increase, provided there are not new large stand-replacing wildfires.

The connectivity areas (see figure B-30) include all land ownerships, and the Forest is not able to predict how, when, or where these lands may be affected by vegetation management, road access, or development. However, even if vegetation management activities on all lands are planned to maintain, restore, or improve connectivity, it is not possible to predict exactly where or when wildfires, insect infestations, or disease would occur, or if forest succession (which creates cover for connectivity) would outpace loss of cover due to these factors. For these reasons, connectivity would need to be assessed at the project level at a particular point in time.

The forest plan includes numerous plan components for wildlife connectivity, but as monitoring of forest conditions in recent decades has shown, extensive stand-replacing wildfires, insect infestations, and disease can reduce cover for connectivity across large areas encompassing all lands (USDA, 2014a). Based upon the warmer and drier summer climate predicted by most climate models, large stand-replacing wildfires are likely to continue to occur in the future and can be expected to affect connectivity of forest cover between NFS lands and surrounding lands.

Forestwide desired condition FW-DC-P&C-01 places emphasis on the Forest cooperating with other land managers, including efforts to mitigate threats or stressors, provide for wildlife and fish habitat connectivity, and to promote ecological conditions that contribute to mutual objectives. Where there are willing landowners, the forest plan also emphasizes future connectivity through desired condition FW-DC-LSU-01, which would reduce the risk that private lands in key connectivity areas would be commercially developed or subdivided for residences in the future, which would permanently reduce connectivity. The Forest's desired conditions complement those of other governments and agencies (such as MFWP, Missoula County, and the City of Whitefish), as well as those of non-government organizations and businesses (such as the Flathead Land Trust, The Nature Conservancy, and F. H. Stoltze Land & Lumber Company), that are working together to maintain connectivity in key areas.

Several scientists identified strategies and key locations for highway crossings, eight of which are within Flathead National Forest geographic areas. Because the Forest does not have authority over highways but does manage some lands adjacent to highways, guideline FW-GDL-IFS-12 states that the Forest should cooperate with highway managers and other landowners to design approaches and crossings that contribute to wildlife and public safety within areas specifically identified as being important for wildlife connectivity across highways. These areas are identified in a table under the guideline and include portions of the following highways: U.S. Highway 2, U.S. Highway 93, Montana Highway 83, and Montana Highway 486.

In addition to forestwide and geographic area desired conditions, standards, guidelines, and suitability, the mix of management area allocations for the forest plan provides for long-distance range shifts of species by providing large areas of habitat with relatively low levels of human development and disturbance (such as management areas 1a, 1b, and 5) with linkage to tribal wilderness areas, Glacier National Park, and north into Canada.

In summary, plan components for the Forest, in the context of all lands of the larger landscape, contribute to the ecological conditions of habitats that provide connectivity for animals. Plan components limit road access, help to provide cover for connectivity in a vast network of riparian areas and other key areas of the Forest where present, and promote cooperation with other agencies and landowners on activities such as highway crossings and conservation easements that benefit numerous species. Although the Forest Service does not have authority over all the stressors that affect connectivity, NFS lands would help to promote the connectivity of habitats with tribal lands of the Confederated Salish and Kootenai Tribes, Glacier National Park, Canada, and adjacent national forests.

3.7.7 Summary of key consequences to wildlife from forest plan components associated with other resource programs or management activities

The following section provides a brief summary of the consequences to wildlife from forest plan components associated with other resource programs or management areas. Consequences to key ecosystems, ecosystem characteristics, ecological conditions, and wildlife species are discussed throughout sections 3.7.4, 3.7.5, and 3.7.6.

Consequences from recommended wilderness (management area 1b) and eligible wild and scenic rivers (management area 2b)

Eligible wild and scenic rivers are the same for all action alternatives. In addition to currently designated rivers (management area 2a) eligible rivers would be managed according to Forest Service policy to protect the free-flowing condition of designated wild and scenic rivers and preserve and enhance the values for which they were established. This would be beneficial to wildlife.

In addition to currently designated wilderness (management area 1a) there are differences in alternatives for recommended wilderness management area 1b (see figures 1-01 through 1-04; 1-77 through 1-84):

- Alternative A: there are five recommended wilderness areas totaling about 98,400 acres
- Alternative B modified: there are eight recommended wilderness areas totaling about 190,400 acres
- Alternative C: there are 17 recommended wilderness areas totaling about 507,000 acres
- Alternative D: there are no recommended wilderness areas

Alternative C has the least risk of disturbance to wildlife from motorized travel or mechanized transport Except for the Jewel Basin Hiking Area (which has a high density of hiking trails and is very accessible), most recommended wilderness areas on the Forest do not currently have high levels of nonmotorized recreational use. The Jewel Basin Hiking Area already has prohibitions on stock and pack animals, mechanized transport and motorized uses. These prohibitions would continue regardless of management area 1b allocation. Even though alternative D does not have recommended wilderness, there would be about 290,262 acres of management area 5a where motorized recreational use would not be suitable in any season. There would be 117,650 acres management area 5c where motorized recreational use would be suitable only in winter, limiting effects on wildlife species that are sensitive to motorized disturbance.

Because alternative C has the most management area 1b (recommended wilderness), the expectation is that wildfire would be the primary driver of habitat change under this alternative. Because many wildfires on the Forest in recent decades have been stand-replacing and large (e.g., 10,000-40,000 contiguous acres), this could result in large areas that are in an early-successional stage providing grass/forb/shrub habitats and there could be more acres with snags and downed woody material than under alternatives A, B modified, or D. This would be beneficial for species associated with these key ecosystem characteristics but could be detrimental to species that are associated with old-growth habitat, areas of dense cover, large patches of mature forest, or connectivity provided by forest cover.

Consequences from access, infrastructure, and recreation management

Roads, trails, and other infrastructure can affect some wildlife species through habitat loss, disturbance, or displacement. All action alternatives include (1) standards for riparian management zones that limit roads, (2) standards for grizzly bears that roads are maintained at baseline levels (see glossary), and (3) objectives to decommission or place into intermittent stored service 30 to 60 miles of roads in key areas. Under alternatives A and C, additional roads would be expected to be closed to meet the requirements of

amendment 19 or to meet desired conditions for recommended wilderness. Across the Forest, public motorized use is allowed only on designated routes, except in winter. Effects of alternatives were analyzed for key habitats of wildlife species that are sensitive to disturbance in particular areas or during particular time periods (e.g., grizzly bear, mountain goat). Under all alternatives, large blocks of NFS lands have no routes designated for motorized use during the grizzly bear non-denning season (April 1 through November 30). These large areas provide habitat security and reduced risk of mortality for a wide variety of wildlife species as well as protect riparian habitats, old growth, and very large snags.

All alternatives address suitability for motorized over-snow vehicle use. Limits on areas suitable for this use benefit wildlife species that may be sensitive to human disturbance during the winter. Under alternative A, about 19 percent of the Forest is currently open to motorized over-snow vehicle use from Dec. 1 to March 31, about 10 percent is open yearlong (snow conditions permitting), and about 2 percent is open during the time period from April 1 to Nov 30. Three alternatives are considered for specific areas and routes where motorized over-snow vehicle use would be suitable. Alternative C reduces suitable routes and areas the most, alternative D increases them slightly and alternative B modified is in between. If site-specific situations arise, the Forest has the ability to respond on a site-specific basis if monitoring indicates there is a need.

Recreational use is projected to increase in the coming decades under all alternatives. The action alternatives B modified, C, and D include a variety of areas that would be designated as management area 7, management areas suitable for focused recreation. Alternatives B modified and D would increase the areas allocated to management 7, whereas alternatives A and C would have less. Focusing developed recreation in these areas could disturb or displace some wildlife species but could also make areas of high recreational use more predictable, reducing the risk of human-wildlife conflicts. All alternatives include plan components to reduce the risk of human disturbance to wildlife at key time periods in key habitats, if within Forest Service authority. The Forest has two resorts with downhill ski areas. All alternatives maintain the management area allocations consistent with their current special-use permit boundary, and there are also plan components for their management that reduce potential impacts to wildlife species.

Roads can alter aquatic habitat, riparian habitat diversity, and wildlife connectivity, especially if they parallel streams. Forestwide infrastructure standards FW-STD-IFS-02, 05, 06, and 07 benefit wildlife species associated with aquatic, riparian, and wetlands habitats. Forestwide guideline FW-GDL-CNW-01 limits roads within the conservation watershed network. Standard FW-STD-WTR 02 reduces the risk of road impacts to aquatic habitats by specifying that project-specific best management practices (including both Federal and State of Montana best management practices) shall be incorporated in land use and project plans. Forestwide guidelines FW-GDL-RMZ-11 and 14 limit construction of new roads, temporary roads, and landings. These plan components would benefit a variety of wildlife species by helping to maintain habitat quality and connectivity. Recreation developments can also alter riparian diversity and connectivity. Guidelines FW-GDL-REC 02 and FW-GDL-REC 06 provide direction to reduce effects to riparian resources that would benefit wildlife habitat quality and connectivity.

Consequences from vegetation management

Vegetation management can have a positive effect on some wildlife species but not on others. Forestwide standards and guidelines help achieve or maintain desired conditions for wildlife. Desired conditions for wildlife may be met using a variety of active management techniques (e.g., timber harvest, precommercial thinning, planting, prescribed fire) on suitable lands. Four alternatives were considered, including a variety of management areas suitable for timber production to contribute to ecological, economic, and social sustainability (see figures 1-09 through 12). Desired conditions for vegetation are integrated with wildlife habitat needs and biodiversity. Forestwide standards, guidelines, and management area allocations promote the retention and development of key ecosystems and ecosystem characteristics

including (but not limited to) riparian vegetation, old growth, very large live trees, snags, large downed woody material, and connectivity. Plan components provide desired conditions to restore historic tree species composition and/or historic structure (e.g., seed-producing whitebark pine, more diverse structure within ponderosa pine/Douglas-fir forest) that is beneficial to wildlife. Vegetation plan components could help make forests more resilient with respect to likely future environments, where feasible within USFS authority and capability of lands. Modeled vegetation and wildlife habitats would stay within the natural range of variation under all alternatives.

The primary differences among the alternatives are due to different combinations of management areas, whether they are suitable for timber production, whether timber harvest is allowable, and the intensity of management that may occur. Under alternative A, about 534,600 acres are suitable for timber production, the most of any alternative (see figure 1-09). Under alternative B modified, about 465,200 acres are suitable for timber production (see figure 1-10). Under alternative C, about 308,200 acres are suitable for timber production, the least of any alternative (see figure 1-11). Under alternative D, about 482,600 acres are suited for timber production (see figure 1-12). Under all the alternatives, about 1.6 million acres of the Forest are lands that are not suitable for timber production because they are in existing wilderness or inventoried roadless areas, which are not suitable for timber production under the 2001 Roadless Area Conservation Rule (see figures B-25 and B-26).

The intensity of management of lands suitable for timber production varies by management area (see the description of timber management in the forest plan for each management area). Alternative C has the highest proportion of lands suitable for timber production that emphasize a medium intensity of management, at 63 percent. About 37 percent of lands suitable for timber production emphasize a high intensity of management. Alternatives B modified and D have similar proportions of intensity in management, with 54 and 50 percent, respectively, of lands suitable for timber production identified for a moderate level of intensity of management and 46 and 50 percent, respectively, identified for more intense management. Because the existing forest plan does not explicitly identify a “medium-intensity” or a “high-intensity” management approach for the management areas, percentages have not been determined for alternative A.

In addition to lands suitable for timber production, timber harvest is allowable on some lands not suitable for timber production for purposes such as salvage, fuels management, insect and disease mitigation, protection or enhancement of wildlife habitat, research or administrative studies, or recreation and scenic-resource management (see section 3.21 for more details). Timber harvest on these lands is not scheduled or managed on a rotation basis. Timber harvest on these lands would have to be consistent with other management direction. For example, old growth is identified at the project level, and old-growth standards restrict timber harvest, regardless of management area. Additionally, in Canada lynx habitat, NRLMD vegetation management standards apply regardless of the management area designated by the Forest. Timber harvest for fuels reduction in the wildland-urban interface may occur if it is consistent with exemptions listed under the lynx standards. The number of acres where timber harvest is allowable on land *not* suitable for timber production are as follows: alternative A = 437,700 acres (18 percent of the Forest); alternative B modified = 447,200 (19 percent of the Forest); alternative C = 403,700 acres (17 percent of the Forest); and alternative D = 522,600 acres (22 percent of the Forest). Under alternatives B modified and D, approximately one half of these acres are comprised of inventoried roadless areas. For alternative C, the largest percentage of these acres are those allocated to management area 6a. With respect to management area 6, it is likely that there would be less intensive harvest of live conifer trees in management area 6a than 6b or 6c over time because management area 6a is not suitable for timber production and does not have scheduled timber harvest. Less intensive or extensive timber harvest would be of greater benefit for species associated with late-successional stages or mature forest cover and would be of lesser benefit for species associated with early-successional stages (see appendix 6 for a list of these

species). With respect to lands where timber harvest is allowable, consequences to wildlife are difficult to predict with certainty in a programmatic document such as this because it is unknown where wildfires, insects, or disease will occur. Effects to wildlife would be considered during project implementation. Forestwide standards and guidelines would help achieve or maintain desired conditions for wildlife.

Riparian habitats are not suitable for timber production under any alternative. Under alternative A, mapped riparian habitat conservation areas total about 13 percent of NFS lands on the Forest. Alternative A has approximately 56,000 acres not suitable for timber production because they are within a riparian habitat conservation area, which equates to about a 10 percent reduction in lands suitable for timber production. The mapped riparian management zones under alternatives B modified, C, and D total about 411,000 acres, or about 17 percent of the Forest. All the action alternatives have a similar reduction (18 percent) in lands suitable for timber production due to being within a riparian management zone. Under alternatives B modified and D, this percentage amounts to approximately 103,000 and 105,000 acres, respectively, that are not suitable for timber production because they are within a riparian management zone. Under alternative C, this percentage amounts to approximately 67,000 acres not suitable for timber production because they are within a riparian management zone. Timber harvest is allowable, as are other types of vegetation management, for other purposes as long as it is consistent with other plan components. Timber harvest and other management activities in riparian management zones would be designed to promote desired conditions. Desired conditions for wildlife are integrated with forestwide desired conditions FW-DC-RMZ-01 through 06. These desired conditions support ecological conditions that provide for wildlife biodiversity and habitat integrity within riparian management zones because they emphasize natural composition of flora and fauna, natural processes, and a relatively more diverse structure and composition than areas outside riparian management zones. These desired conditions also emphasize vegetation pattern and cover conditions that contribute to habitat connectivity, benefiting wildlife species. The desired condition to provide for habitat connectivity across the landscape is addressed by forestwide plan component FW-DC-TE&V-19.

Consequences from fire and fuels management

Fire management using prescribed burning and natural, unplanned ignitions to meet resource objectives can have a positive effect on some wildlife species but not on others. Plan components for all action alternatives promote the use of fire as an important tool in moving vegetation towards desired conditions. The action alternatives have plan components that address the value of areas burned by moderate- to high-severity fire for some wildlife species. These alternatives have plan components that address wildlife needs during salvage harvest, including but not limited to wildfire areas. The alternatives also recognize the need to protect human safety and infrastructure and to salvage dead trees to contribute to economic and social sustainability in certain locations. In lands within the wildland-urban interface, particularly near communities, a continued policy of fire suppression is anticipated, as is mechanical treatment to reduce hazardous fuels and trend the vegetation towards desired conditions. This effect is common to all alternatives and could benefit species associated with mature forest or old-growth habitat by reducing stand-replacing wildfire. Species associated with mixed- to high-severity fire would benefit from wildfires that would be more likely to occur in wilderness and/or recommended wilderness, but even in these areas some fires would be actively suppressed (see section 3.3 for more details).

Wildfire can affect riparian diversity and connectivity, depending upon the size and severity of the wildfire. Under all alternatives, a full-suppression approach for wildfire management is most likely to be employed in the Salish Mountains geographic area and in valley portions of the North Fork, Middle Fork, Hungry Horse, and Swan Valley geographic areas where there are intermingled private lands. Under alternative A, fire and fuels management standards and guidelines protect riparian habitat conservation areas by providing strategies to minimize the disturbance of riparian ground vegetation and regulating rehabilitation, the location of facilities and the use of retardant, foam, and additives. Under the action

alternatives, guidelines FW-GDL-RMZ-02 through 04 provide similar protections as alternative A, benefiting aquatic, wetland, and riparian wildlife habitats and associated species. FW-GDL-RMZ-05 specifies the use of minimum impact suppression tactics in order to minimize impacts to the riparian management zone and aquatic resources, thus benefiting wildlife. In wilderness (management area 1a) recommended wilderness (management area 1b), and backcountry (management area 5), wildfire is more likely to spread into riparian management zones. This increases the habitat for species associated with riparian shrubs, deciduous trees, grasses, forbs, and snags but reduces habitat and the connectivity of cover for species associated with later successional stages. These effects persist for about 20 years, on average.

With respect to fuels reduction treatments in riparian management zones, standard FW-STD-RMZ-06 allows an exception for mechanical fuels reduction treatments in the wildland-urban interface within 300 feet of private property boundaries (except for fens and peatlands). Although fuels reduction treatments could reduce habitat quality for some wildlife species, analysis indicates that this exception would affect only about 1 percent of the riparian management zone acreage, a minor amount that would have minor effects on wildlife.

Consequences from invasive species management

Herbicides used to control invasive species can affect riparian habitat diversity, depending on the type, extent, and amount of herbicide that is used and the proximity to a waterbody, wetland, or riparian area. Effects to wildlife species may occur due to direct contact if chemical concentrations are high enough. Under the action alternatives, standard FW-STD-RMZ-04 reduces risks to wildlife associated with aquatic, wetland, and riparian habitats. Guideline FW-GDL-NNIP-01 also reduces risks to wildlife because it states that when planning non-native invasive plant treatments within riparian management zones, the use of mechanical, biological, and cultural means of control should be considered before chemical control methods.

Consequences from watershed, soil, riparian, and aquatic habitat management

All alternatives include plan components that protect watershed integrity and soil productivity as well as riparian and aquatic wildlife habitats. Riparian habitat conservation areas (alternative A) or riparian management zones (the action alternatives) provide key wildlife habitats, and these areas are unsuitable for timber management. Under alternative A, mapped riparian habitat conservation areas total about 13 percent of NFS lands on the Forest. Alternative A has approximately 56,000 acres not suitable for timber production because they are within a riparian habitat conservation area, which equates to about a 10 percent reduction in lands suitable for timber production. The mapped riparian management zones under alternatives B modified, C and D total about 411,000 acres, or about 17 percent of the Forest. All the action alternatives have a similar reduction (18 percent) in lands suitable for timber production due to being within a riparian management zone. For alternatives B modified and D, this percentage amounts to approximately 103,000 and 105,000 acres, respectively, not suitable for timber production because they are within a riparian management zone. For alternative C, this percentage amounts to approximately 67,000 acres not suitable for timber production because they are within a riparian management zone. However, timber harvest is allowable in the riparian management zone if it is in conformance with riparian management zone desired conditions, standards, and guidelines. Under the action alternatives, the riparian management zone is broken into two areas, called the inner and outer riparian management zones. Some activities are prohibited or restricted in the inner riparian management zone, whereas more active management is allowable in the outer riparian management zone in some situations. Vegetation management can only occur in the inner riparian management zone when necessary to maintain, restore, or enhance aquatic and riparian-associated resources, with listed exceptions. Plan components for riparian management zones (alternatives B modified, C, and D) or riparian habitat conservation areas (alternative

A) would benefit many aquatic and terrestrial wildlife species. Plan components for the restoration of five Class 2 watersheds would also benefit wildlife by promoting aquatic, riparian, and wetland integrity (see section 3.2 for more details).

Consequences from management of mineral exploration or development

The potential for development of leasable and locatable minerals on the Forest is low. All minerals stipulations are subject to valid existing rights. These activities undergo site-specific NEPA analysis to determine effects and to ensure that required mitigation measures are included in plans of operations and rehabilitation requirements, if needed. Three action alternatives were considered, including standards and guidelines for the grizzly bear that would limit consequences from mineral and energy exploration or development. Plan components for the grizzly bear would also benefit many other wildlife species. Alternatives B modified and C would apply no surface occupancy stipulations to the grizzly bear recovery zone/primary conservation area, reducing the risk of future impacts to wildlife from mineral development. Under alternative A, standards and guidelines for riparian habitat conservation areas state that structures, support facilities, waste facilities, sand and gravel mining and extraction, and roads should be located outside riparian habitat conservation areas unless there is no alternative. Under alternatives B modified, C, and D, guideline FW-GDL-E&M-07 specifies that mineral operations should not be authorized in riparian management zones, and guideline FW-RMZ-06 limits new gravel pits within riparian management zones. These plan components promote riparian habitat diversity, integrity, and connectivity.

Consequences from management of livestock grazing

Livestock grazing has declined on the Forest in the last several decades. The action alternatives (B modified, C, and D) include standards and guidelines for the grizzly bear that limit the risk of conflicts from future livestock grazing. These plan components provide benefits for all wildlife species that may be affected by the reduction of forage in grass/forb/shrub habitats and provide benefits to birds that are susceptible to cowbird nest parasitism or predation within about a mile of livestock concentration areas. Cattle grazing can alter riparian diversity by changing the composition or abundance of grass, forbs, shrubs, and hardwood trees and can spread invasive plants in riparian management zones. Grazing allotments occur in only two of the seven geographic areas: the Swan Valley and Salish Mountains geographic areas. Standards and guidelines for riparian habitat conservation areas address grazing practices, livestock handling facilities, watering facilities, and salting to ensure that they do not adversely affect inland native fish, and this would indirectly benefit aquatic wildlife species. Cattle grazing is a minor activity on the Forest, but the authorization of new grazing allotments would not be restricted under alternative A. Alternatives B modified, C, and D include standard FW-STD-GR-02, which limits the authorization of new cattle grazing allotments in all but the Salish Mountains geographic area. The Swan geographic area has guideline GA-SV-GDL-04 to phase out cattle allotments if opportunities arise with a willing permittee, which would reduce the risk of impacts due to grazing on NFS lands. Livestock grazing plan components FW-DC-GR-03, FW-STD-GR-07 and 08, and FW-GDL-GR-01 through 04 are similar to plan components in alternative A but include additional direction.

Consequences from management of lands and special uses

Land ownership adjustment is one of the tools used to simplify and improve management of NFS lands, including wildlife habitat. Special-use permits authorize the occupancy and use of NFS land by private individuals or companies for a wide variety of activities, such as roads, utility corridors, communication sites, and other private or commercial uses. All alternatives have plan components for special uses that are designed to coordinate special uses with the needs of wildlife.

Consequences from management of other ecosystem services, other multiple uses, and partnerships

Development of all alternatives and plan components considers ecosystem services and multiple uses provided by NFS lands. Plan components integrated throughout the action alternatives are intended to manage for social and economic sustainability and multiple uses in ways that are compatible with ecological sustainability and the needs of wildlife. Partnerships are vital to an all-lands approach to management. Cooperation with other Federal agencies, tribes, State agencies, counties, universities, non-government organizations, and the public helps to increase knowledge of the Forest's wildlife and their needs, promotes sustainable wildlife populations and habitats, helps mitigate threats or stressors, and helps provide social, economic, and ecological conditions that contribute to multiple objectives.

3.7.8 Terrestrial invertebrates

Introduction

Invertebrates are animals without a backbone. They are cold-blooded, meaning their body temperature depends upon the temperature of their surrounding environment. They include such animal groups as insects, mollusks, crustaceans, and arachnids (i.e., spiders). There are a lot of unknowns with regard to invertebrate populations; in many areas, invertebrate populations have not been surveyed or have not been surveyed recently (see also the section specific to pollinators below). The Montana Natural Heritage Program prepared a comprehensive field guide for snails and land slugs of Montana (Hendricks, 2012), which states that the species richness of Montana land mollusks is higher west of the Continental Divide than east and includes 42 known native mollusks.

Key Indicators for analysis for most terrestrial invertebrates

The needs of most terrestrial invertebrates would be met by the plan components for diverse ecosystems and key ecosystem characteristics, as described in sections 3.2, 3.3, 3.7.4, and 3.7.5. In addition, the following indicator applies to the carinate mountainsnail, an invertebrate species that is endemic to the Forest:

- Reduce the risk of activities that may impact talus habitats with known populations of the carinate mountainsnail.

Affected environment

Two endemic invertebrate species are known to occur on the Forest: the carinate mountainsnail (*Oreohelix elrodi)* and the alpine mountainsnail (*Oreohelix alpina*) (Kuennen, 2013b). According to the Montana Natural Heritage Program database (MNHP-MTFWP, 2016a, 2016b), known locations of these mountainsnails on the Forest have been surveyed from 1974-2010, and these species are persisting in those locations. The alpine mountainsnail is known from six sites in four counties west of or near the Continental Divide, ranging from 7,200 to 9,700 feet. On the Forest, the alpine mountainsnail is known to occur only at high elevations within wilderness areas where there are no known threats. In Montana, there are 29 records of the carinate mountainsnail from five sites west of or near the Continental Divide in two counties (most are from Lake County), ranging from 3,600 to 8,000 feet in elevation.

Many mollusks, including the mountainsnails, are found under woody debris, within the talus under or on rocks, or in accumulations of duff or leaf and needle litter. Downed trees and other woody material are used by many invertebrates, such as ants and beetles. Long, large-diameter wood is generally most important because it can be used by a greater range of species and provides a stable and persistent structure as well as better protection from weather extremes.

Talus sites with mountainsnail populations may lack forest canopy altogether or occur under an open mixed conifer canopy that includes Douglas-fir, western larch, ponderosa pine, and western red cedar (near streams), with aspen, paper birch, and mock orange scattered along the margins of talus slopes. They may occur at higher elevations in drier habitat where snowbanks and seeps keep soil moist. Other habitat requirements and food habits are poorly understood (Hendricks, 2012).

Key stressors

Talus areas inhabited by mollusks are subject to very few stressors. The talus areas occupied by the carinate mountainsnail may be negatively affected by activities that destabilize talus or by activities adjacent to talus areas such as timber harvest, fire, or weed spraying (Hendricks, 2003).

Environmental consequences

Alternative A

The 1986 forest plan did not have management direction for invertebrates, but management direction for soils and downed woody material helps to protect mollusk habitat.

Alternatives B modified, C, and D

Plan components to maintain ecosystem diversity and key ecosystem characteristics would meet the needs of most invertebrates on the Forest, including the mountainsnails. In addition, alternatives B modified, C, and D include one guideline to protect known locations of the carinate mountainsnail. Guideline GA-SV-GDL-02 states that, in order to protect this invertebrate species, talus slopes with known populations of the carinate mountainsnail should not be used as a gravel or ornamental rock source and immediately adjacent vegetation should not be harvested or sprayed for non-native invasive weeds.

Cumulative effects

This species is also known to occur in the Mission Range, within the Mission Mountains Tribal Wilderness of the Confederated Salish and Kootenai Tribes, where there are no known threats other than a nonmotorized trail (Hendricks, 2003).

3.7.9 Pollinators

Introduction

Pollinators include bees, beetles, bats, birds, butterflies, flies, moths, and wasps. At the national level, a Federal strategy to promote the health of pollinators was initiated by a presidential memorandum in June of 2014 (The White House, 2014) that recognized the importance of pollinators to the economy of the United States and the serious declines of some pollinator species in recent years. Pollinators face several stressors. Although researchers have not determined the specific cause of pollinator decline, they have developed a list of pressures that are thought to cause individual illness and population crashes (see the Forest assessment for more details), which include habitat conversion on private lands, malnutrition, pests, and pathogens.

Affected environment

There have not been any research studies specifically on pollinators in the Flathead Valley and surrounding areas (see the Forest assessment for more details).

The Forest Service has responded to the required accomplishments outlined in the May 18, 2015, release from the White House regarding the national strategy to promote the health of honey bees and other pollinators (USDA, 2015e). The Forest Service response included documents identifying and prioritizing

native plant species that are most beneficial to pollinators for consideration in native plant restoration activities and for integration into seed collection programs (USDA, 2015e). This guidance is incorporated into the native plant species programs of the Flathead National Forest.

Key stressors

Land management

USFS land management activities that may affect pollinators include ground disturbance and the use of pesticides and herbicides for the control of invasive species. Ground disturbance that occurs during vegetation management activities can disturb or remove pollinators' ground nests and tree or snag nests.

Pests and pathogens

Pollinators have their own pests and diseases. For example, the well-publicized colony collapse disorder has affected honeybee hives in recent years. Several possible causes have been identified, but none have been determined to be the definitive cause of the decline. There is evidence that honeybee colonies go through cycles of collapse without known causes. Current collapses are in the 30 to 40 percent range, which is significant. Mites have been introduced from Europe, as well as gut fungus and viruses, and these have contributed to further declines. The mites are thought to spread viruses between hosts. Although these effects are seen in apiaries, wild bees can also be infected when they intermix with mites.

Climate change

Climate change can affect the range of pollinators, the range of their food (native plants), the timing of their food, e.g., the phenology, or periodic life cycle, of wildflowers shifting to earlier in the season). There is some debate as to whether pollinators shift with their key plant species. Plant species have been observed over the past couple of decades shifting spatially toward the poles as well as flowering earlier in the growing season. Some habitats are more affected than others, depending on abiotic factors such as precipitation, photoperiodicity, and temperature.

Environmental consequences

Alternative A

The 1986 forest plan did not have management direction for pollinators, but management direction for soils and snags would protect pollinator habitat.

Alternatives B modified, C, and D

The action alternatives are built on the principle that by restoring and maintaining the key ecosystem characteristics, conditions, and functionality of native ecosystems and managing for additional needs of key species, the Forest will be able to maintain and improve ecosystem diversity and integrity, provide for the habitat needs of diverse plant and animal species on the Forest, and support the persistence of native species. This coarse-filter approach focuses on providing the range of vegetation and habitat conditions consistent with the natural range of variation, with the expectation that the needs and functional capacity of most organisms and processes would be fulfilled by managing key ecosystems/characteristics and ecological conditions at the landscape scale. There is little information related to specific types, conditions, or needs for pollinator species on the Flathead. The coarse-filter plan components in the terrestrial vegetation section of the plan are based upon an estimated natural range of variation and are expected to provide for the habitat needs of native invertebrate species, including pollinators. Ecosystem plan components would meet the needs of pollinator species.

In addition, alternatives B modified, C, and D include a desired condition to provide for pollinators. All action alternatives include desired condition FW-DC-POLL-01: "Ecological processes create vegetation conditions and patterns across the Forest that are consistent with the natural range of variation. These processes support plant communities composed of a diverse mix of native grass, forb, shrub, and tree species, providing foraging habitat for native pollinator species such as butterflies, bees, and hummingbirds."

Introduced, invasive plant species can displace rare species through competitive displacement. Indirect impacts include herbicide spraying and mechanical ground disturbance to control noxious weeds once they gain a foothold. Competition from invasive non-native species and noxious weeds can result in loss of habitat or loss of pollinators. Few studies have been done on the effects of herbicides to pollinators. Even though herbicides are sprayed on the Forest for the sole purpose of controlling invasive plants, they may also affect native vegetation that is in the path of the herbicide if it is not carefully applied, which reduces insect forage. Herbicide spraying can indirectly kill populations of native pollinators by contaminating nesting materials and pollen resources. Much of the chemical treatment on the Forest is restricted to roadsides, gravel pits, landings, trails and campgrounds, so any potential effects are localized to these areas.

Regarding the risk of weed invasion and control of populations, the alternatives differ in some ways. All the action alternatives contain forestwide desired conditions that address invasive plant species and their treatment and control (see the forest plan section titled "Non-Native Invasive Plants/Noxious Weeds"). Integrated pest management approaches would be used, including best management practices that limit the introduction, intensification, and spread of non-native invasive plants due to management activities. Areas requiring revegetation would use locally adapted, native plant species where feasible and appropriate. Desired condition FW-DC-P&C-17 states, "Cooperation and coordination occurs with adjacent landowners to identify and manage non-native invasive weeds." Because roads and machinery can be vectors for weeds, alternatives A, B modified, and D, with their emphasis on a higher level and rate of vegetation management that would involve the use of roads and machinery, would be expected to require the highest level of effort to control weeds. Alternative C would likely require the least effort.

Standards and guidelines for limiting soil disturbance during vegetation management activities would also be beneficial to ground-nesting pollinator species by limiting ground disturbance (see the "Soils and Geology" section in chapter 2 of the plan). Forest plan direction associated with snag and downed wood retention would be beneficial to pollinator species that nest in snags and dead wood by maintaining levels of snags and downed wood within desired ranges (see FW-STD-TE&V-03 and associated standards within each geographic area).

Cumulative effects

Pollinators are in decline nationwide due to a combination of threats, including the introduction of non-native species or pathogens, loss of habitat (decline of quality or quantity), pesticides, and climate change. Commercially reared bumble bees used to pollinate crops and plants in greenhouses are infected with parasites that have been imported from other countries. The spread of non-native mites and virus species has severely compromised honeybee colonies and may spread to native pollinators on NFS lands from nearby communities.

Non-native plants grown on private lands, as well as non-native invasive species found on all lands, can also decrease pollinator habitat quality. Although the conversion of native plant communities to agricultural lands benefits some native pollinators, it can decrease the habitat quality for others. Pesticides used to protect seeds or kill tree-killing insects, as well as the drift of pesticides sprayed on crops on private lands, can kill pollinators directly. Precautions are taken during Forest pesticide application to

limit the drift of spray in order to limit direct mortality of pollinators. Pesticides or herbicides can also be harmful in sublethal amounts by impeding pollinator foraging ability. Chemicals that do not quickly break down in the environment can be especially harmful.

Climate change is expected to change the composition of pollinator communities, but the nature of the effects and whether the pollinators can adapt to these changes are uncertain. Anecdotal observations have shown that some bee species adapted to warm climates are expanding their ranges northward (Great Pollinator Project, 2014).

3.8 Fire and Fuels Management

3.8.1 Introduction

Wildland fire refers to both wildfire (unplanned ignitions) and prescribed fire (planned ignitions). Fire management includes the strategies and actions used both before and during wildland fire. The management of wildland fire influences whether fire effects have beneficial or negative impacts on values such as water quality, air quality, habitat, recreation areas, or communities. Wildfire management incorporates a spectrum of responses ranging from protection objectives to resource objectives (see figure 55). Suppression is a management strategy used to extinguish or confine an unwanted wildfire.

The manipulation of vegetation for the purpose of changing the characteristics of a fire when it burns is called “fuels management.” Fuels reduction treatments result in a change in the amount, configuration, and spacing of live and dead vegetation, creating conditions that result in more manageable fire behavior and reduced severity during wildfires.

Wildland fire management

The management of wildfires that reduce fuels and improve ecosystem conditions are characterized as “managing fires (or portions of them) to meet resource objectives.” These fires tend to have effects that are similar to or trend towards desired future conditions. Managing wildfires to meet resource objectives is a strategic choice to use unplanned natural ignitions to achieve resource management objectives and ecological purposes. The benefits of managing wildfires to meet resource objectives may include reducing fuels so that future fires burn in that area with lower intensity, lower impacts, and reduced smoke and are more manageable and pose less threat to communities. Benefits may also include creating a diversity of wildlife habitats, cycling nutrients back into the soil, or reducing forest density to favor fire-resistant species such as ponderosa pine. Managing wildfires to meet resource objectives allows fire to resume its natural role in the ecosystem under pre-identified objectives and conditions. By allowing this to occur, the results could be a more resilient ecosystem.

Effective management of wildfire addresses the nature of wildfire and its contributing factors, recognizes the positive and negative consequences of fire, addresses uncertainty, and develops responses that reduce the chances of catastrophic losses (USDI-USDA, 2011). Forest and fire managers need to manage risk, both short and long term. If the potential positive and negative consequences of fire are recognized, and if management actions to obtain positive outcomes are matched, then in the long term the risk to communities and assets will be reduced, fire will be restored as an ecosystem function to the landscape, and smoke impacts to communities will be reduced.

Figure 55 depicts the continuum of the relationship between protection objectives and resource objectives. This wildlife management continuum, developed by the Forest and based on similar depictions for NFS lands, illustrates how the location and conditions affect the management of wildfires or portions of wildfires. To interpret the continuum, consider its four dimensions of length, width, color, and teeth.

The **length** (side to side) of the continuum shows the spatial component or the location of the fire on the landscape. It also affects the mix of objectives; on the left, the location favors protection objectives, and on the right, the location favors resource objectives.

The **width** (up and down) of the continuum represents the different social, ecological, or environmental conditions affecting the mix of objectives that can be met from a wildfire. On the top edge, protection objectives prevail. On the bottom edge, resource objectives are easier to meet.

The **colors** depict the range of objectives, taking in the combination of both location and conditions. Red (upper left) represents where the combination of conditions and landscape location can cause higher risks to communities or ecological resources, which results in protection as the predominant objective. Green (lower right) has the combination of low-risk conditions and landscape location that makes managing for resources the primary objective. The colors also represent the net value change to natural resources and community assets; red indicates a negative change (damage), and green indicates a positive change (benefit). The fire management response is to protect resources from potential damage and to provide benefits. As the risk is lowered on the landscape, more positive net value change opportunities exist over more locations and conditions, so the ratio of green to red increases.

The **teeth** on each end of the continuum indicate that it wraps around to form a cylinder. A wildfire on the far right could be near an area with high risk, and management of that portion of the fire would be to meet protection objections. As fire management decisions reach the dotted line on the continuum, there are added considerations. Focusing only on protection can put firefighters at risk, and focusing only on obtaining resources benefits can bring management risk (career and/or reputation) to fire managers and decisionmakers.

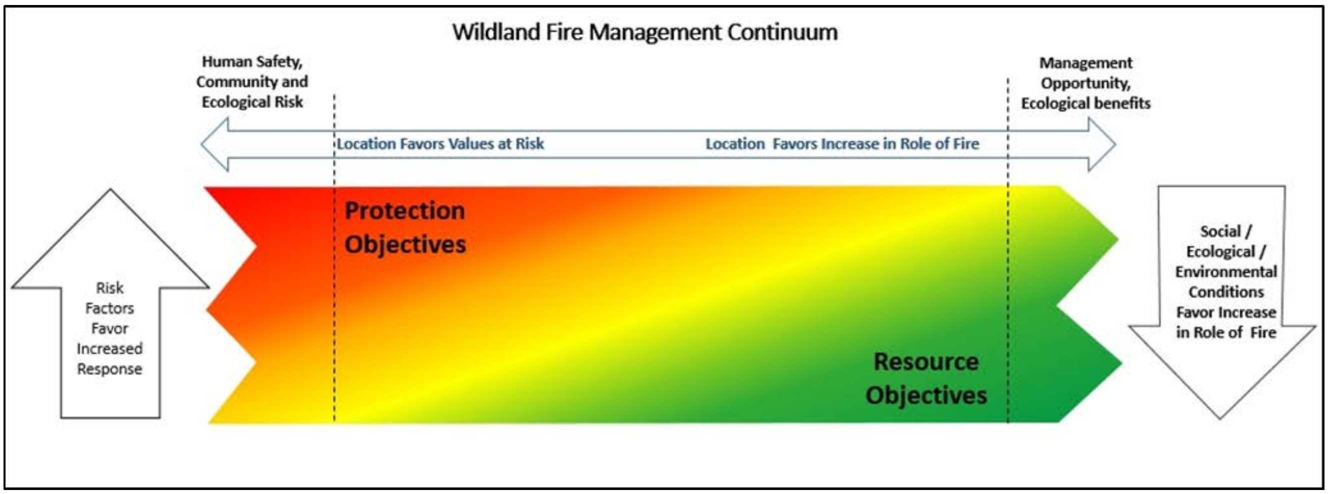

Figure 55. Wildfire management continuum

All wildfires are managed on a continuum between meeting protection objectives and resource objectives, and the mix of these objectives is based both on the location of a wildfire (or a portion of the fire) and the conditions in which it is burning. On a national forest, these objectives come from the forest plan, mainly in the form of desired conditions. The burning conditions change through the season and from year to year, providing both opportunities and restrictions.

Forest Service policy dictates that every management response to wildfire must include some aspect of a protection objective (NIFC, 2017). This response can vary from monitoring the fire under conditions that are conducive to obtaining resource benefits to an aggressive suppression effort to protect communities and natural resources from potential damages. Human-caused wildfires require a direct and aggressive suppression strategy.

Wildfires are not allowed to simply burn; firefighter and public safety, risk to property, fire management resource availability, and national and regional priorities, costs, and potential resource benefits are all factors in every wildfire management decision.

Fire on the landscape is considered a natural process, and many fires on the Forest are started by lightning. However, humans have also been a source of fire on the landscape for centuries and, whether

intentional or not, have influenced vegetation successional dynamics. Fire is not a simple process. Many factors influence its character, including fuel loadings, climatic and weather conditions, topography, vegetation structure and composition, and elevation.

Fires on the Flathead National Forest generally move from west to east with prevailing winds. Dry, cold fronts also produce northwest wind flows that move fires from northwest to southeast. Without wind as the driving mechanism, terrain and diurnal temperature changes have a large influence on fire movement. Fire generally moves uphill faster than downhill.

For each alternative, a wildfire continuum graphic is provided that gives the percentage of each management area and how they would fit on the graphic (see figure 60 to figure 63). This facilitates the qualitative comparison of the alternatives.

Fire suppression

The successful suppression of wildland fire is dependent on many factors: fuels, weather, topography, suppression resource availability, and time of year. The alignment of these factors (e.g., a hot, dry, windy August) created the remarkable events of 1910, 1929, 1988, 2003, 2007, and 2015. When these factors are not aligned (e.g., plenty of suppression resources, a cool, moist, late season), fires are almost always successfully managed. Even with the cooperative efforts of local firefighting resources from all levels of government, the remarkable, challenging years require significant assistance from outside the area. When the level of fire activity is high on the national level so that local resources cannot be supplemented, fires will exceed local capacity and values at risk will be threatened.

Fuels management

Fuels reduction treatments include prescribed fire and mechanical treatments. Prescribed fires are fires intentionally ignited by management actions, in accordance with applicable laws, policies, and regulations, to meet specific objectives. Mechanical treatments include the use of equipment such as feller bunchers to perform activities that change vegetation composition and structure and alter fuels to reduce hazard. Mechanical treatments are often followed up with prescribed burning.

Fuels reduction treatments result in a change in the amount, configuration, and spacing of live and dead vegetation. The costs, environmental impacts, and effectiveness of different fuel treatment types vary. Desired outcomes of fuels treatments are more manageable fire behavior and reduced severity during wildfires (Reinhardt, Keane, Calkin, & Cohen, 2008). Additional benefits are minimizing impacts to values at risk and reducing fire spread to other ownerships. Strategically located fuels treatments would also provide more opportunities to proactively manage the size and costs of future wildfires. In addition to modifying fire behavior, fuels treatments can achieve multiple resource benefits, such as producing timber products, creating desired wildlife habitat, and contributing to meeting desired vegetation conditions.

When people build homes in the wildland-urban interface, they enter a vegetation matrix that will carry fire when the conditions permit. Designation of areas as wildland-urban interface affects all fire management decisions within those interface areas. Although a wide variety of fire management strategies are available, these options are usually narrowed down due to concerns that a fire may move from Federal to private lands. Hazardous fuels treatments in the wildland-urban interface are focused on manipulating the vegetation to enhance the success of fire suppression activities. The focus of fuels management since 2001 has been on modifying the fuel conditions to meet various objectives to reduce threats to values at risk by increasing suppression success by minimizing crown fire likelihood, decreasing fire intensity, or decreasing rate of spread.

Regulatory framework

Law and executive orders

Wildfire Suppression Assistance Act of April 7, 1989 (HR 4936): Authorizes reciprocal fire protection agreements with any fire organization for mutual aid with or without reimbursement and allows for emergency assistance in the vicinity of agency facilities in extinguishing fires when no agreement exists.

Healthy Forests Restoration Act of 2003 (HR 1904): contains a variety of provisions to speed up hazardous-fuel reduction and forest-restoration projects on specific types of Federal land that are at risk of wildland fire and/or of insect and disease epidemics, including streamlined approaches to satisfy requirements of the National Environmental Policy Act and providing authority for expedited fuels treatments projects on Forest Service and Bureau of Land Management lands

Other regulation, policy, and guidance

Healthy Forest Initiative: launched in 2002 with the intent to reduce the risks severe wildfires pose to people, communities, and the environment, through the adoption of administrative reforms and legislative action. Three main areas of change are: 1) streamlined compliance with the National Environmental Policy Act; 2) amended rules for project appeals; and 3) improved Endangered Species Act consultation to expedite decisions.

Interagency Prescribed Fire Planning and Implementation Procedures Guide of 2014: The purpose of this guide is to provide consistent guidance to the U.S. Department of Agriculture and the U.S. Department of Interior, promote common terms and definitions, and provide standardized procedures, for the planning and implementation of prescribed fire. The guide describes what is minimally acceptable for prescribed fire planning and implementation. Agencies may choose to provide more restrictive standards and policy direction, but must adhere to these minimums.

Guidance for Implementation of Federal Wildland Fire Management Policy of 2009: Provides a broad philosophical and policy foundation for the U.S. Departments of Agriculture and Interior for fire management programs and activities, including those conducted under the National Fire Plan. Contains the 2001 Federal Wildland Fire Management Policy, which provides strategic direction for a broad range of fire management related activities.

National Cohesive Wildland Fire Management Strategy of 2014: a strategic document establishing a national vision for wildland fire management with a goal of working collaboratively among all stakeholders and across all landscapes, using best science, to make meaningful progress towards three goals: 1. resilient landscapes; 2. fire adapted communities; and 3. safe and effective wildfire response.

Interagency Standards for Fire and Fire Aviation Operations of 2017: provides fire and fire aviation program management direction for federal agencies.

Methodology and analysis process

Fire is a primary natural disturbance process that changes vegetation conditions within the Flathead National Forest's ecosystems. Fuels management consists of management activities designed to alter vegetation conditions to achieve desired results. Therefore, the analysis process for determining past, present, and future vegetation conditions provides the basis for the analysis of fire and fuels treatments in this section. This process is briefly discussed below. Refer to section 3.3 and appendix 2 for greater detail.

The vegetation management strategy for the Flathead National Forest is to manage the landscape to maintain or trend towards vegetation desired conditions. Modeling was used to estimate the extent and

effects of disturbance processes such as fire into the past (to develop a natural range of variation) and into the future (to project future wildfire under a suppression scenario). Fire (planned and unplanned), insects (e.g., bark beetles), disease (e.g., root disease), and harvest treatments are the main drivers of vegetative change, interacting with climate and the process of vegetative succession. The main analytical models used were the SIMPPLLE model (SIMulating Patterns and Processes at Landscape scaLEs) (Chew et al., 2012) and the Spectrum model (ERG, 2015).

The SIMPPLLE model was used in the forest plan revision for two purposes: to calculate the natural range of variation for vegetation conditions and to project the landscape conditions of the alternatives into the future for analysis in the EIS. SIMPPLLE takes a landscape condition at the beginning of a simulation (including past disturbances and treatments) and uses logic to grow the landscape through time while simulating processes (growth, fire, insects, etc.) that might occur on that landscape, accounting for the effects of those processes. Each simulation timestep is 10 years, and simulations are made for multiple timesteps. To calculate the natural range of variation, conditions back to 960 CE were modeled. To estimate future conditions, simulations were made for five decades into the future. The logic assumptions in the model come from a variety of sources, including expert opinion, empirical data, modeled data from other forestry computer applications, such as the Forest Vegetation Simulator model, and from initial model logic files that reflect a long history of trial and error and research that has been maintained and documented in files that are passed from national forest to national forest.

Spectrum is used to project alternative resource management scenarios and to schedule vegetation treatments into the future. Management actions are selected to achieve desired goals (objectives) while complying with all identified management objectives and limitations (constraints). Spectrum makes it possible to display management actions to landscapes at multiple spatial and temporal scales. The action alternatives were modeled with an objective based on the achievement of desired conditions, as described in the forest plan, for forest composition and size classes. Limits associated with budget levels were also evaluated.

The Forest used the Spectrum and SIMPPLLE models interactively to analyze vegetation conditions. Wildland fire disturbances were first modeled in SIMPPLLE. Resultant disturbance levels were then input into the Spectrum model as acres of projected wildland fire. The Spectrum model was then run, and the outputs from Spectrum were input into the SIMPPLLE model to allow for integration with the ecological processes and disturbances as modeled within SIMPPLLE (fire, insect, disease, succession) and with the spatial analysis of the change in vegetation conditions over time.

Out of necessity, the models simplify very complex and dynamic relationships between ecosystem processes and disturbances (such as climate, fire, and succession) and vegetation over time and space. Although the best available information, including corroboration with actual data, professional experience and knowledge, is used to build these models, there is a high degree of variability and an element of uncertainty associated with the results because of the ecological complexity and inability to accurately predict the timing and location of future events. These models are tools that provide information useful for understanding vegetation change over time and the relative differences between alternatives. The models are not intended to be predictive or to produce precise values for vegetation conditions. Appendix 2 provides detailed information on model development and results.

Information sources

The vegetation analysis process, which incorporates fire and fuels management activities, uses a variety of data sources, including the use of analytical models. Refer to section 3.3 and to appendix 2 for detailed information on information sources. Historical data sets and records for fire starts and acres burned were used to help develop model assumptions and logic.

Incomplete and unavailable information

Terrestrial ecosystems are highly complex and contain an enormous number of known and unknown living and non-living factors that interact with each other, often in unpredictable ways. For this reason, the Forest acknowledges that there are gaps in available information and knowledge about ecological functioning, and an inability to even evaluate what those gaps may be. These gaps in information may lessen over time as new information or methodology is devised. The Forest's ability to predict fire or other disturbances into the future is limited and is subject to uncertainty. The level of uncertainty depends on how predictable such factors as natural disturbances, climate change, or human-caused influences may be.

Analysis area

The affected area for the fire and fuels management effects is the lands administered by the Forest as well as lands of other ownership, both within and adjoining to the Forest.

Notable changes between draft and final EIS

One notable change that occurred between the draft and final EIS was the updating and refining of the SIMPPLLE modeling used to estimate future vegetation conditions. Further correlation of the model vegetation input layer (VMap) with the Forest Inventory and Analysis database for current conditions was conducted for the large and very large forest size classes and for species presence. Changes were made to the model assumptions to address issues that were discovered related to patterns of future insect, disease, and fire disturbances. These changes to the model improved the comparison and interpretation of both the natural range of variation and future vegetation conditions compared to the current vegetation conditions. Refer to Henderson (2017) for details of the model changes.

3.8.2 Affected environment

Historical wildfire natural range of variation

The 2012 planning rule emphasizes managing the national forests to promote ecosystem integrity and resilience (Forest Service Handbook 1909.12 chap. 20). Evaluation of the natural range of variation for ecosystem components is recognized as important for providing insight into the structural and functional properties of a resilient ecosystem. The natural range of variation was estimated for the key vegetation components identified for the Flathead National Forest using models to quantify the natural range of variation for vegetation composition, forest size class, and forest density. For the Forest's analysis, vegetation conditions back to 960 CE were modeled. This reference period allowed the simulation of conditions associated with much of the time period known as the medieval climate anomaly (about 950 to 1250), when climate was warmer on average, as well as the other end of the climate spectrum known as the Little Ice Age (early 1300s to about 1870s), when climate was cooler on average. The inclusion of the medieval climate anomaly in the simulation is potentially valuable in that it might indicate conditions and processes that could occur in the modern climate regime (Calder, Parker, Stopka, Jimenez-Moreno, & Shuman, 2015). The model was run under a scenario that assumed only natural ecological processes and disturbances (fire, insects, disease) and their interactions with climate. Thirty simulations were run to better capture the variability and uncertainties associated with disturbance events and resulting vegetation change. Refer to appendix 2 for details as to how the model inputs were developed, the climate indices that were used, and other information on the natural range of variation analysis.

The natural range of variation analysis for wildfire on the Flathead National Forest suggests that the pattern of fire varied widely in extent, size, and pattern over time, closely tied to variations in climate. The model simulations reflect the reasonable assumption that under warmer climate periods drier conditions would also occur, and thus a higher amount of fire could be expected across the landscape

when compared to normal climatic periods. Historically, the Forest was dominated by stand-replacement fire, which would kill most of the trees. Mixed- or moderate-severity fires would also occur, with more variable mortality patterns, but at least 40 percent of the trees would be killed within the fires' boundaries. Low-severity fires were the least common fire type on the Forest, occurring primarily in the dry valley bottoms and foothill forests that historically were dominated by ponderosa pine and, to a lesser extent, Douglas-fir. Deliberate ignitions by Native Americans were also common in portions of the Forest, such as the Flathead and Swan valley bottomlands and foothills. The natural range of variation for average area burned on Forest lands at any fire severity on a per decade basis (one timestep in the model equals one decade) is estimated to be 3 to 18 percent of the Forest (about 80,000 to 330,000 acres). The minimum area burned was as low as 0.5 percent (about 20,000 acres) in a decade, and the maximum area burned was as high as 28 percent (about 670,000 acres) in a decade. Most (at least 75 percent) of these fires were stand replacement, with the remainder mixed (i.e., moderate) severity. A relatively low (3 percent) of the historical fire was estimated to be low severity. Refer to graphs that display the natural range of variation as estimated for wildfire (Trechsel, 2017b).

Recent wildfire history and trends on the Forest

Wildland fire burned approximately 1,230,000 acres from 1889 to 1930 (see figure 56) in the vicinity of the Forest. The trend of large fires decreased between the 1930s and 1980s and then increased again starting in 1988. This cycle has many influences, including fuels, weather (daily, monthly, and long term), ignition sources, and suppression efforts. The lull in the cycle is likely the combination of reduced fuels from the earlier high fire cycle, the peak in staffed lookouts that likely occurred in the early 1940s (McKay, 1994; Shaw, 1967), the increasing capability of technology (e.g., air tankers, dozers), and agency focus on suppression. Recent increases in large fires also can be attributed to changes in national wildland fire policy since 1980, the recognition and implementation of the role of fire on the landscape, and the integration of the changing policy into the management of the Forest wildfire program. Recent wildfire history is shown in table 95.

Table 95. Estimated acres and percent of Flathead NF lands burned by wildfire from the years 1994 to 2013 (source: Flathead National Forest geographic information system, fire history data).

1994-1999	2000-2009	2010-2013	Total acres burned	Percent burned
42,400	338,700	48,400	429,500	18 percent

Historic fire occurrence data from the Forest Fire Atlas has been summarized to show lightning and all other causes in figure 57. Overall, with the exception of 1940, there is general consistency through the years of a cumulative average of 69 fires per year. Lightning is the dominant ignition source on the Forest, with an average of 45 starts per year. All human-caused starts combined for an average of 24 fires per year.

These figures together lead to the conclusion that the large fire events of the late 1800s and early 1900s burned and reburned pieces of the landscape, producing a landscape that required time to regenerate into stands that would generate the fire events that are currently occurring. In addition, the climate during the 1940s to 1990s was not conducive to many large fires. As outlined in the Flathead National Forest assessment, much of the Forest landscape is in fire regimes in the 35-100-year or longer fire frequencies, which matches up with the fire events of the last 140 years (USDA, 2014a, p. 61).

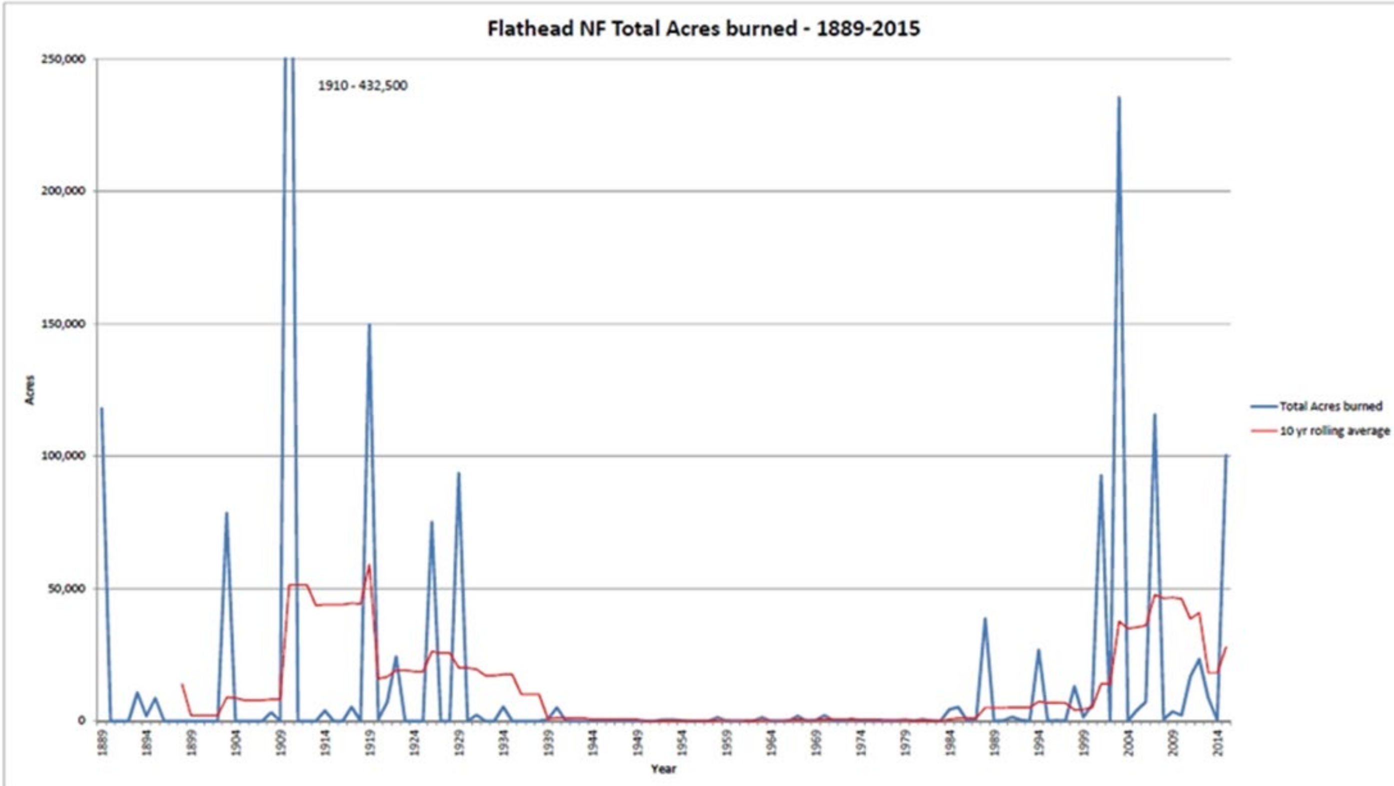

Figure 56. Total acres burned and 10-year rolling average, Flathead National Forest, 1889-2015

Source: Data summarized from Flathead National Forest and Regional Fire history data.

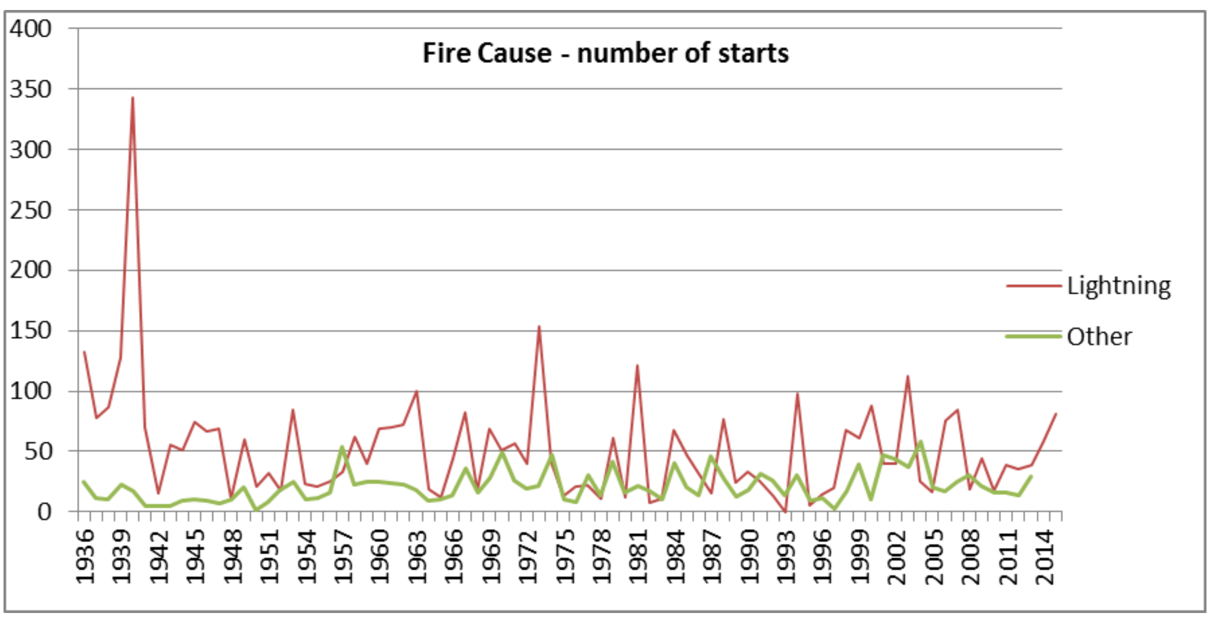

Figure 57. Number of starts of lightning-caused and human-caused fires, Flathead National Forest, 1936-2015

Source: Data summarized from Flathead National Forest and Regional Fire history data.

3.8.3 Environmental consequences

Expected future fire trends

Fire has been a fundamental part of the northern Rockies forests for thousands of years, whether naturally ignited (i.e., lightning) or human induced (i.e., by Native Americans). Fire, fuels, and climate are closely interrelated. Natural, long-term variations in temperature and precipitation patterns have resulted in continuously changing fire regimes (Whitlock et al., 2008) and thus continually changing forest conditions. This past climatic variability has had major effects on the timing, frequency, intensity, severity, and extent of wildland fires, as would potential future changes in climate. The effects may be due to direct climate-related factors, such as increased temperature and greater drying of forest fuels, or to indirect factors related to potential changes in forest composition and structure due partly to climate change (refer to the assessment (USDA, 2014a), section Terrestrial Ecosystems: Key Ecosystem Characteristics, subsections “Vegetation Dominance Types” and “Forest Size Classes”). These climate-induced changes in fire regimes could have substantial impacts on ecosystems, with associated effects pm communities and economies (McKenzie, Peterson, & Littell, 2009). In other words, vegetation, fire, climate, and weather are closely interconnected, and the relationship between the multiple aspects of each is extremely dynamic and complex.

A recent comprehensive synthesis of the science surrounding climatic change and ecosystems (Walthall et al., 2012) concluded that all fire regimes in western forest ecosystems will experience some increase in fire risk. More fires are occurring in all forests because of longer fire seasons and higher human populations (Vose, Peterson, & Patel-Weynand, 2012). Fire intensity and severity will probably be higher as well because of more extreme (i.e., hotter) fire weather and higher fuel loadings (i.e., tree mortality, increased forest densities). In moderate-severity (mixed-severity) regimes, more frequent fires could convert lands to more of a low-severity fire regime, where frequent fires favor more open stand conditions and tree species resistant to fire damage. Increased fire risk and fire sizes in high-severity fire regimes could have significant local effects, especially where close to human population centers. It is not well articulated in the climate change discussion that risk also increases because of increased occupation of the wildland environment. Fire has been a component of the landscape for thousands of years, but now there is a “too much fire” problem.

Simulation modeling (SIMPPLLE model) was used to estimate wildfire activity on the Flathead for five decades into the future. Best available information was used to build the fire suppression logic and assumptions within the model, including corroboration with actual data and professional experience and knowledge. Refer to appendix 2 for a detailed discussion of model development and outputs associated with fire and resulting vegetation changes.

Recognized constraints to fire management

A key consideration of fire management on the Forest is that, in general, there is a very large number of burnable acres of NFS lands that cannot be actively managed by mechanical means due largely to remote conditions, and an even larger number that has policy limitations on the application of prescribed fire because the area is designated as wilderness. Appropriately managing wildfire in places that have the opportunity to obtain resource benefits and a low risk of potential damages may be the only way in many areas to increase the pace and scale of ecosystem restoration activities. Management of wildfire would also need to be a method for maintaining areas once restoration has occurred.

Comparison of all alternatives

The alternatives vary in terms of the allocations of land on the Forest to different management areas. The management area allocation that has the most impact on fuels management is designated wilderness

(management area 1a) due to the policy limitations on both mechanical and prescribed fire. In recommended wilderness (management area 1b), the initial limitations would be for the mechanical treatment of fuels. Additionally, the implementation of the Northern Rockies Lynx Management Direction (USDA, 2007d) constrains treatments in lynx habitat outside the wildland-urban interface where multistoried hare habitat or stand initiation hare habitat is present (refer to section 3.3.10, subsection “Effects from wildlife management”).

Summary and comparison of model results

This section references the output from the SIMPPLLE model and the fire component. Refer to appendix 2 and to Henderson (2017) for additional details on the modeling process and results.

Fire-specific assumptions related to the SIMPPLLE model include the following:

- Class “A” size (0-0.25 acre) fires that are suppressed have no influence on the model.
- Suppression rates are based upon the national standards from the National Wildfire Coordinating Group resource production tables.
- Suppression response time varies from 0.5 hour in the wildland-urban interface to two days in remote locations.
- Fire may reburn an area if the vegetation becomes conducive to fire spread in future years.
- For the final EIS, a future range of variation in amount of fire activity was evaluated, incorporating runs that represented the current trend of fire activity as well as runs that represented increased and decreased levels of fire activity. The climate scenario pattern over time was also changed so that all five decades used the “warmer” climate scenerio (which was also assumed to be drier). In the draft EIS, only the last three decades of the five decade period were modeled under the warm climate scenario.

Results of the modeling of future fire activity are displayed in figure 58. The data for modeled wildfire in the figure is segmented by decades for each alternative. A minimum, average and maximum amount of fire per decade is displayed. For all alternatives, the minimum level of modeled fire activity is near or slightly above the 10-year average amount of fire experienced in recent decades (see figure 56). The average level of modeled fire activity hovers around 200,000 acres per decade for all alternatives, which is similar to the last 10 years. These results reflect the potential continuation of an average or somewhat warmer climatic pattern, which could potentially increase the average amount of fire activity over the next five decades, as compared to the decades from 1940 to 1990. The lack of variation in the minimum and average level of modeled fire activity over time in these two scenarios is consistent with the fire regimes on the Forest, where very large stand-replacement fires that consume large areas of forest at one time generally do not occur in years with “average” weather and fuel conditions.

The maximum level of modeled fire activity reflects the potential under a warm and potentially dry climate scenario, where most fires that occur are stand replacing, and very large fires (> 50,000 acres) could be expected to occur. The maximum level has the most variability by alternative, ranging from 300,000 to 450,000 acres per decade (figure 58). It is important to keep in mind that warmer temperatures do not necessarily correlate to increased fire acres burned, primarily because the global climate models do not capture precipitation or wind at landscape levels very well, which can directly or indirectly limit fire spread. When compared to the trends in figure 56, the model data supports the concept that the current increase in fire since 1988 and expected fire in the future decades likely will replicate the trend of large fires that occurred in the late 1800s and early 1900s.

The mixed-severity and high-severity fire regimes are split approximately evenly across the Flathead National Forest landscape (see USDA, 2014a). Under the natural fire regimes on the Flathead, periods of high fire activity with very large fire events followed by periods of relatively low fire activity would be the anticipated pattern into the future, as supported by the natural range of variation analysis and recent historical fire records (see section 3.8.2 above). In this more "normal" scenario, a decline in fire activity would be expected to occur over the next few decades, influenced both by changed fuel conditions and forest patterns, as well as climate conditions. The analysis of future fire activity suggests that by introducing the warmer climate scenario into the model, decadal increases in total acres burned is likely, although a gradual decline in very large fires (the "maximum" scenario portrayed in Figure 58) would occur. However, global change climate models are robust for predicting temperature changes but are less robust for predicting wind and relative humidity (Stavros, Abatzoglou, McKenzie, & Larkin, 2014). Predicted precipitation changes are also less certain than temperature changes. Wind is locally a significant factor in recent very large wildfire growth (for example, Bear Creek in 2015). In their analysis, Stavros et al. (2014) also modeled start and end weeks in which very large wildfires occur and found that for the northern Rockies there will not be a significant difference in the start and end weeks between the years 2031-2060 when compared to the present. This implies that although the "fire season" may increase, the period of time where very large wildfires may develop will likely remain similar.

The average and minimum amount of expected wildfire as modeled does not change substantially over the five decade period under any of the alternatives. The reason for the increase over the five decades in maximum acres burned under alternative A is uncertain, although it may be related to the lack of inclusion of prescribed fire in the model assumptions for this alternative. Alternatives B modified, C, and D all trend down in the maximum amount of modeled fire over the decades, from an average of 390,000 acres to 320,000 acres. This is likely due to changes in vegetation and fuel conditions across the landscape. The similar amounts and trends between the alternatives in modeled wildfire activity into the future is mainly because it is natural disturbances and ecosystem processes rather than vegetation treatments that are the primary driver of vegetation changes forestwide, and the fire suppression logic in the model is the same under all alternatives. The changes in management area designation between alternatives would impact prescribed burn opportunities, but do not have much impact on the expected acres of prescribed burning (except for alternative A, which has no prescribed burning modeled). Although there are differences in the alternatives in amount of projected harvest treatment acres in any given decade, the effect of treatment acres does not readily change fire occurrence on the landscape in the model because of the very small proportion of area harvested compared to areas impacted by natural disturbance and ecosystem processes (such as succession).

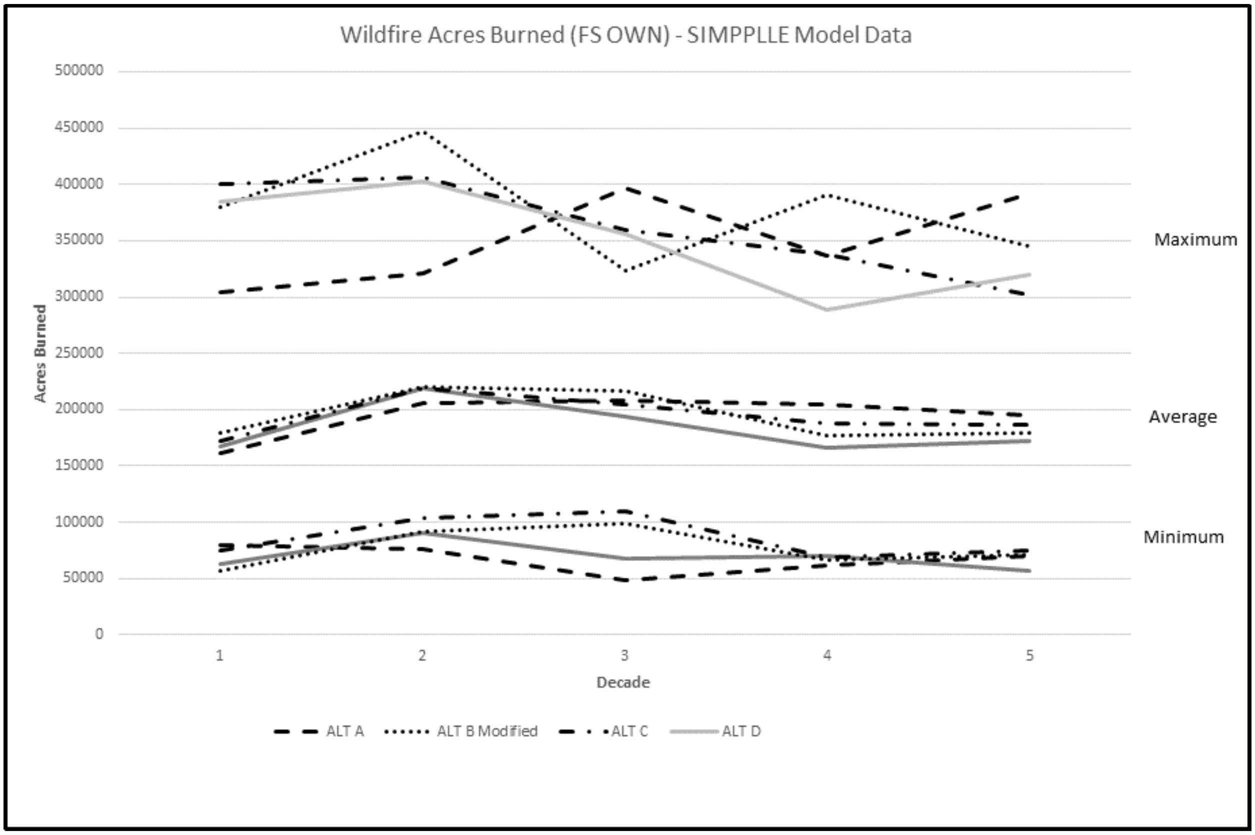

Figure 58. SIMPPLLE model outputs for wildfire acres burned on the Flathead National Forest by decade and by alternative across the five-decade model period.

Summary of fire management approaches

Using the wildfire continuum as a metric for comparison of the overall intent of each alternative, the alternatives generally fall along the spectrum from protection to resource objectives as illustrated in Figure 59 below. This is based upon the how each alternative allocates the landscape to each management area. The primary driver is the amount of wilderness and proposed wilderness.

The alternatives also vary on the management area allocation that occurs within the wildland-urban interface as it currently exists. These changes influence the type of treatments that may be utilized to manage vegetation. Table 96 compares the alternatives and grouped management areas. The management areas are grouped by similar types of management implications within the wildland-urban interface. Under each alternative, there are 401,965 acres of wildland-urban interface on the Forest (17 percent of NFS lands).

The primary wildland-urban interface data was created from the Flathead County Community Wildfire Protection Plan, the Whitefish Community Wildfire Protection Plan, and the Seeley-Swan area of the Missoula County Community Wildfire Protection Plan (Suenram, 2011; Wallace, 2005; Whitefish Area CWPP Collaborative, 2009). Each of these analyses and resulting plans incorporated not only communities at risk, as defined in the Healthy Forest Restoration Act of 2003 (Pub. L. 108-148), but also other values such as dispersed infrastructure, powerlines, and high-density “neighborhoods” not within a defined community. Also, the wildland-urban interface data and mapping incorporated some analysis of potential fire behavior and likely fire spread that would threaten these values. Where the wildland-urban interface overlaps with management area 1a or 1b, there may be limitations on treatment options, based upon the direction in the Forest Service Manual and the Forest Service Handbook.

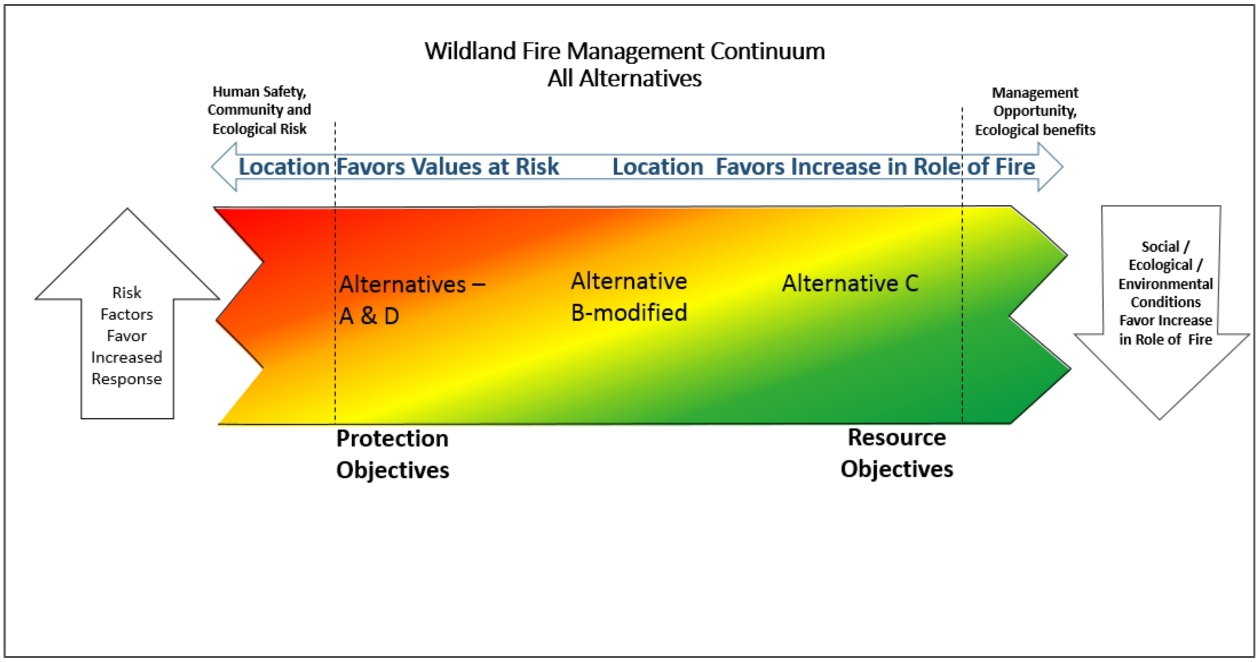

Figure 59. Position of all alternatives on the wildfire management continuum chart.

Table 96. Acres and percent of wildland-urban interface by management area group and alternative

Management Areas	Alternative A	Alternative B modified	Alternative C	Alternative D
1a, 1b	19,538 5%	18,162 5%	72,924 18%	15,858 4%
2a, 2b, 3a, 3b, 4a, 4b	23,284 6%	29,884 7%	28,223 7%	29,977 7%
5a, 5b, 5c, 5d	52,535 13%	42,205 10%	16,764 4%	40,419 10%
6a, 6b, 6c, 7	306,607 76%	311,714 78%	284,053 71%	315,711 79%

Alternative A—No action

Management direction for alternative A—No action

Current direction for fire management in the 1986 forest plan emphasizes suppression. Forestwide Resource Goal 11 is: “Improve local knowledge of native succession and disturbance regimes, and resulting landscape dynamics. Apply this knowledge in developing desired future landscape patterns and ecological process for individual landscapes and watersheds” (p. II-5). Vegetation Objectives at the landscape level also identify the following:

- Manage landscape composition and patterns to reduce the risk of undesirable fire, insect and pathogen disturbances.
- Where fuel conditions and potential fire regimes have been significantly affected by fire exclusion and timber management, manage landscape fuel conditions (amounts and spatial arrangement) to restore the historical fire regimes and reduce the risk of undesirable fire events. Emphasize this objective in areas where wildlands interface with urban and rural areas of private property. (p. II-9)

Currently, 17 of the 25 management areas on the Forest have no flexibility for fire management and require full suppression under all conditions. During years when the fire season is not expected to be severe and evolves into a below average year related to fire risk and fuel conditions (e.g., 2014), fires that could be allowed to burn to mitigate fuels concerns and maintain fire regimes in these management areas are instead suppressed. Thus, fire response is constrained by the plan direction instead of the conditions on the landscape.

Under alternative A, to achieve the direction in the existing 1986 forest plan, an estimated 518 miles of existing roads would need to be reclaimed and either left on the transportation system as reclaimed or taken off the transportation system as decommissioned. This would lead to increased response time for wildfires and increased costs for prescribed fires. Reduced access would also limit the ability of the Forest Service to use mechanical treatments to reduce fuel loadings in the future.

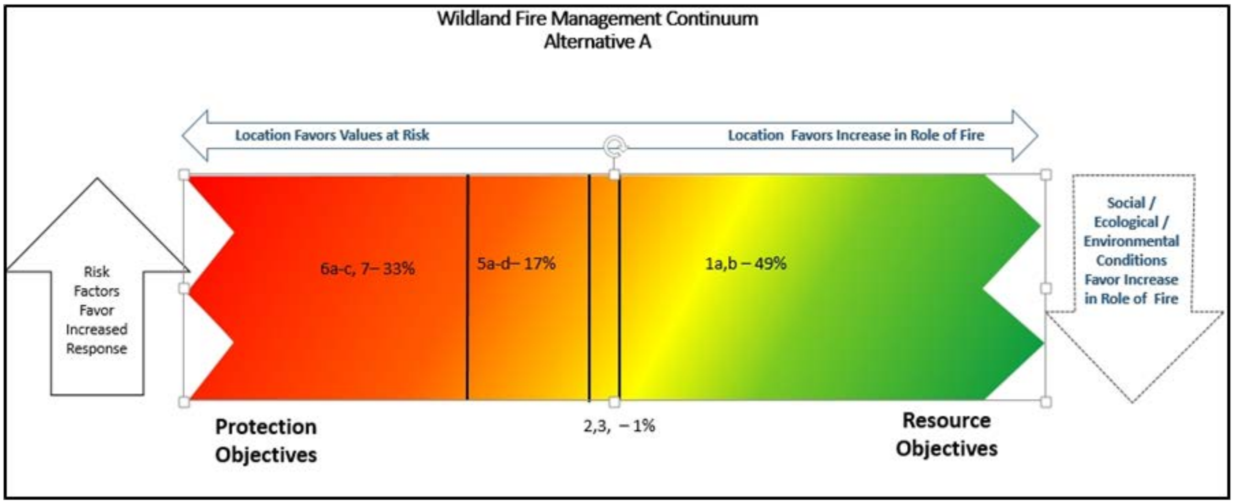

Figure 60. Alternative A: Wildfire management continuum chart with management areas.

The wildfire continuum shown in figure 60 portrays the percentage of management areas cross-referenced to the categories of the new management areas in the forest plan. The wildfire continuum graph depicts the constraining objectives by the changes in colors for management areas. Note that even in the management areas of designated wilderness and recommended wilderness (management areas 1a and 1b), overlapping areas of wildland-urban interface likely would cause fires to be suppressed due to proximity to communities and other values at risk and to fuel conditions. This has been the case in recent years. Under alternative A, the area where fuel treatment and management opportunities would be most available (e.g., backcountry management areas 5a-5d and general forest management areas 6a-6c) is approximately 362,362 acres, which is second to alternative D (see table 96).

The effect is that fires would continue to be suppressed under all conditions in general forest, backcountry, and focused recreation areas (management areas 6a-6c and most of management areas 5 and 7), which would likely lead to continued increases in hazardous fuel conditions, eventually leading to larger fires that would be difficult to contain.

Alternatives B modified, C, and D

Effects of forestwide direction

All the action alternatives contain desired conditions and guidelines that articulate the role fire should play. Management direction recognizes that risks to important values change depending on the seasonal

changes in weather and fuels, providing the opportunity to use fire as a management tool when conditions are conducive to meeting various plan objectives. The forest plan recognizes that given certain weather, fuels, and topography, fires can be managed with minimal risk to values. The acres of each management area would influence how fire management would be implemented under each alternative.

Management direction for alternative B modified

As shown in figure 61, alternative B modified has more acreage in designated wilderness and recommended wilderness (management areas 1a and 1b) and less in general forest and focused recreation (management areas 6a-6c and 7) compared to alternative A. Also, in the general forest and focused recreation management areas there is more “green” in the continuum, reflecting that there would be some potential for managing fires with goals other than keeping them as small as possible. These opportunities would be based on the pre-season conditions and then a decision, once a fire started, to take into account the actual fuel, time of season, and the current and expected weather (see appendix C for examples of strategies). The intent of fire management would be to manage fires so that they grow for shorter time frames and smaller spatial extent, the potential for positive effects would be high and the risks of negative impacts would be low. The impact of increased acres of recommended wilderness might reduce the ability of the Forest to mechanically treat fuels, or in some cases non-mechanical treat with prescribed fire, to mitigate for fire risk and meet the objective (FW-OBJ-FIRE-01) of using treatments on the landscape to reduce fire impacts to private property and NFS infrastructure.

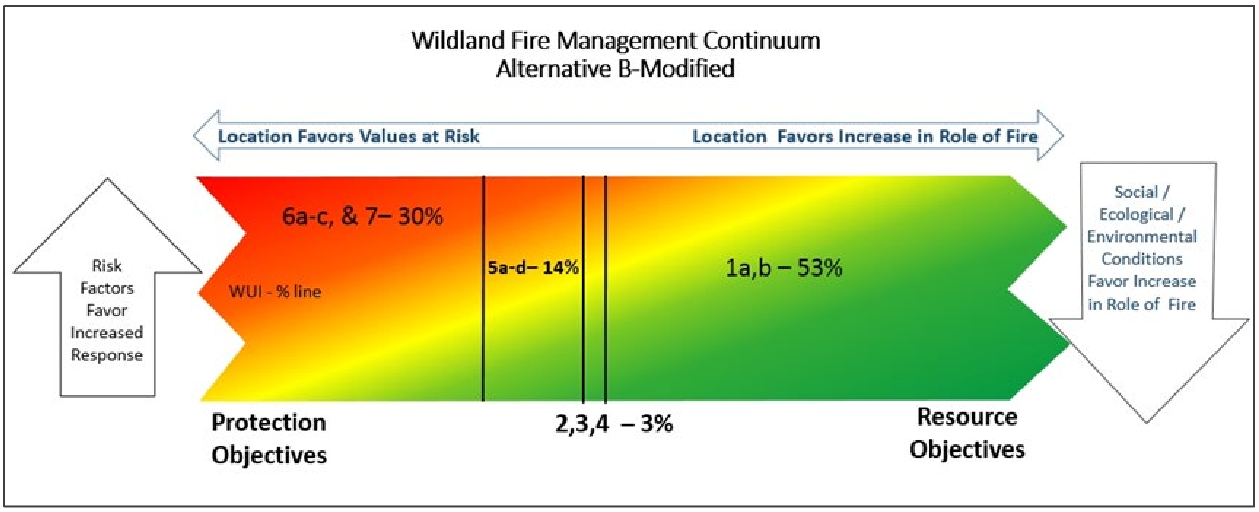

Figure 61. Alternative B modified: Wildfire management continuum chart with management areas

The wildland-urban interface areas area where fuel treatment and management opportunities would be most available (e.g., backcountry management areas 5a-5d and general forest management areas 6a-6c) total approximately 357,124 acres (see table 96). Compared to alternative A, this represents a 2 percent decrease in acres.

Management direction for alternative C

Alternative C has the most acres in designated wilderness and recommended wilderness (management areas 1a and 1b) (see figure 62).There would be greater limitations on the Forest’s ability to utilize either mechanical treatments or prescribed fire in alternative C compared to the other alternatives, especially when recommended wilderness becomes designated wilderness in the future.

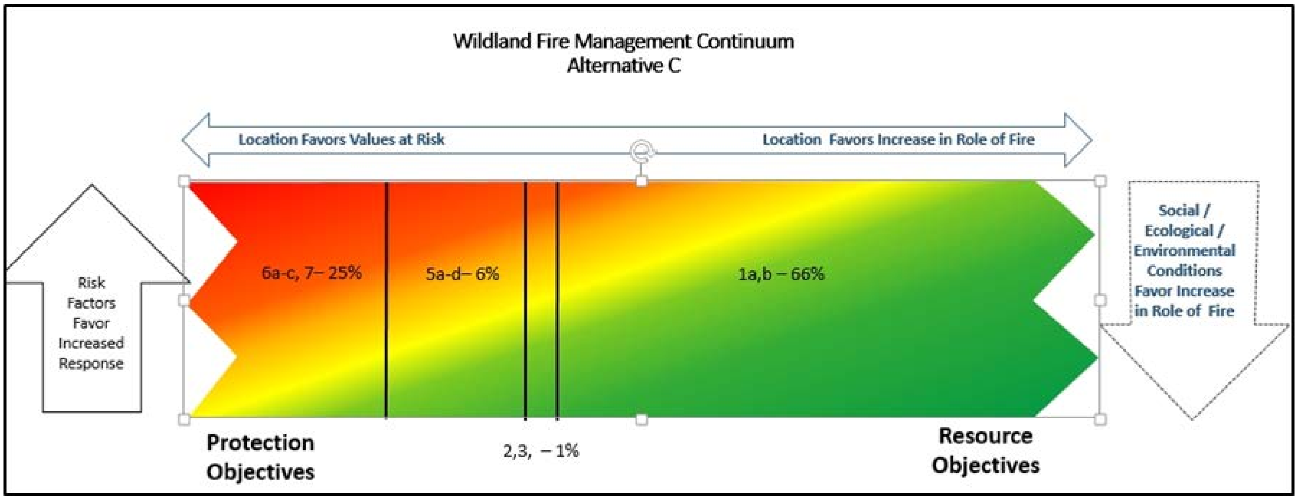

Figure 62. Alternative C: Wildfire management continuum chart with management areas

The expectation is that non-mechanical treatments would be more widely applied to manage vegetation conditions and that wildfire would be utilized more frequently to meet resource objectives. However, wildland fire use would be dependent upon the use of unplanned ignitions and the risk assessment associated with each season and event that might instead require fire suppression actions. With the focus on the natural role of fire, the use of prescribed fire under alternative C would be expected to be less relative to alternatives B modified and D.

The wildland-urban interface acres area where fuel treatment and management opportunities would be most available (e.g., backcountry management areas 5a-5d and general forest management areas 6a-6c) from table 96 total approximately 304,022 acres. Compared to alternative A, this is a 17 percent decrease in acres. This alternative provides potentially the least opportunity to treat wildland-urban interface acres.

Management direction for alternative D

Alternative D provides for the most flexibility in fire suppression across the Forest due to the reduced amount of recommended wilderness and the increased opportunities for and focus on mechanical treatments (see figure 63). The potential for motorized access would be greater than under alternative C, though similar to alternative B modified. Alternative D would likely result in less amounts of wildland fire managed for resource objectives because mechanical treatments could potentially be more widely applied compared to alternative C and prescribed fire potentially more widely applied than either alternatives A or B modified.

The wildland-urban interface area where fuel treatment and management options would be most available (e.g., backcountry management areas 5a-5d and general forest management areas 6a-6c) totals approximately 359,349 acres (see table 96). Compared to alternative A, alternative D has a slight (1 percent) decrease in acres.

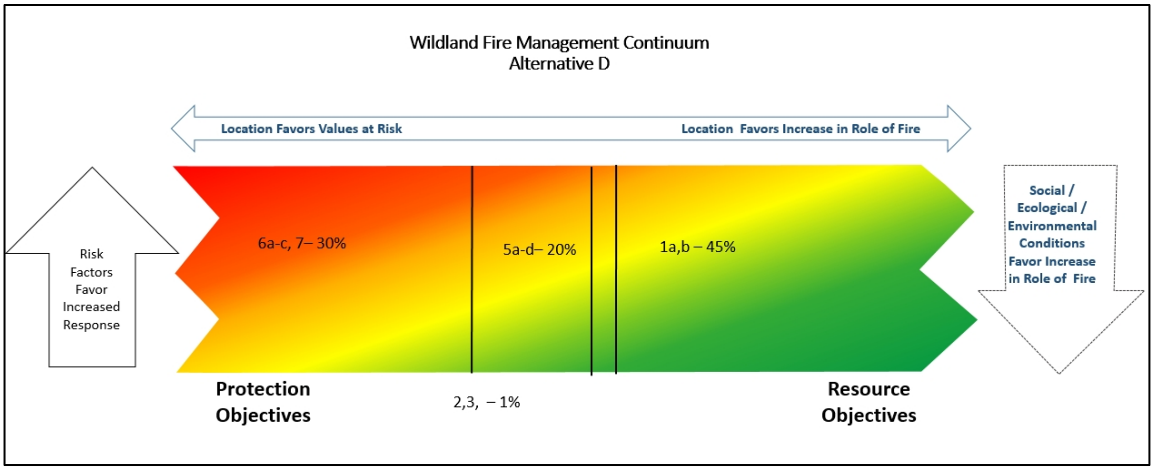

Figure 63. Alternative D: Wildfire management continuum chart with management areas

Summary of effects of management area direction

Compared to the current forest plan, the action alternatives provide direction that would emphasize the need to treat fuels and lower wildfire risks where values at risk are the greatest, which changes through time. Hazardous fuels treatment objectives would be emphasized where the risks are greatest within project areas. Coordination with adjacent landowners and working with partners is recognized as important components of fuel management strategies (FW-GDL-FIRE-01). The role of fire as an integral part of achieving ecosystem sustainability is recognized (FW-DC-FIRE-03). Fire's interrelationship with economic and social components is also recognized, including the protection of property and other values at risk (FW-DC-FIRE-03). The full range of fuel reduction and fire management activities are emphasized, including the use of planned and unplanned ignitions.

Effects of geographic area direction

Salish Mountains geographic area

Compared to the other alternatives, alternative C has more of the general forest management area allocated to low or medium-intensity vegetation management (management areas 6a and 6b) as opposed to high intensity (management area 6c). This it to give more consideration to wildlife connectivity values and the retention of a greater amount of forest cover. Harvest methods would include less regeneration harvest or a slower rate of timber harvest. However, this might produce fuels concerns, particularly along the east side of the Tally Lake area. Given the proximity to private property and to highways, a railroad line, and other infrastructure, it could be challenging to manage fuels and suppress fire in portions of this geographic area.

Swan Valley geographic area

Under alternative A, and estimated 518 miles of roads forestwide would need to be reclaimed and either placed on the transportation system as reclaimed or taken off the transportation system as decommissioned, and most of this is expected to occur in the Swan Valley geographic area. This would be required to meet grizzly bear management objectives in the existing 1986 forest plan (amendment 19), and it would likely lead to fewer opportunities for roaded access and associated mechanical fuels projects.

This might reduce the opportunity for or increase the complexity of prescribed burning without pretreatment in some locations. It might also increase the response time to wildfires. Under alternative C, the allocation to general forest low-intensity vegetation management (management area 6a) across larger portions of the geographic area compared to the other alternatives may impact the ability to treat along the wilderness boundary for fire management purposes.

Under alternative B modified, the acres in management area 6c could receive mechanical treatment of fuels in close proximity to private property. Prescribed fire in management area 6c could facilitate the maintenance of the vegetation objectives. The location of the western boundary of the Swan Front recommended wilderness would also enhance the prescribed burning opportunities in this area, compared to alternatives A and C.

Consequences to fire from forest plan components associated with other resource programs or management activities

Effects from air quality management

The consequences to fire from air quality management are the same under all alternatives. All the alternatives have the same plan components requiring air quality standards established by Federal and State agencies to be met. The Forest Service would meet the requirements of state air quality implementation plans and smoke management plans. Fall valley inversions in the past have constrained the Forest Service's ability to implement prescribed burns. The expectation is that this would continue into the future. The SIMPPLLE model runs do not take this into account, so the model outputs over-predict the amount of prescribed acres likely to be burned in any decade.

Effects from timber management

Vegetation treatments are typically designed and implemented to achieve multiple resource and social and economic objectives, including those associated with fuels management. Where fuels reduction is an identified objective, the timber management program supports the accomplishment of that objective.

Under alternative A, the existing forest plan directs the suppression of all wildfires in those management areas where timber production is an objective. None of the action alternatives has this limitation. The Forest recognizes that not all fire is detrimental to timber production and that there is therefore an opportunity to allow wildfires to burn to help maintain or restore fire-adapted ecosystems.

Effects from access and recreation management

Changes in road access are the most under alternative A and about the same under alternatives B modified, C, and D (see section 3.10 and 3.12). This would influence access for fire management activity, removing it where roads are decommissioned. Other means of treating fuels might be more expensive and thus prohibited.

Effects from watershed, soil, riparian, and aquatic management

The consequences of forest plan components related to the ability to restore or maintain ecosystems or reduce hazardous fuels would be generally similar under all the alternatives. To meet the plan direction associated with these resources, there would likely be occasions where prescribed or natural fires could not be used due to the potential negative effects that those activities could have on the resources. Fuels management activities occasionally require some soil-disturbing activities or road construction, which might have to be limited to meet other plan direction. Although it is difficult to quantify the effects, all the alternatives have components that, in certain circumstances, would limit the use of fire for ecosystem maintenance or would limit fuels treatments.

Effects from wildlife management

Generally, wildlife management direction has low impact on fire and fuels management within the wildland-urban interface because management direction recognizes the importance of managing vegetation to modify fire behavior. The Northern Rockies Lynx Management Direction (USDA, 2007d) recognized the importance of fuel treatments within the wildland-urban interface as designated by the Healthy Forest Restoration Act (see section 3.7.5, subsection "Canada lynx," for more details). However, opportunities to conduct vegetation treatments, including prescribed fire or mechanical fuels reduction treatments, outside the wildland-urban interface are limited under current lynx management direction. The restrictions on treatments within these forest conditions are likely to reduce the ability and effectiveness of achieving desired forest and fuel conditions outside the wildland-urban interface, for reasons summarized below (see also section 3.3.10).

Lynx management direction restrictions on treatments in multistory hare habitat and young seedling/sapling forests have the most impact. These forest conditions are widespread across the Flathead National Forest due to the dominance of subalpine fir-spruce forests and of fire as a natural disturbance process, creating large areas of seedling/sapling forest. Thinning of dense sapling stands is typically designed to create future forests composed of larger trees and desired species (such as fire-resistant western larch). These forests are more resilient in the face of future wildfire events and may burn less severely, reducing potential future impacts to values at risk. Thinning in most dense seedling/sapling stands outside the wildland urban interface is not allowed under current management direction. Treatments in multi-story forests that provide hare habitat that would result in it no longer qualifying as multi-story hare habitat is also not allowed outside wildland urban interface. This includes both mechanical (i.e., harvest) and prescribed burn treatments. Typically, the objective of prescribed fire is to reduce stand density by removal of the understory and, in some forest types (such as subalpine fir- and lodgepole-dominated forests), to remove portions of the overstory to create patches of more open forest conditions across the landscape. Prescribed fire management with these objectives would not be able to occur in multistory hare habitat, limiting the Forest's ability to manage landscape patterns and fuel conditions across some portions of the Forest to achieve desired conditions. The use of wildfire (unplanned ignitions) to achieve desired conditions is frequently infeasible due to seasonal changes in weather and fuel conditions.

Effects from recommended wilderness area designations

The Forest assumes that recommended wilderness areas will be designated by Congress as wilderness at some point in the future. Wilderness designation would result in reduced flexibility and options for vegetation and fuels management to achieve desired conditions. The use of prescribed fire is typically not allowed within designated wilderness areas, and the ability to use unplanned ignitions (wildfire) as a tool would be very limited within some of the recommended wilderness areas. This is because of the small size and/or the locations of the recommended wilderness areas; most wildfires would likely have to be aggressively suppressed to protect identified values (i.e., private lands). This effect would be most pronounced under alternative C, with some impact, although much less, under alternative B modified. There would be little impact under alternatives A and D. For a detailed discussion, refer to section 3.5.1, subsection "Effects to whitebark pine," and to section 3.3.10.

Cumulative effects

National Fire Plan, Healthy Forests Initiative, and Healthy Forests Restoration Act

Since they were developed, the national-level National Fire Plan of 2000 and the Healthy Forests Restoration Act of 2003 have influenced the vegetation and fuel management programs on the Flathead National Forest. Therefore, they have had some effects on hazardous fuels, and it is anticipated that they

will continue to do so for the foreseeable future. In general, these plans have resulted in more vegetation treatments being implemented in the vicinity of and within wildland-urban interface areas with the objective of reducing hazardous fuels, as well as fewer vegetation treatments being conducted in areas located away from communities. In addition, the types of fuel treatments that are being used in response to these national-level plans and legislation are often more expensive than methods used elsewhere, and the social issues (i.e., the effects of treatments on scenery, air quality, noise, wildlife viewing, etc.) can be more contentious. Therefore, higher public involvement, planning, and implementation expenses are likely to lead to fewer acres being treated within a given budget level. Not only do the National Fire Plan and the Healthy Forests Restoration Act emphasize the need to reduce hazardous fuels in the wildland-urban interface, but they also stress the need to restore the natural fire regimes and forest conditions to the larger national forest landscape. These plans encourage the development of more resistant and resilient forest vegetation that would be less susceptible to large undesirable wildfires and/or insect outbreaks.

Climate change

Of all of the ongoing and foreseeable future actions that have the potential to affect fire, especially unwanted wildfire, climate change is likely to be the single most important factor. The effects of climate change will likely combine with some of the effects that result from implementing the forest plan to produce cumulative impacts. In general, the fire seasons are expected to become longer, large wildfires are expected to occur more often, and total area burned is expected to increase. By increasing the amount of prescribed fire use, as well as the amount of wildfire use for multiple objectives, the action alternatives would be expected to partially offset the predicted effects of climate change. The more fire use (and mechanical treatments) that occurs as a result of the plan direction, the more the fuels would be reduced and the forest vegetation restored to more resistant and resilient conditions, which would mitigate climate change effects. The windows for prescribed fire may become longer with a warmer climate, which might reduce some air quality issues that fall inversions have historically produced.

Human population increases and/or shifts towards the wildland-urban interface

Over the last several decades, more human development has occurring around the “edges” of lands administered by the Flathead National Forest. This trend is expected to continue in the future and is likely to have effects on the forest vegetation that are similar to those discussed above under the section titled “National Fire Plan, Healthy Forests Initiative, and Healthy Forest Restoration Act.” In addition, as more and more people live and recreate in these wildland-urban interface areas, the probability increases of more human-caused wildfire ignitions that could have effects on the forest vegetation despite efforts to suppress human-caused fires.

Although working cooperatively with neighboring large land owners on the management of fire and implementing fuels management strategies is effective, it is the small lot owner that becomes the focus of suppression resources when large wildfires occur. The future increase in small lot owners will continue to challenge wildfire management during large fire events. To work individually with these property owners is costly and creates a patch work of defendable properties among those that are not.

Rural fire department staffing is currently declining, leading to limitations on their ability to support fire suppression and/or structure protection in their jurisdictions. This may lead to increased spread of fire from off the Forest.

Where plan components limit the implementation of prescribed fire, the ability of fire managers to use this tool for larger landscape fuels management may be compromised.

Increased regulation and concern over smoke emissions

The ability to use fire to maintain and/or restore the fire-adapted ecosystems on the Forest, or to use fire to reduce hazardous fuels in the wildland-urban interface, is dependent upon air quality regulations. Therefore, to the extent that air quality regulations may become more stringent in regards to the quantity and timing of smoke emissions, there could be substantial effects on the ability of the Forest's fire management program to utilize these fire tools. If past trends of increasing regulations and decreasing burn opportunities continue, the effects could be substantial and would likely result in the Forest's not being able to use fire to make meaningful improvements to forest and fuel conditions and to meet objectives.

Timber product manufacturing infrastructure and economics

The ability of the Forest to positively affect the forest vegetation is partially dependent upon its ability to sell forest products to manufacturing companies and to use the harvesting process (including the residual slash disposal activities) as a means to positively affect the forest vegetation and reduce hazardous fuels. If the forest products industry declines in areas surrounding the Forest to the degree that it is difficult to sell forest products or if "stumpage prices" decrease significantly, the number of acres that could be treated would be reduced. Although some treatments could be accomplished by using prescribed burns only, this method is generally too risky in the wildland-urban interface and is very expensive elsewhere.

3.9 Air Quality

3.9.1 Introduction

Air quality is dependent on the type and amount of pollutants emitted into the atmosphere, the pollutants that currently exist in the atmosphere, the size and topography of the airshed, and the prevailing meteorological and weather conditions. Sources of pollution within the Forest may include particulates generated from timber and mining operations and prescribed fire. Dust from forest roads may also contribute to fine particulates in the air.

The focus of this discussion is on smoke and how the various alternatives could affect smoke production through the use of prescribed fire, the use of natural, unplanned ignitions to meet resource objectives, or the emissions from unwanted wildfires. Of all potential sources of air pollution from management activities that occur on the Forests (e.g., road dust, mining operations, emissions from logging equipment and recreational vehicles), smoke is the most substantial contributor to air quality and visibility. Smoke can exacerbate public health issues as well as reduce the ability to view the scenery on the Forest. However, as discussed in sections 3.3 and 3.8, there is a strong need to use fire to maintain and restore the fire-adapted ecosystems on the Forest and to reduce hazardous fuels in the wildland-urban interface.

Regulatory framework

Clean Air Act of 1955 (as amended in 1967, 1970, 1977, and 1990) (42 U.S.C. 85 § 7401 et seq.): This federal act is a legal mandate designed to protect the public from air pollution. Although this policy created the foundation for air quality regulation, States and counties are often responsible for implementation of the air quality standards. The Clean Air Act assigns the task of setting the national ambient air quality standards to the Environmental Protection Agency. The Environmental Protection Agency evaluates and updates these standards every five years.

Regional Haze Rule of 1999: This rule, issued by the Environmental Protection Agency, mandates that states address control of man-made air pollution that impacts visibility in designated Class I airsheds (such as the Bob Marshall and Mission Mountain Wilderness Areas). The goal of the Regional Haze Rule is to return visibility conditions in Class I areas to natural background conditions by the year 2064.

Clean Air Act Conformity: This provision of the Clean Air Act requires Federal agencies to ensure that actions they undertake in nonattainment and maintenance areas are consistent with federally enforceable air quality management plans for those areas.

Prevention of Significant Deterioration: This provision of the Clean Air Act requires Federal land managers "to preserve, protect, and enhance the air quality in national parks, national wilderness areas, national monuments, . . . and other areas of special national or regional natural, recreational, scenic, or historic value." This section addresses resource protection through the establishment of ceilings on additional amounts of air pollution over baseline levels in "clean" air areas, the protection of the air quality-related values of certain special areas, and additional protection for the visibility values of certain special areas.

National and Montana Ambient Air Quality Standards (Administrative Rules of the State of Montana, chap. 17.8, subchap. 2, Ambient Air Quality, state air quality requirements): Establishes health-based levels of certain air pollutants considered healthy for all persons in all areas. Levels have been established nationally and for the state of Montana.

Montana State Implementation Plan: This is the collection of Environmental Protection Agency-approved programs, policies, and rules that the State of Montana uses to attain and maintain the primary and secondary national ambient air quality standards.

National Environmental Protection Act Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions (revised draft of 2014): This guidance explains that agencies should consider both the potential effects of a proposed action on climate change, as indicated by its estimated greenhouse gas emissions, and the implications of climate change for the environmental effects of a proposed action. The revised draft guidance supersedes the draft greenhouse gas and climate change guidance released by the Council on Environmental Quality in February 2010 and, unlike the 2010 draft guidance, the revised draft guidance applies to all proposed Federal agency actions, including land and resource management actions.

Key indicators

The key indicators are ambient air quality and visibility, as follows:

- An alternative would be considered to have potentially significant impacts if its implementation would result in a national ambient air quality standards non-compliance violation as determined by the Montana Department of Environmental Quality.
- An alternative would be considered to have potentially significant impacts to visibility if its implementation would result in changes to or degradation of visual quality, views, and the aesthetic landscape.

The Montana Department of Environmental Quality has a network of air quality monitoring sites across the state. Monitoring sites that are within the administrative boundaries of the Flathead National Forest and will be referenced in this analysis are the following:

- Kalispell: Flathead Electric
- Whitefish: Dead End

Methodology and analysis process

A qualitative assessment of smoke emissions and consequences to ambient air quality and visibility was used as the indicators for effects to air quality. The actual quantitative values of smoke and other emissions that would be produced under each alternative are too variable to accurately predict. Therefore, the comparison of alternatives is based on a qualitative assessment of the relative amounts and timing of smoke that might be emitted by the alternatives.

Information sources

Information was obtained from U.S. Environmental Protection Agency, Western Regional Climate Center, Montana Department of Environmental Quality, and Montana-Idaho Airshed Group Web sites, databases, and reports. Additional information was obtained from Forest Service documents.

Incomplete and unavailable information

Quantitative values for smoke and other emissions are difficult to predict. Potential emissions from unwanted wildfires are also difficult to predict as they would vary depending upon site-specific vegetation and fuels conditions, ignitions, weather, and available suppression resources. Emissions from the use of prescribed fire and the use of natural, unplanned ignitions to meet resource objectives are also difficult to predict quantitatively.

Analysis area

The analysis area or region of influence for air quality depends on the specific pollutant(s) and emissions source(s) involved, as well as weather patterns, terrain, and prevailing winds. Primary pollutants are emitted directly; secondary pollutants are formed through chemical reactions in the atmosphere from precursor pollutants. The region of influence for a primary pollutant depends on the rate of emissions from a source, the elevation of the source, the type of pollutant, and the meteorological conditions that limit its dispersion and dilution during transport away from the emissions source. The region of influence for primary pollutants is an area potentially subject to measureable air quality impacts under unfavorable dispersion conditions and is generally a relatively small area, ranging from 1 mile to less than a few miles from the source. The region of influence for a secondary pollutant, such as ozone, is much larger because secondary pollutants can impact air quality for 100 miles.

The analysis area for the evaluation of effects to air quality from forest plan alternatives is the airshed in which the Flathead National Forest lies. An airshed is a geographical area in which atmospheric characteristics, such as wind patterns, are similar. Airshed boundary descriptions are detailed in the Montana/Idaho Airshed Group Operations Guide (MTDEQ, 2010). The mountains of the Continental Divide influence wind patterns and air quality in Montana, and this is reflected in the layout of the State's airsheds, shown in figure 64. The Flathead National Forest is within airshed number 2. The impact zones within airshed number 2 are Kalispell and Thompson Falls. Impact zones are areas identified in the Montana/Idaho Airshed Group Operations Guide as smoke sensitive or that have an existing air quality problem.

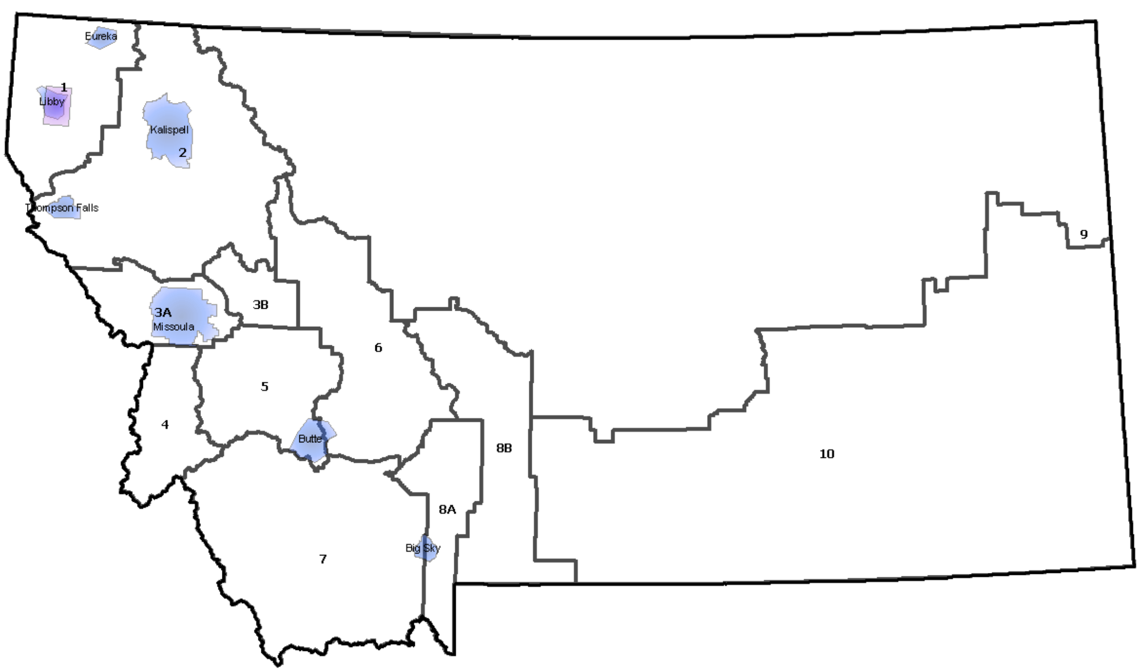

Figure 64. Airsheds and impact zones (shaded areas) of Montana (MTDEQ, 2010)

Notable changes between draft and final EIS

Data for Monture Guard Station (Lolo National Forest) and the four active air quality monitoring sites in Glacier National Park (see www.nature.nps.gov/air/monitoring/MonHist) were added to the analysis. These areas represent conditions in the wilderness areas of the Flathead National Forest.

3.9.2 Affected environment

Air quality is highly influenced by climate. All of the affected environment lies west of the Continental Divide. Here, the climate can be described as a modified north Pacific Coast type in which winters are milder, precipitation is more evenly distributed throughout the year, summers are cooler in general, and winds are lighter than on the eastern side of the Divide. There is more cloudiness in the west in all seasons, humidity runs higher, and the growing season is shorter than in the eastern plains areas (WRCC, 2015). The annual prevailing wind pattern is shown in figure 65; it follows a semi-counterclockwise pattern in the affected area.

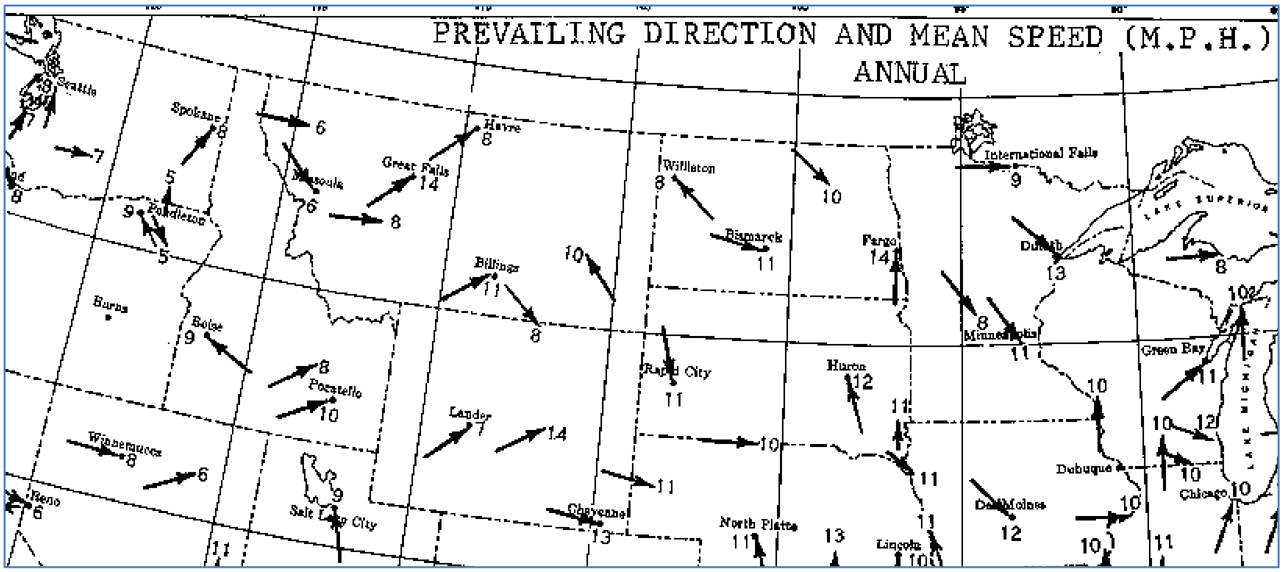

Figure 65. Annual prevailing wind pattern for the affected environment (WRCC, 2015)

Pollutants

The Environmental Protection Agency defines six known air pollutants as criteria pollutants for which national ambient air quality standard are set. The most common violation of a national ambient air quality standard from smoke is that of the $PM_{2.5}$ standard, which refers to atmospheric particulate matter with a diameter less than 2.5 micrometers. Wildfires are considered naturally occurring events; their smoke impacts may not be prevented. State departments of environmental quality are required to have natural emergency action plans that identify procedures to follow when natural events violate air quality standards, such as notifying the public of the health impacts of smoke and how to decrease and/or minimize exposure. Prescribed fires that are ignited by land managers are human-caused and are, therefore, subject to regulation. Table 97 displays the national ambient air quality standards for the six criteria pollutants identified by the Environmental Protection Agency. Montana's ambient air quality standards are as stringent as, or more stringent than, the national ambient air quality standards. Some of the Montana ambient air quality standards have different averaging periods or have been converted from concentration units (parts per million) to mass units (micrograms per cubic meter), using different standard conditions. Table 97 also displays the State of Montana standards (MTDEQ, 2015).

Table 97. The Environmental Protection Agency's national ambient air quality standards compared to Montana's ambient air quality standards

Pollutant	Averaging Period	Federal (EPA) standards (2016)[a]	State of Montana standards (2015)[b]	EPA Standard Type
Carbon Monoxide	1 hour	35 ppm	23 ppm	primary
	8 hours	9 ppm	9 ppm	primary
Lead	3 months	1.5 µg/m^3	1.5 µg/m^3	NA
	rolling 3 months	0.15 µg/m^3	NA	primary & secondary
Nitrogen Dioxide	1 hour	100 ppb	0.30 ppm	primary
	1 year	53 ppb	0.05 ppm	primary & secondary
Ozone	1 hour	NA	0.10 ppm	primary & secondary
	8 hours	0.070 ppm (2015 standard)	NA	primary & secondary
Particulate Matter ≤ 10 µm (PM_{10})	24 hours	150 µg/m	150 µg/m^3	primary & secondary
	1 year	NA	50 µg/m^3	primary & secondary
Particulate Matter ≤ 2.5 µm ($PM_{2.5}$)	24 hours	35 µg/m	NA	primary & secondary
	1 year	12.0 µg/m	NA	primary
	1 year	15.0 µg/m	NA	secondary
Sulfur Dioxide	1 hour	75 ppb	0.50 ppm	primary
	3 hours	0.5 ppm	NA	secondary
	24 hours	0.14 ppm	0.10 ppm	primary
	1 year	0.030 ppm	0.02 ppm	primary
Visibility	1 year	NA	3 x 10^{-5}/m	NA

Note. µg/m^3 = micrograms per cubic meter, µm = micrometer, NA = not applicable, PM_{10} = atmospheric particulate matter with a diameter less than 10 micrometers, $PM_{2.5}$ = atmospheric particulate matter with a diameter less than 2.5 micrometers, ppb = parts per billion, ppm = parts per million, m = meter.

a. For additional information about the Federal (EPA) standards, go to https://www.epa.gov/criteria-air-pollutants/naaqs-table.

b. For additional information about the State (Montana) standards, go to http://deq.mt.gov/Portals/112/DEQAdmin/DIR/Documents/legal/Chapters/CH08-02.pdf.

The Clean Air Act requires each state to identify areas that have ambient air quality in violation of the national ambient air quality standards. The status of areas with respect to the national ambient air quality standards is categorized as nonattainment (any area that does not meet an ambient air quality standard, or that is contributing to ambient air quality in a nearby area that does not meet the standard), attainment (meets the national standards), or unclassifiable (cannot be classified based on available information). The unclassified designation includes attainment areas that comply with federal standards, as well as areas that lack monitoring data. Unclassified areas are treated as attainment areas for most regulatory purposes. Areas that have been reclassified from nonattainment to attainment are considered maintenance areas. States are required to develop, adopt, and implement a state implementation plan to achieve, maintain, and enforce the national ambient air quality standards in nonattainment areas. The plans are submitted to, and must be approved by, the Environmental Protection Agency. Deadlines for achieving the national ambient air quality standards vary according to the air pollutant at issue and the severity of existing air quality problems. The State of Montana is required to notify the public whenever the national ambient air quality standards are exceeded.

Several areas in the vicinity of the Flathead National Forest have been identified as “PM-10 Nonattainment Areas,” as identified at either the state or federal level. This means that these communities have not attained the particulate matter standard for PM_{10} (atmospheric particulate matter with a diameter less than 10 micrometers).

Montana State PM-10 Nonattainment Areas

- Columbia Falls
- Kalispell
- Whitefish

Montana Federal PM-10 Nonattainment Areas

- Polson
- Ronan

The PM-10 Nonattainment Areas are monitored by the Montana Department of Environmental Quality’s Air Division. Data from 2006 to 2016 acquired from the Montana Department of Environmental Quality shows that the PM-10 standard is rarely exceeded, based on the 150 micrograms per cubic meter per day criterion (figures are given as days exceeded/total days monitored):

- Columbia Falls - 0/2,470
- Kalispell - 0/2,852
- Whitefish - 1/2,602
- Polson - 2/2,821
- Ronan - 0/614

The State of Montana is in the process of evaluating and changing these areas to attainment in the future (S. Coe, Montana Department of Environmental Quality, April 1, 2017, personal communication).

The Kalispell Carbon Dioxide Nonattainment Area was never officially designated as a non-attainment area, and there is no monitoring by the State of Montana for carbon monoxide (Steve Coe, Montana Department of Environmental Quality, April 1, 2017, personal communication).

The Flathead National Forest’s forest plan is not expected to generate conditions that would affect these two criteria in the future. PM-10 particles “fall out” close to roads and do not contribute to broader visibility issues.

Smoke

The Forest Service participates in an organization known as the Montana-Idaho Airshed Group, which regulates prescribed burns within the state of Montana. Group members submit prescribed burns to the smoke management unit for daily, site-specific approval. The smoke management unit, located at the Aerial Fire Depot in Missoula, coordinates efforts to manage smoke during both wildfire season and prescribed burning seasons. They are responsible for making sound and timely decisions that consider both the importance of implementing prescribed burns and the minimization of potential adverse air quality impacts on individual airsheds throughout Montana and Idaho. Some flexibility is provided should a national ambient air quality standard violation occur because of

smoke. Adherence to the Montana/Idaho Airshed Group Operating Guide (MTDEQ, 2010) is the current accepted smoke management plan for the state of Montana.

The Forest Service is required to obtain an annual open burning permit from the Montana Department of Environmental Quality to conduct prescribed burning statewide under the State's prevention of significant deterioration program. During the fall burning season (September-December), the smoke management unit coordinates with the Montana Department of Environmental Quality on burn approvals. During the winter season (December-February), the smoke management unit is not in operation; however, burning can potentially take place with special approval from the Montana Department of Environmental Quality. The Montana Department of Environmental Quality also requires burners to use the best available control technology. This is defined as those techniques and methods of controlling emission of pollutants from an existing or proposed open burning source that limits those emissions to the maximum degree that the Montana Department of Environmental Quality determines, on a case-by-case basis, is achievable for that source, taking into account impacts on energy use, the environment, and the economy and any other costs, including the cost to the source.

Air quality is addressed in the individual prescribed fire plan for each prescribed burn. Forest Service Manual 5140 requires a documented burn plan that contains all of the elements outlined in the 2014 Interagency Prescribed Fire Planning and Implementation Procedures Guide (NIFC, 2014). This guide prompts the burn plan author to address all laws and regulations concerning smoke management as well as the potential for localized nuisance smoke impacts.

In 1998, the Environmental Protection Agency released the Interim Air Quality Policy on Wildland and Prescribed Fires (EPA, 1998). The document was published with the intent of integrating two public policy goals: "(1) to allow fire to function, as nearly as possible, in its natural role in maintaining healthy wildland ecosystems, and (2) to protect public health and welfare by mitigating the impacts of air pollutant emissions on air quality and visibility" (p. 1). These goals underly the management approach for fire and vegetation on the Flathead National Forest as well.

Wildfire smoke can produce three of the six criteria pollutants the Environmental Protection Agency has set maximum standards for to protect human and environmental health. These are carbon monoxide, particulate matter, and volatile organic compounds that can produce ground-level ozone (EPA, 2016). Smoke is a complex mixture of carbon dioxide, water vapor, carbon monoxide, particulate matter, hydrocarbons, and other organic chemicals. The number of compounds present in smoke number in the thousands (EPA, 2016). Seventy percent of smoke emissions are made up of small particulate matter ($PM_{2.5}$, or particulate matter smaller than 2.5 micrometers), which has been proven to cause adverse health effects in humans (EPA, 2017). Because of this, wildfire smoke from naturally ignited fire and prescribed fire poses a potential health threat to the public.

Another smoke emission that poses health risks to humans is carbon monoxide, which can cause short-term health-related problems for firefighters. Carbon monoxide rapidly mixes with surrounding air at short distances from a burn area, and it therefore poses little to no risk to the general public. Ground-level ozone, although not a direct product of smoke emissions, is a concern due to its effects on lung function and plant growth.

The Montana/Idaho Airshed Group (MTDEQ, 2010) defines impact zones as areas identified as smoke sensitive or as having existing air quality problems. In the vicinity of the Flathead National Forest, one impact zone, Kalispell (Flathead valley area), is identified (see Figure 64). Impact zones are created for populated areas where air quality concerns to public health arise because national ambient air quality standards are sometimes exceeded or come close to being exceeded. Areas of

population generally exist in valley bottoms where the mixing and dispersion of air is reduced. Sources of pollution within these impact zones, including smoke, are closely monitored and regulated.

Fires in the Flathead National Forest area generally spread west to east, and smoke also follows the atmospheric winds west to east. See the assessment (USDA, 2014a, Fire section) for history and location of wildfires. The smoke generated by most wildfires is east of the main population center of the Flathead Valley, and most communities in the planning area would not see significant impacts. Dispersed populations in the North and Middle Forks of the Flathead River will be impacted by smoke, typically for short durations. Large landscape fires occur on the Forest approximately every three to six years, and these could impact populations for longer durations. Most wildfire smoke that affects the Flathead Valley comes from fires to the west, including fires in the western states of California, Nevada, Idaho, Oregon, and Washington and occasionally fires in British Columbia. Wildfire smoke from these areas are beyond the scope of the forest plan to mitigate.

The forest plan components are expected to reduce future impacts by distributing some of the locally generated smoke to years that have average to below average fire conditions but still have better dispersion during the wildfire season compared to the prescribed burn season. This will also potentially reduce fuel loading during extreme wildfire seasons, which will also reduce smoke production during those events.

Visibility

The scenic vistas of the nation’s national parks and wilderness areas are protected under amendments of the Clean Air Act. The act establishes three classifications of areas (Classes I, II, and III) where emissions of particulate matter and sulfur dioxide are to be restricted. The restrictions are most severe in Class I areas and are progressively more lenient in Class II and III areas, with Class III not exceeding the national ambient air quality standards. The most stringent protection is required for Federal Class I areas, which include wilderness areas exceeding 500 acres. Congress declared the following as a national visibility goal for these areas: “the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory class I Federal areas which impairment results from manmade air pollution” (42 U.S.C. § 7491 section 169A).

The small size of $PM_{2.5}$ (particulate matter less than 2.5 micrometers in diameter) makes these particles highly efficient at scattering light, causing visibility issues and contributing to what the Environmental Protection Agency calls “regional haze.” Visibility impairment in the form of regional haze obscures the clarity, color, texture, and form of what can be seen. Haze-causing pollutants (mostly fine particles) are directly emitted into the atmosphere or are formed when gases emitted to the air form particles as they are carried downwind. Emissions from manmade and natural sources can spread across long distances and result in regional haze.

The Regional Haze Rule, issued by the Environmental Protection Agency in 1999, addresses improving the visibility in Class I areas, and the Wilderness Act of 1964 mandates that the Forest Service preserve and protect the natural condition of designated wilderness areas (regardless of Class I designation), including the intrinsic wilderness value of air quality. Regardless of whether smoke violates air quality standards, localized impacts of burning can cause visibility issues on public roadways. Nuisance smoke is defined by the Environmental Protection Agency as the amount of smoke in the ambient air that interferes with a right or privilege common to members of the public, including the use or enjoyment of public or private resources (EPA, 1998). Voluntary smoke management from forest industry, State, and Federal partners has helped prevent national

ambient air quality standards violations and reduced nuisance smoke in the Flathead National Forest area.

Mandatory Class I areas within the affected environment are the Bob Marshall Wilderness Area, Scapegoat Wilderness Area, and Mission Mountains Wilderness Area, which are managed by the Forest Service, and Glacier National Park, managed by the National Park Service. The Flathead Indian Reservation is a tribal Class 1 airshed. The Forest Service has designated the Great Bear Wilderness as a Class II area. The USFWS does not designate the Swan River National Wildlife Refuge as a Class II area (Rob Bundy, April 27, 2017, personal communication).

Glacier National Park vistas of such spectacular scenery are sometimes obscured by haze caused by fine particles in the air. Many of the same pollutants that ultimately fall out as nitrogen and sulfur deposition contribute to this haze and visibility impairment. Additionally, organic compounds, soot, and dust reduce visibility; as does smoke from nearby forest fires. Air quality and visibility is activity monitored at Glacier National Park (see https://www.nature.nps.gov/air/Permits/aris/glac/index.cfm).
Figure 66 and figure 67 display visibility trends for Glacier National Park and the Monture Guard Station on the Lolo National Forest Service, via the Interagency Monitoring of Protected Visual Environments (IMPROVE) network.

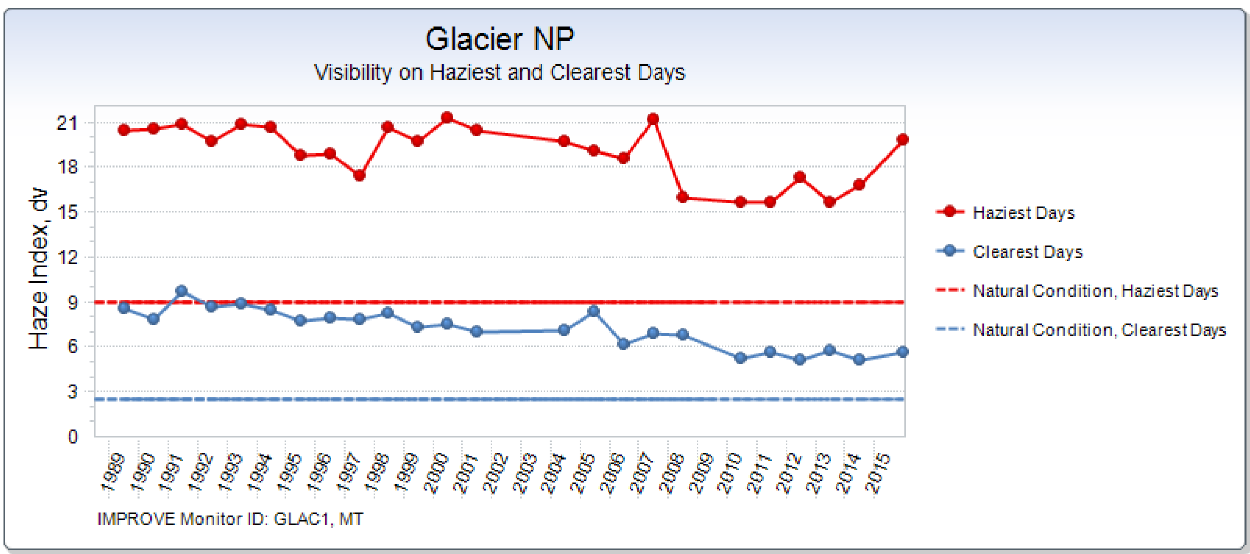

Figure 66. Trend in air quality related values at Glacier National Park.
(Source: Improve Web site, http://vista.cira.colostate.edu/Improve/, 2017)

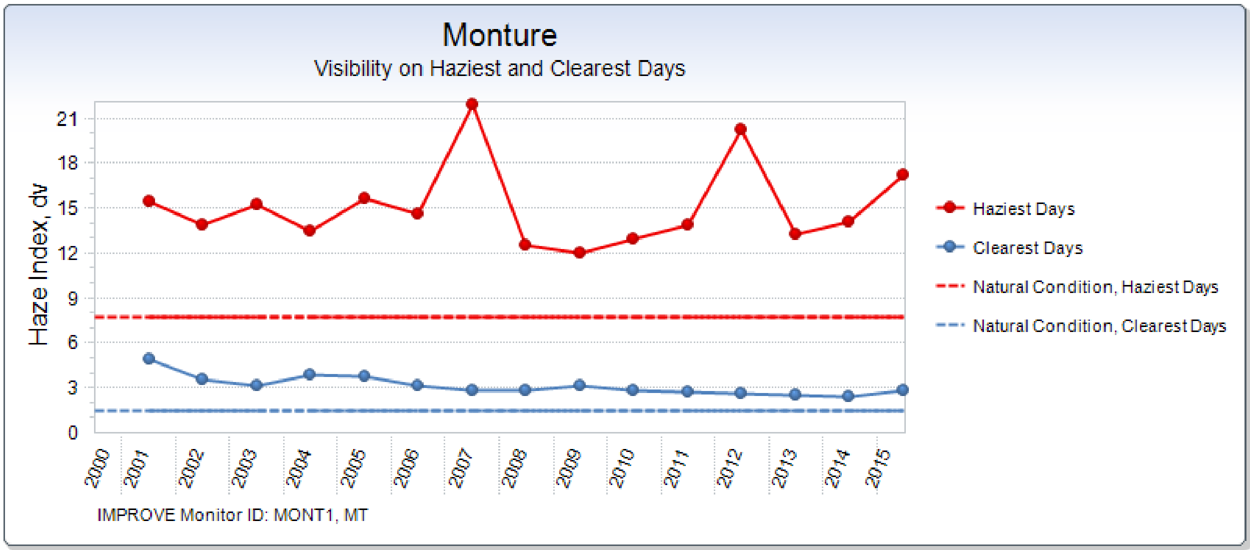

Figure 67. Trend in air quality related values for the Monture Guard Station visibility monitoring site, Lolo National Forest.

(Source: Improve Web site, http://vista.cira.colostate.edu/Improve/, 2017)

Overall, the trend for each station is constant or improving (the haze index is decreasing in value), except during years with impacts from large fires (either local or regional). This is expected to continue into the future. The impacts would be similar under all alternatives. The overall air quality within the region is largely outside the control of the Flathead National Forest. Smoke management opportunities are limited during large wildfires, especially those that are to the west of the Forest and affect the Forest's airsheds.

Climate change

The Environmental Protection Agency defines climate change as major changes in temperature, precipitation, or wind patterns, among other effects, that occur over several decades or longer. These changes may result from naturally occurring events, including changes in the sun's energy or in the Earth's orbit; natural processes within the climate system (such as changes to circulation patterns of oceans); or human activities. Scientists on the Intergovernmental Panel on Climate Change believe that most of the warming experienced since the 1950s is from human activities and has resulted in an increase in carbon dioxide and other greenhouse gas emissions (EPA, 2009).

Greenhouse gases are compounds found naturally within the Earth's atmosphere that trap and convert sunlight into infrared heat. Increased levels of greenhouse gases in the atmosphere have been correlated to a greater overall temperature on Earth (global warming). The most common greenhouse gases emitted from natural processes and human activities are carbon dioxide, methane, and nitrous oxide. Carbon dioxide is the primary greenhouse gas emitted by human activities in the United States, and the largest source is fossil fuel combustion. Increasing greenhouse gases are associated with changes in the Earth's climate, resulting in unintended effects to human health and the environment.

Neither the general conformity regulations established under the Clean Air Act, nor the Council on Environmental Quality's National Environmental Protection Act require considering greenhouse gas emissions and the impacts of proposed Federal actions on climate change, and there is no universal standard or regulation to determine the significance of cumulative impacts from greenhouse gas emissions. The 2012 planning rule and regulations require an assessment of baseline carbon stocks and a consideration of this information in management of the national forests (Forest Service Handbook 1909.12.4). This analysis can be found in section 3.4 on carbon sequestration. Land management actions such as prescribed burning, timber harvest and fuel load reductions, can contribute both carbon emissions and carbon sequestration to the global carbon cycle. Using prescribed fire to maintain natural ecosystem resilience is a human-caused influence on a natural system that both emits greenhouse gases and results in enhanced regrowth and biological sequestration. Notably, the net effect of these management actions may lead to reductions of greenhouse gas concentrations through increases in carbon stocks or reduced risks of future emissions. In the forest management context, whether a forest practice is a net carbon sink or source will depend on multiple factors, including the climate region and site factors (i.e., precipitation, soil types), the forest conditions (such as density, composition and age), and human activities, such as harvest and manufacturing wood products.

3.9.3 Environmental consequences

Effects common to all alternatives

Smoke from wildfire is anticipated to be the primary source of pollutants and associated impacts to air quality on the Flathead National Forest, as it has been historically. The Forest has limited ability to alter or control the location or extent of this effect due to the unpredictable nature of wildfire. Wildfires have the greatest potential to influence short-term air quality and visibility in local areas.

The Forest will continue to adhere to the current accepted state smoke management plan and to obtain required permits and approval from the Montana Department of Environmental Quality to conduct prescribed burning operations. These controls provide the best possible protection of public health and welfare by mitigating the impacts of air pollution while still allowing fire to assume its natural role in maintaining healthy wildland ecosystems.

Alternative A—No action

The no-action alternative is the baseline to which the action alternatives are compared. Under the no-action alternative, current management direction under the 1986 forest plan would continue.

This section includes a summary of this direction and an evaluation of the effects of continuing the current management.

Management direction under alternative 1—No action

Current 1986 forest plan direction is to coordinate all Forest Service management activities to meet the requirements of the Montana State Implementation Plan, the State's Smoke Management Plan (i.e., Montana/Idaho Airshed Group, (MTDEQ, 2010)), and Federal air quality standards.

Under the fire management program, the direction is to conduct prescribed fire objectives within the constraints established by the Montana/Idaho Airshed Group. Air quality is to be maintained at adequate levels as described by State, county, and Federal direction, and all prescribed burns conducted on Flathead National Forest land will be governed by this direction and meet this objective.

The airsheds of the Bob Marshall and the Mission Mountains Wildernesses are managed (primarily via wilderness fire management plans) to meet Class I air quality standards. In the Great Bear Wilderness, the airshed is managed to meet Class II air quality standards. The 1986 forest plan also requires, where manageable or negotiable, the identification and mitigation of outside influences, particularly when prevention of significant deterioration provisions apply that may impact the wilderness is received from the Montana Department of Environmental Quality.

Direct and indirect effects of the no-action alternative

Under the no-action alternative, both wildfire and prescribed fire would continue to have short-term and long-term impacts on air quality. The continued use of prescribed fire would have the potential to influence short-term air quality and visibility in local areas. The current management direction requires meeting air quality standards established by Federal and State agencies through requirements of state implementation plans and smoke management plans. Current direction (the 1986 forest plan) limits the use of prescribed fire by restricting how much vegetation can be burned and when and where burns can occur. The cost of conducting prescribed fires also increases as a result of these restrictions, which also affects how much vegetation is burned. Limited use of prescribed fire lowers the rate and volume of smoke and particulate emissions, which in turn limits impacts on visibility. Table 98 displays the acres of wildfire and prescribed fire under alternative A. The data sources for the historical information are Flathead National Forest databases. Future estimates are derived from modeling analysis (refer to appendix 2).

Table 98. Past and projected average acres per decade of Forest Service wildfire and prescribed fire under alternative A

Component and Indicator	Historical (average acres per decade)	Future 50 years (average acres per decade)
All wildfire: acres burned	132,060	194,824
Prescribed fire: acres burned	25,000	0

The modeling did not project any future prescribed burning under alternative A because there is no explicit objective in the current 1986 forest plan for prescribed burning. However, the Forest does burn an average of approximately 2,500 acres per year under the current plan. To date, there have been no national ambient air quality standard non-compliance violations. Any degradations of visual quality, views, and the aesthetic landscape generally are short term, and these are usually related to the challenge of obtaining accurate weather forecasts.

Alternatives B modified, C, and D

Management direction under alternatives B modified, C, and D

Effects of forestwide direction, management area direction, and geographic area direction for air quality

The action alternatives would result in short-term and long-term adverse effects to air quality. The continued use of prescribed fire would have the potential to influence short-term air quality and visibility in local areas. All action alternatives would be required to meet air quality standards established by Federal and State agencies through the requirements of state implementation plans and smoke management plans. The use of prescribed fire under the action alternatives would be restricted in terms of how much vegetation could be burned and when and where burns could occur. The limitations on the use of prescribed fire would affect the rate and volume of smoke and particulate emissions, which in turn would limit the impacts to visibility. Table 99 displays the acres of wildfire and prescribed fire for alternatives B modified, C, and D. the data sources for the historical information are Flathead National Forest databases. Future estimates are derived from modeling analysis (refer to appendix 2).

Table 99. Past and projected average acres per decade of Forest Service wildfire and prescribed fire by action alternative

Component and Indicator	Historical (average acres per decade)	Alternative B modified future 50 years (average acres per decade)	Alternative C future 50 years (average acres per decade)	Alternative D future 50 years (average acres per decade)
All wildfire: acres burned	132,060	183,620	194,564	193,823
Prescribed fire: acres burned	25,000	49,170	49,100	41,320

The amount of prescribed burning estimated by the model over the next five decades is greater than the amount conducted in the past. Currently, the Forest conducts prescribed burns on about 2,500 acres per year on average (i.e., 25,000 acres per decade). The model estimates the potential for an increase in acres of prescribed burning over the next 5 decades. Prescribed fire is anticipated to become an increasingly important tool for management of forest conditions and landscape patterns to maintain or improve desired ecosystem resilience. However, the model acres may be an overestimation of the acres that would actually be reasonably implemented due to anticipated limitations on burning in lynx habitat (multistory forest) as well as logistical considerations (see section 3.3.10 and appendix 2 for details). Adherence to required regulations is expected to minimize adverse effects to air quality due to prescribed burning and thus to minimize the impacts on public health and visibility. Wildfire is expected to remain the primary source of smoke and the resulting potential degradation of air quality on the Flathead National Forest.

Cumulative effects

Most impacts to air quality and visual quality are related to the contribution of smoke from areas to the south and west of the Forest, even all the way to the West Coast. Historically, in years when large fires did not provide additional smoke to the area, prescribed fires and most wildfires have not produced long-term declines in air or visual quality. Occasionally, smoke from Canada also contributes to air quality issues in the area. Currently, the Forest does not coordinate with Canadian officials regarding smoke management.

Human Uses, Benefits, and Designations of the Forest

3.10 Sustainable Recreation and Access

3.10.1 Introduction

Regulatory framework

Laws and Executive Orders

Organic Administration Act of June 4, 1897 (30 Stat. 11, as amended): This act authorizes the establishment of national forests.

Term Permit Act of March 4, 1915 (Pub. L. 63-293, Ch. 144, 38 Stat. 1101, as amended; 16 U.S.C. 497): This act provides direction to the NFS lands to authorize occupancy for a wide variety of uses through permits not exceeding 30 years.

Multiple-Use Sustained-Yield Act of June 12, 1960 (Pub. L.86-517, 74 Stat. 215): This act provides direction to the NFS lands to provide access and recreation opportunities. The act states, "The policy of Congress is that national forests are established and administered for outdoor recreation . . ."

National Forest Roads and Trails Act of October 13, 1964 (Pub. L. 88-657, 78 Stat. 1089, as amended): This act declares that an adequate system of roads and trails should be constructed and maintained to meet the increasing demand for recreation and other uses. The act authorizes road and trail systems for the national forests. It authorizes granting of easements across NFS lands, construction and financing of maximum-economy roads (Forest Service Manual 7705), and imposition of requirements on road users for maintaining and reconstructing roads, including cooperative deposits for that work.

Land and Water Conservation Fund Act of 1965 (Pub. L. 88-578, 78 Stat. 897 as amended; 16 U.S.C. 460l-4604 (note); 460l-4604 through 6a, 460l-4607 through 460l-4610, 460l-4610a-d, 460l-4611): "The purposes of this act are to assist in preserving, developing, and assuring accessibility to all citizens of the United States of America . . . [to] such quality and quantity of outdoor recreation resources . . . [and] providing funds" to States for acquisition, planning, and development of recreation facilities and Federal agencies for acquisition and development of certain lands and other areas.

Architectural Barriers Act of August 12, 1968 (Pub. L. 90-480, 82 Stat. 718 51 U.S.C. 4151-4154, 4154a, 4155-4157): This act establishes additional requirements to ensure that buildings, facilities, rail passenger cars, and vehicles are accessible to individuals with disabilities. It covers architecture and design, transportation, and communication elements of recreational site planning and development.

National Trails System Act of October 2, 1968 (Pub. L. 90-543, 82 Stat. 919, as amended): This act establishes the National Trails System and authorizes planning, right-of-way acquisition, and construction of trails established by Congress or the Secretary of Agriculture.

Rehabilitation Act of September 26, 1973 (Pub. L. 93-112, Title V, 87 Stat. 390, as amended; 29 U.S.C. 791, 793-794, 794a, 794b): This act requires that programs and activities conducted by Federal agencies and by entities that receive funding from, or operate under a permit from, Federal agencies provide an equal opportunity for individuals with disabilities to participate in an integrated setting, as independently as possible. The only exception to the requirement is when the program would be fundamentally altered if changes were made solely for the purpose of accessibility.

Forest and Rangeland Renewable Resources Planning Act of August 17, 1974 (Pub. L. 93-378, 88 Stat. 476, as amended): This act declares (per Sec. 10) that “the installation of a proper system of transportation to service the NFS . . . shall be carried forward in time to meet anticipated needs on an economical and environmentally sound basis.”

Federal Land Policy and Management Act of October 21, 1976 (Pub. L. 94-579, 90 Stat. 2742, as amended): This act declares (per Sec. 102) that “the public lands be managed in a manner that . . . will provide for outdoor recreation and human occupancy and use.”

Omnibus Parks and Public Lands Management Act of November 12, 1996 (Pub. L. 104-333, Div. I, Title VII, Sec. 701, 110 Stat. 4182; 16 U.S.C. 497c): Section 701 of this act

- establishes a system to calculate fees for ski area permits issued under the National Forest Ski Area Permit Act of 1986 (16 U.S.C. 497b);
- provides for holders of ski area permits issued under other authorities to elect this permit fee system (Forest Service Handbook 2709.11, sec. 38.03a);
- includes provisions concerning compliance with NEPA when issuing permits for existing ski areas (Forest Service Manual 2721.61f and Forest Service Handbook 2709.11, sec. 41.61b); and
- withdraws leasable and locatable minerals, subject to valid existing rights (Forest Service Handbook 2709.11, sec. 41.61c).

Secure Rural Schools and Community Self-Determination Act of October 30, 2000 (Pub. L. 106-393, 114 Stat. 1607; 16 U.S.C.500 note): This act provides provisions to make additional investments in, and create additional employment opportunities through, projects that improve the maintenance of existing infrastructure; implement stewardship objectives that enhance forest ecosystems; and restore and improve land health and water quality.

Federal Lands Recreation Enhancement Act of December 8, 2004 (Pub. L. 108-447, as amended): This act gives the Secretaries of Agriculture and Interior the authority to establish, modify, charge, and collect recreation fees at Federal recreational lands where a certain level of amenities have been developed.

The **Federal Cave Resources Protection Act of 1988** (Pub. L. 101-691): This act aims to “secure, protect, and preserve significant caves on Federal lands for the perpetual use, enjoyment, and benefit of all people; and to foster increased cooperation and exchange of information between governmental authorities and those who utilize caves located on Federal lands for scientific, education, or recreational purposes.” Specific effects of the act include prohibiting the disclosure of location of significant caves, the removal of cave resources, and vandalizing or disturbing cave resources.

Executive Order 12862, Setting Customer Service Standards: Requires information about the quantity and quality of recreation visits for national forest plans.

Executive Order 11644, as amended: Establishes policy and procedure "that will ensure that the use of off-road vehicles on public lands will be controlled and directed so as to protect the resources of those lands, to promote the safety of all users of those lands, and to minimize conflicts among the various uses of those lands."

Key indicators

- Acres of desired summer and winter recreation opportunity spectrum settings
- Desired summer and winter recreation opportunity spectrum settings
- Acres of NFS lands suitable/not suitable for motorized over-snow vehicle use
- Acres and miles of late-season motorized over-snow vehicle use (outside of denning season)
- Acres and miles of NFS lands open yearlong to motorized over-snow vehicle use

Methodology and analysis process

For comparison purposes, the desired recreation opportunity spectrum for summer and winter was mapped across the Forest for each alternative. The methodology for mapping the recreation opportunity spectrum for each alternative follows Forest Service handbook direction. Each alternative was then analyzed for the total number of acres and percentage of the desired recreation opportunity spectrum settings on the Forest.

For comparison purposes, the total number of acres where motorized over-snow vehicle use and late-season motorized over-snow vehicle use would be suitable was analyzed for each alternative. A motorized over-snow vehicle suitability map was completed for each alternative to reflect where motorized use would be suitable. A geographic information system (GIS) was then used to calculate the number of acres suitable for each alternative.

When the phrase "wheeled motor-vehicle use" is used in this final EIS relative to road, trail, and area or cross-country travel, it refers to all types of motor vehicles as defined in 36 CFR § 212.1 except over-snow vehicles. This generally includes wheeled motor vehicles such as automobiles, four-wheel-drive vehicles, and off-highway vehicles (except over-snow vehicles), but it also includes vehicles that have the driving wheels moving inside endless tracks (or that are capable of such conversion) when operating outside snow-covered ground conditions. Over-snow vehicles are defined as motor vehicles designed for use over snow that run on a track or tracks and/or a ski or skis while in use over snow (36 CFR § 212.1). Effects of these two recreation opportunities are analyzed as separate activities in this document and are referred to as either "wheeled motor vehicle use" or "motorized over-snow vehicle use." When the term motorized access or motorized recreation is used, it refers to all vehicles—both wheeled motor vehicles and motorized over-snow vehicle use. Mechanized or mechanical transport is bicycles, wagons and carts. Electric bikes, commonly called e-bikes, are considered motorized and are not allowed on roads, trails, and/or areas that prohibit motorized use.

Information sources

Much of the recreation data used in this analysis comes from the Forest Service infrastructure database (INFRA). This Forest-level database is a collection of Web-based data entry forms, reporting tools, and mapping tools (a geographic information system that enables Forests to manage and report accurate information about their inventory of constructed features and land units). Use of the geographic information system allows Forest staff to visualize, analyze, interpret, and understand data to reveal relationships and patterns.

Analysis area

The geographic scope of the analysis is the NFS lands administered by the Flathead National Forest (hereinafter referred to as the “Forest”). All lands of all ownership within the Forest boundary form the geographic scope for cumulative effects. The temporal scope is the anticipated life of the plan (15 years).

3.10.2 Affected environment (existing condition)

Recreation setting and access

People choose a specific setting for recreational activities in order to achieve a desired set of experiences. For example, camping in a large undeveloped area with few facilities offers a sense of solitude, challenge, and self-reliance. In contrast, camping in a setting that is easy to access and that has developed facilities such as toilets and tables offers more comfort, security, and social opportunities. A goal of the Forest Service is to provide opportunities for recreationists to obtain satisfying recreational experiences through offering choices in both types of settings and activities. The Forest Service utilizes a framework called the recreation opportunity spectrum, pictured in figure 68, to describe different settings across the landscape and the attributes associated with those settings. The Forest Service defines a recreation opportunity setting as the combination of physical, biological, social, and managerial conditions that give value to a place. Thus, an opportunity includes qualities provided by nature (vegetation, landscape, topography, scenery), qualities associated with recreational use (levels and types of use), and conditions provided by management (developments, roads, regulations).

The recreation opportunity spectrum is the framework for settings and opportunities and is determined, in part, by the suitability by management area for motorized and nonmotorized vehicles use. Travel management decisions are separate, project-level decisions that determine the specific areas and routes for motorized recreation consistent with areas identified in the plan as suitable for motorized recreation use.

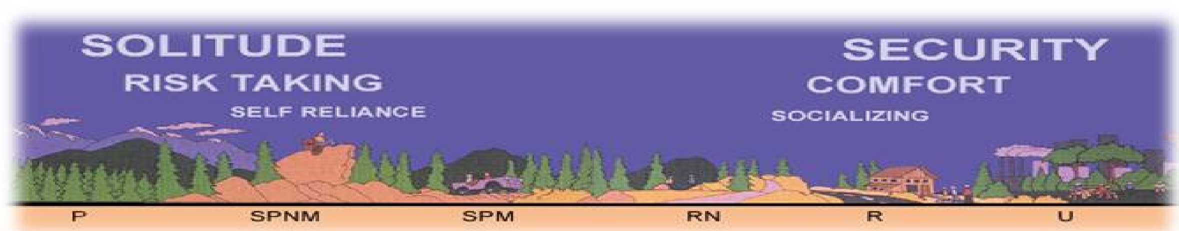

Figure 68. Illustration of the recreation opportunity spectrum settings

(P = primitive, SPNM = semiprimitive nonmotorized, SPM = semiprimitive motorized, RN = roaded natural, R = rural, U = urban)

The recreation opportunity spectrum has six distinct classes in a continuum that describe settings ranging from highly modified and developed to primitive and undeveloped (Clark & Stankey, 1979). Five of the recreation opportunity spectrum classes apply to the Flathead National Forest: primitive, semiprimitive nonmotorized, semiprimitive motorized, roaded natural, and rural. There are no urban recreation opportunity spectrum classes on the Forest. These five recreation opportunity classes are briefly described as follows:

Primitive—This setting is large, remote, wild, and predominantly unmodified landscapes. There is no motorized activity and little probability of seeing other people. Primitive settings are managed for quiet solitude away from roads, people, and development. There few, if any facilities or developments. Most of the primitive settings coincide with designated wilderness boundaries and recommended wilderness areas.

Semiprimitive nonmotorized—The semiprimitive nonmotorized settings include areas of the Forest managed for nonmotorized use. Mechanized transport such as mountain bikes are often present. Rustic facilities are present for the primary purpose of protecting the natural resources of the area. These settings are not as vast or remote as the primitive settings, but they also offer opportunities for exploration, challenge, and self-reliance.

Semiprimitive motorized—This setting is managed for backcountry motorized use on designated routes. Routes are designed for off-highway vehicles and other high-clearance vehicles. This setting offers visitors motorized opportunities for exploration, challenge, and self-reliance. Mountain bikes and other mechanized transport are also sometimes present. Rustic facilities are present for the primary purpose of protecting the natural resources of the area or providing portals to adjacent primitive or semiprimitive nonmotorized areas.

Roaded natural—This setting is managed as natural appearing with nodes and corridors of development that support higher concentrations of use, user comfort, and social interaction. The road system is generally well defined in this setting and can typically accommodate passenger car travel. System roads also provide access to other recreation opportunity spectrum settings of semiprimitive motorized, semiprimitive nonmotorized, and primitive areas.

Rural—This setting represents the most developed recreation sites and modified natural settings on the Forest. Facilities are designed primarily for user comfort and convenience.

The existing recreation opportunity spectrum is based on modeling of travel routes and terrain. Recreation opportunity spectrum classes on the Forest were mapped for summer and winter seasons to address the changes in motorized and nonmotorized opportunities during these seasons.

Summer recreation opportunity spectrum

As shown in table 100, the three largest summer recreation opportunity spectrum classes on the Forest are primitive (48 percent), roaded natural (25 percent), and semiprimitive nonmotorized (24 percent). Refer to figure 1-52 for a map of the existing summer recreation opportunity spectrum.

Combining the two nonmotorized classes (primitive and semiprimitive nonmotorized), 72 percent of the Forest is in a nonmotorized setting. This is primarily because of three designated wilderness areas (Bob Marshall, Great Bear, and Mission Mountains) and large amounts of inventoried roadless areas (478,757 acres) on the Forest. Combining the motorized classes (semiprimitive motorized, roaded natural, and rural), 28 percent of the Forest is in a motorized setting.

Winter recreation opportunity spectrum

As shown in table 100, the three largest winter recreation opportunity spectrum settings on the Forest are primitive (48 percent), semiprimitive motorized (34 percent), and semiprimitive nonmotorized (14 percent). Refer to figure 1-53 for a map of the existing winter recreation opportunity spectrum.

As shown in table 100, there is a shift in recreation opportunity spectrum settings between summer and winter. The semiprimitive nonmotorized and roaded natural settings shift to semiprimitive motorized. The roaded natural setting decreases because most Forest roads are not plowed and therefore are not open in the winter, providing a semiprimitive motorized setting. The semiprimitive nonmotorized setting decreases because there are more areas open to motorized over-snow vehicles across the Forest.

Combining the two nonmotorized classes (primitive and semiprimitive nonmotorized), 62 percent of the Forest is in a nonmotorized setting. Combining the motorized classes (semiprimitive motorized, roaded natural, and rural), 38 percent of the Forest is in a motorized setting.

Table 100. Existing summer and winter recreation opportunity spectrum settings on the Forest

Recreation Opportunity Spectrum	Primitive (percent)	Semiprimitive nonmotorized (percent)	Semiprimitive motorized (percent)	Roaded Natural (percent)	Rural (percent)
Summer	48	24	3	25	< 1
Winter	48	14	34	4	< 1

Developed recreation sites

Developed recreation sites provide much of the infrastructure necessary for the enjoyment of a wide variety of recreation activities in the analysis area. The Forest Service definition of developed recreation site is a recreation site on NFS lands that has a development scale of 3, 4, or 5. See the glossary for the full definition, which includes development scale delineation.

Table 101 identifies the number of Forest Service recreation sites on the Forest by categories of developed recreation sites. In addition to specific categories such as campgrounds or trailheads, the other developed recreation category includes day-use sites such as boat and fishing facilities and administrative sites such as cabin rentals.

Table 101. Number of Forest Service developed recreation sites on the Forest

Site Type	Total Sites
Boating Site	19
Campground	22
Fishing Site	1
Group Campground	1
Group Picnic Site	1
Interpretive Site	2
Lookout/Cabin	13
Observation Site	1
Picnic Site	5
Ski Area Nordic	1

Site Type	Total Sites
Snow Park (Snowmobile)	2
Swimming Site	2
Trailhead	10
TOTAL	80

The Forest also has two privately developed ski resorts under permit with the Forest Service that provide a developed recreation opportunity, primarily for alpine winter activities. Refer to table 102 for downhill skier visits conducted under Forest special-use permits from 2003 to 2013 and to the Flathead assessment (USDA, 2014a) for additional information on use numbers.

Table 102. Downhill skier visits conducted under the Flathead National Forest special-use permits from 2003 to 2013 (source: Special-use database, retrieved Dec. 19, 2014)

Year	Whitefish Mountain Resort	Blacktail Mountain	Visitor Days
2003	235,018	30,887	265,905
2004	258,738	31,051	289,789
2005	213,409	19,191	232,600
2006	304,366	37,356	341,722
2007	260,278	40,215	300,493
2008	296,708	41,657	338,365
2009	280,484	36,815	317,299
2010	282,933	34,733	317,666
2011	318,222	40,641	358,863
2012	294,261	42,271	336,532
2013	322,589	42,516	365,105

The draft NCDE grizzly bear conservation strategy was written by and is applicable to multiple land management agencies, and therefore the definition of a developed recreation site varies from the standard Forest Service definition and applies only to the NCDE management zones. Throughout this document, the phrase (NCDE definition) follows the phrase "developed recreation site(s)" when referring to the NCDE definition. If (NCDE definition) does not follow the phrase developed recreation site, then the phrase is referring to the Forest Service definition of a developed recreation site. See the glossary for both definitions of developed recreation site.

Forest plan standard FW-STD-REC-01 applies to overnight developed recreation sites, defined as follows: "Developed recreation sites on National Forest System lands that are designed and managed for overnight use include campgrounds, lodging at ski areas, cabin rentals, huts, guest lodges, and recreation residences. This standard does not apply to dispersed recreation sites nor to developed recreation sites managed for day use only (e.g., outfitter camps, roadside trail crossings, or interpretive pull-outs; trailheads, picnic areas, or boat launches that are closed at night; and ski areas that do not have overnight lodging). [NCDE]"

Table 103 shows the number of developed recreation sites (NCDE definition) by category within the primary conservation area on the Forest. The largest category is trailheads that primarily provide day-use opportunities but sometimes have overnight facilities and are counted as overnight developed recreation sites (NCDE definition). The second largest category is day-use sites such as

picnic areas, boating sites, and fishing sites. There are 63 campgrounds, 63 recreation residences, and 20 overnight sites/buildings that are considered overnight facilities. Note that these are not all owned by the Forest Service; but some are under special-use permits (e.g., recreation residence, lodges). Administrative sites are agency-owned buildings such as bunkhouses, and work centers.

Table 103. Number of developed recreation sites (NCDE definition) by category on the Forest within the primary conservation area

Area	Developed campgrounds	Day-Use Sites	Trailheads[a]	Administrative sites	Overnight sites/buildings	Residences
Primary conservation area	63	73	198	52	20	63

a. The NCDE definition of developed sites includes trailheads; the Forest Service definition of developed site does not generally include trailheads unless they are specifically designed for overnight camping or have associated improvements such as a stock corral. Thus, the number of trailheads under the NCDE definition of developed sites (198) is much larger than the number of trailheads under the Forest Service definition (10).

Table 104 shows the capacity of overnight developed sites within the primary conservation area.

Table 104. Capacity of overnight developed sites (NCDE definition) on the Forest within the primary conservation area

Site Type	Capacity[1]
Campgrounds	552
Cabins	48
Residences	63
Rooms in Lodges	13
Bunkhouses	7

a. In the NCDE, measurement of capacity varies by site type. Campground capacity is defined as the number of sites in the campground; cabins and residences as the number of cabins and residences; lodge capacity as the number of rooms; and bunkhouses as the number of bunkhouses.

Dispersed recreation

Dispersed recreation consists of those activities that take place *outside* of developed recreation areas. Dispersed sites generally do not have fees associated with them and have little or no facilities such as toilets, tables, or garbage collection.

Over two thirds of Forest visitors come to the Forest to engage in dispersed activities. Once on the Forest, according to 2015 monitoring, 38 percent of visitors participate in dispersed recreation (USDA, 2017b). Types of dispersed activities that occur on the Forest include, but are not limited to, camping, hiking, fishing, skiing, hunting, gathering huckleberries, horseback riding, river use, and snowmobiling. The Forest's motor vehicle use map indicates concentrated dispersed areas where visitors park in order to camp, fish, hunt, hike, etc.

Cross-country motor vehicle travel is prohibited except when authorized in certain areas and on roads and trails open to motorized vehicles. These areas, roads, and trails are shown on the Flathead National Forest motor vehicle use map for each district. The motor vehicle use maps also show where limited cross-country travel is allowed solely to access a dispersed camping site.

In the winter, recreation staging (parking) becomes concentrated because many roads are closed by snow. Access to over-snow recreation depends on the major routes that are plowed throughout the season. Both motorized and nonmotorized uses become concentrated in the frontcountry areas. Once in the backcountry, winter use is often more dispersed since more acres are open to motorized use (an increase from 3 to 34 percent of the Forest in semiprimitive nonmotorized, and the use is not as limited in the winter to designated routes as it is in the summer).

There are a large number of caves and related geologic features on Forest lands. Caving and rock-climbing are popular recreational activities in some areas and may increase in the future, but these activities require specialized training and/or equipment and they are not likely to increase as rapidly as other types of recreation. Cave resources are both fragile and non-renewable, and special considerations are required to provide resource protection and recreational opportunities. On Federal lands, the Federal Cave Resources Protection Act of 1988 (102 Stat. 4546; 16 U.S.C. § 4301-4309) provides for the protection and preservation of caves.

There are 45 “significant caves” (see glossary) and over one hundred nonsignificant caves on the Forest. A significant cave is a cave located on National Forest System lands that has been determined to meet the criteria in § 290.3(c) or (d) and has been designated in accordance with § 290.3(e). A significant cave has one of the following features, characteristics or values: biota, cultural, geological/mineralogic/paleontologic, hydrologic, recreational, or educational or scientific.

Although the majority of caves on the Forest are not accessible to humans for much of the year, one cave that is very accessible has been vandalized in the past, requiring installation of a protective door. This cave requires a permit to enter. Caves in designated wilderness are not signed or marked on the Forest visitor map. Refer to “Cliff, cave, scree, and rock habitats” in section 3.7.4 for additional information about caves and their use by wildlife.

Recreational use

National visitor use monitoring

A national visitor monitoring program takes place across the entire NFS every five years in which each Forest monitors its recreational use through exit surveys of visitors. The national visitor use monitoring program provides science-based estimates of the volume and characteristics of recreation visitation to the NFS. The Flathead National Forest last collected data in 2015, and this data is show in table 105 and discussed in the narrative. The table displays visitation results for the Forest, the year it was sampled, recreation visits, wilderness visits, percentage of visitors living within 100 miles of the Forest, and percentage of visitors from Flathead County (USDA, 2017b). As shown in table 105, the Flathead National Forest serves primarily a local area, with the most visitation from within 100 miles (83 percent of visitors), although about 10 percent of visitors travel over 500 miles to visit the Forest. A sizeable number of users of the Forest (70 percent) visit the Forest more than five times a year. Out of the total visits to the Forest, most visitors (95 percent) use areas of the Forest outside of designated wilderness.

Between 2010 and 2015, the total number of visits reported to the Forest increased by 213,000 while visits to designated wilderness areas decreased by 4,000. The percentage of visitors that live within 100 miles of the Forest increased from 75 percent to 83 percent, and visitors from Flathead County increased from 70 percent in 2010 to 79 percent in 2015. The recession in the United States occurred between 2007 and 2009, with the recovery period 2009 to 2011; thus, the 2010 visitor use data was collected during the recovery period, which influenced recreational activities. Since this

data reflects only three points in time and survey protocols evolved between each round of surveys, it is not feasible to represent this data as a trend.

Table 105. Flathead National Forest recreational visits, wilderness visits, and percentage of visitors living within 100 miles, and percentage of visitors from Flathead County for the years 2015, 2010, and 2005 (source: (USDA, 2017b))

Year sampled	Recreational visits	Wilderness visits (% of total recreation visits)	Visitors living within 100 miles of forest (%)	Visitors from Flathead County (%)
2015	1,098,000	54,000 (5)	83	79
2010	885,000	58,000 (7)	75	70
2005	852,000	20,000 (2)	73	75

Visitor use

Main recreational activities

Figure 69 represents the Forest visitor's main activity which is the reason the visitor came to the Flathead National Forest. Visitors than identified how many hours spent participating in that main activity during their visit (see table 101). Most Forest visitors participate in several recreational activities during each visit in addition to their main activity. For example, a visitor may come to the Forest to camp at one of the campgrounds (main activity), but they may participate in other activities such as swimming, relaxing, and viewing scenery.

As shown in figure 69, the top four main activities for Forest visitors in 2015 were downhill skiing (37 percent), hiking/walking (11 percent), viewing natural features (9 percent) and fishing (6 percent). These four activities make up over 63 percent of total activities on the Forest. Five years earlier, in 2010, the following were the main activities visitors came to the Forest: downhill skiing (29 percent), hunting (17 percent), hiking (12 percent), and viewing natural features (6 percent).

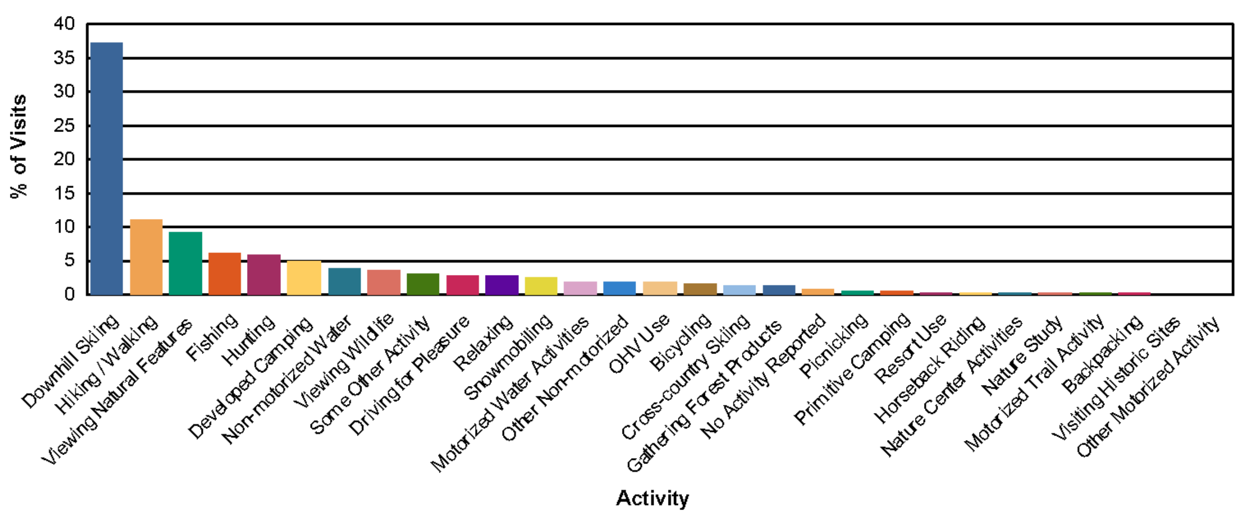

Figure 69. Percentage of visits by activity in 2015 on the Flathead (USDA, 2017b)

Participation rates by activity are shown in table 106. As an example, this table shows that 32 percent of visitors identified viewing natural features as a recreational activity in which they

participated but only 6 percent of visitors identified it as their main activity (figure 69) during their Forest visit.

Table 106 compares the top activities by participation rate reported in the 2010 and 2015 reports. Viewing natural features went from first in participation in 2010 to second in 2015, downhill skiing went from fifth in participation to first, and relaxing went from third in participation to fifth. Generally, the top 10 activities by percentage participation in 2010 were still within the top 10 activities in 2015, although gathering forest products and nature study activities fell off the top ten activities and were replaced by developed camping and other nonmotorized activities.

Table 106. Top 10 activities by participation rate on the Forest, 2010 and 2015

2010 Top 10 Activities	Participation (%)	2015 Top 10 Activities	Participation (%)
1. Viewing Natural Features	42.2	1. Downhill Skiing	37.7
2. Viewing Wildlife	35.8	2. Viewing Natural Features	31.8
3. Relaxing	33.7	3. Hiking/Walking	26.5
4. Hiking / Walking	33.5	4. Viewing Wildlife	21.7
5. Downhill Skiing	30.1	5. Relaxing	20.4
6. Driving for Pleasure	20.3	6. Driving for Pleasure	11.9
7. Hunting	18.0	7. Fishing	9.3
8.Nature Center Activities	12.2	8. Developed Camping	8.7
9. Fishing	11.7	9. Hunting	6.7
10. Gathering Forest Products	9.4	10. Other Nonmotorized	5.8

Source: (USDA, 2017b)

Access

Travel routes include NFS roads and trails. Table 107 shows the miles of wheeled motorized access routes and areas open for travel (year-round or seasonally) and are based on the motorized baseline density. Open motorized access routes and areas for wheeled vehicles are further distinguished by the miles within the primary conservation area and the miles outside the primary conservation area but within zone 1 (within and outside of the demographic connectivity area). A few designated areas (500 acres total) on the Forest are open to wheeled motorized use.

Table 107. Miles of Flathead National Forest open roads and motorized trails for wheeled vehicles, within the primary conservation area (PCA) and within zone 1 both within and outside the demographic connectivity area (DCA)

Area	Open Roads (miles)	Motorized Trails (miles)	Open for Travel (acres)
Flathead National Forest	1,427	226	501
PCA within the Forest	818	120	500
Zone 1, within DCA	212	16	0
Zone 1, no DCA	357	86	1

See section 3.12, particularly subsection “National Forest System Roads,” for detailed information on NFS roads.

Trails

About 2,220 miles of system trails on the Flathead National Forest are documented in the national infrastructure database, which is the official database for the Forest Service. There are about 1,107 miles of trails located outside of designated wilderness areas and about 1,115 miles within designated wilderness areas. In the last five years, the Forest maintained about 1,000 miles of trails per year and improved/reconstructed an average of 30 miles of trails.

Table 108 shows the total miles of summer trails for the different types of allowable uses. Trails can have multiple types of allowable use on them, so many trails are duplicative in this table and cannot be totaled.

Table 108. Allowed summer trail use on the Flathead National Forest, in miles, as of 2015

Mechanized transport	Hiking	Pack and Saddle	Wheeled Motorized
836	2,053	2,012	226

Source: Flathead National Forest GIS layer and INFRA data, Sept. 18, 2015.

Motorized over-snow vehicles

Areas suitable for motorized over-snow vehicle use on the Flathead National Forest were determined by the winter use provisions of the Flathead's Winter Motorized Recreation Plan (USDA, 2006), which is amendment 24 to the 1986 forest plan. Areas were identified as suitable and not suitable for motorized over-snow vehicle use, including four late-season (outside of grizzly bear denning season) areas within the primary conservation area (Canyon Creek, Challenge-Skyland, Lost Johnny, and Six Mile areas as identified in amendment 24) where motorized over-snow vehicle use is allowed during April and May (see figure 1-46).

In addition to these late-season areas, there are route corridors in the North Fork and Salish geographic areas with a 200-foot corridor (100 feet on either side of the road) that are designated as open yearlong to over-snow vehicle use, conditions permitting. Because these are linear features, these routes are described in *miles* (for routes) and *acres* (for areas) in table 109.

The Flathead National Forest and Montana Fish, Wildlife and Parks monitor motorized over-snow vehicle use, as well as known grizzly bear den locations and grizzly bears emerging from their dens, and report this information to the USFWS. The agencies have not detected any conflicts due to motorized over-snow vehicle use on the Flathead National Forest thus far. Motorized over-snow vehicle use is suitable on about 31 percent (753,497 acres) of the Flathead National Forest. Table 109 shows motorized over-snow vehicle use according to the three separate seasons (denning season for grizzly bears, late spring season, and yearlong as conditions permit) across the Forest as well. These numbers reflect the Flathead National Forest Winter Motorized Recreation Plan, or amendment 24; any differences in acres and miles are due to GIS mapping realignments and updates to the database and not because of changes in routes or areas on the ground.

A correction was made to amendment 24 to the forest plan motorized over-snow suitability map to reflect the amendment 24 decision that designated intermingled private and NFS lands in the North Fork suitable for motorized over-snow vehicle use. These had been incorrectly mapped as not suitable for motorized over-snow vehicles use on the Forest's over-snow vehicle use maps. As a result, these additional 2,122 acres are now suitable for motorized over-snow vehicles for all alternatives in this analysis, which reflects the existing condition.

Table 109. Miles and acres of motorized over-snow vehicle routes and areas on the Forest by season allowed[1]

Season When Use Is Allowed	Motorized Over-Snow Vehicle Routes in Miles	Motorized Over-Snow Vehicle Areas in Acres (Percent)
Dec. 1 to March 31	295 miles	459,255 acres (19%)
April 1 to Nov. 30[2]	623 miles	53,905 acres (2%)
Yearlong[3]	1,046 miles	240,337 acres (10%)

1. Numbers in this table reflect the Flathead National Forest Winter Motorized Recreation Plan (amendment 24); differences in acres and miles are due to GIS mapping realignments and updates to the database.

2. Routes and areas are open for a portion of this time period, snow conditions permitting. In addition, they are open December 1 to March 31.

3. Yearlong routes are open to motorized over-snow vehicle use, conditions permitting.

3.10.3 Environmental consequences

Alternative A—No action

Recreation opportunity spectrum

The existing recreation opportunity spectrum is described above under the "Affected environment" section. Refer to table 100 for the recreation opportunity spectrum class allocation.

Recreation

Recreational use is expected to increase in the analysis area. The capacity of developed campgrounds in many of the campgrounds is reached during peak time periods (July and August weekends). Use of dispersed recreation (recreation outside of developed sites) may increase as developed sites reach capacity. The existing 80 developed sites on the Flathead National Forest would be retained, and there would not be limits on future development other than those resulting from budget limitations. Dispersed recreation opportunities would continue to be available.

Focused recreation areas (management area 7 in the draft plan) were not a management area in the 1986 forest plan. A comparison of management areas from the 1986 forest plan (alternative A) with alternatives B modified, C, and D has been developed. The 1986 forest plan generally included developed recreation sites, downhill ski resorts, and Nordic ski areas such as Round Meadow in management area 7. Alternative A includes approximately 5,655 acres of recreation areas that are similar in character to focused recreation management area 7.

Access

See the "Access" subsection in section 3.10.2 for a description of alternative A existing conditions for motorized over-snow vehicle use.

The 1986 forest plan components under alternative A created management requirements for additional closures and reclamation of roads and motorized trails. Approximately 518 miles of roads may need to be reclaimed in order to fully meet amendment 19 numeric objectives in each bear management subunit, unless site-specifically amended (see final EIS section 3.7.5 for more details). This could affect recreational activities that depend on roads either to access NFS lands by vehicle or to engage in activities that occur adjacent to roads, such as dispersed car camping. Because these roads would not be passable by vehicle, the type of use that could occur on them would be nonmotorized, but it could also include mechanized transport such as bicycle use.

For example, one scenario that would move towards fully implementing amendment 19 grizzly bear security requirements for the Lion Creek bear management subunit would be to close Van Lake Road (NFS Road 9882), which would eliminate motorized access to Van Lake and the campground there (Ake, 2015a).

Additionally, 57 miles of trails would no longer allow wheeled motorized use (see table 110). This figure is an estimated programmatic assessment of the number of miles needed to meet amendment 19 requirements. The actual number might be higher or lower depending upon changing access conditions on adjacent lands and the site-specific factors that must be considered when evaluating access and grizzly bear habitat needs. Amendment 19 does not apply to portions of the Salish geographic area (e.g., west of Highway 93 or subunits where NFS lands are minimal) (see section 3.7.5 for more details); therefore, road and trail motorized use would not be reduced in that area.

If the estimated 518 miles of roads are closed and/or reclaimed, this could cause a shift in the recreation opportunity spectrum classes in these areas from a roaded natural to a semiprimitive nonmotorized experience.

Table 110. Bear management subunits on the Flathead National Forest and the estimated miles of wheeled motorized trails that need to be closed to fully meet the requirements of amendment 19

Bear Management Subunit Name	Estimated miles of wheeled motorized trails that need to be closed to meet amendment 19 standards
Peters Ridge	28 miles
Swan Lake	27 miles
Skyland Challenge	1 mile

This estimated reduction in wheeled motorized trails could reduce the current motorized trail system by 57 miles, resulting in a total of 171 miles of wheeled motorized trails on the Forest. Wheeled motorized trails would then comprise about 8 percent of the system trails on the Forest. Wheeled motorized use would be concentrated on the 171 miles of trails, which could cause negative user experiences due to crowding at trailheads and on the trails. Some Forest users might be displaced to other areas that allow wheeled motorized use. The majority of wheeled motorized use would occur in the Salish Mountains geographic area which, includes the Blacktail Wild Bill Off-Highway Vehicle Trail System and trails on the Tally Lake Ranger District; and the Hungry Horse geographic area, which includes the Cedar Flats Off-Highway Vehicle Area and the Hungry Horse Off-Highway Vehicle Area. The majority of wheeled motorized use would be in low-elevation and roaded areas and would not provide the higher-elevation backcountry experience.

For example, a possible scenario to meet amendment 19 security requirements for the Peters Ridge bear management subunit could close all motorized trails and the only access to the Alpine 7 trail would be from the Hungry Horse Reservoir side (Ake, 2015a).

Although this alternative would provide both motorized and nonmotorized recreational opportunities as well as opportunities for mechanized transport (e.g., mountain bikes) and motorized over-snow vehicle use, there would be a 25 percent reduction in wheeled motorized trails on the Forest.

The Forest’s trail system would increase by roughly 25 miles because trailheads most likely would be relocated to where roads end, and to meet amendment 19 security requirements they might be nonmotorized, which could increase nonmotorized trails on the Forest’s trail system.

Alternatives B modified, C, and D effects

Recreation opportunity spectrum

The desired recreation opportunity spectrum varies by alternative, in part based on changes in management area allocation. Differences in management area allocation by alternative have a direct effect on acres of recreation opportunity spectrum classes. Management areas in which the allocation of recreation opportunity spectrum classes changes by alternative are primarily 1b, 5a, 5b, 5c, and 5d, as well as 7.

Visitor use is expected to continue to increase regardless of the alternative selected. Management actions can be taken to reach the desired recreation opportunity spectrum settings, as described in chapter 2 of the forest plan (see the “Summer Recreation Settings” and “Winter Recreation Settings” subsections of the “Sustainable Recreation” section) and depicted in figures B-19 to B-24, the desired recreation opportunity spectrum maps for all alternatives, both summer and winter.

The desired recreation opportunity spectrum is used to show the general effect of alternatives to recreation settings and opportunities across the Forest.

Table 111 displays the allocation of the summer recreation opportunity spectrum and table 112 the winter recreation opportunity spectrum for each alternative (refer to figures B-19 to B-24). In winter compared to summer, a shift from roaded natural to semiprimitive motorized normally occurs because most Forest Service roads are not plowed. There is also a decrease in semiprimitive nonmotorized acreage because there are areas open to motorized over-snow vehicle use across the Forest, creating a semiprimitive motorized setting.

In summer and winter, the nonmotorized recreation opportunity spectrum classes (primitive and semiprimitive nonmotorized) are the highest under alternative C. This is because of this alternative’s increase in recommended wilderness and decrease in management areas 5b and 5c compared to the other alternatives. Alternative D has the fewest acres in the nonmotorized recreation opportunity classes because of reduced acres allocated to recommended wilderness and an increase in allocation to management areas 5b and 5c. The summer and winter total nonmotorized recreation opportunity classes remain very similar under alternative B modified compared to under alternative A, with a slight decrease under alternative B modified in the summer and a slight increase in the winter.

Conversely, the summer and winter motorized recreation opportunity classes (semiprimitive motorized and roaded natural) are higher under alternative D and lower under alternative C compared to under alternative A. Alternative D provides the most motorized recreation opportunity setting, and alternative C provides the least. The summer and winter total motorized recreation opportunity spectrum settings remain similar under alternative B modified compared to under alternative A, with a slight increase under alternative B modified in the summer and a slight decrease in the winter.

Table 111. Percentages of desired summer recreation opportunity spectrum classes on the Flathead National Forest by alternative

Alternative	Primitive (%)	Semiprimitive nonmotorized (%)	Semiprimitive motorized (%)	Roaded Natural (%)	Rural (%)
A	48	24	3	25	< 1
B modified	53	16	2	29	< 1
C	66	9	1	24	< 1
D	45	13	8	34	< 1

Table 112. Percentages of desired winter recreation opportunity spectrum classes on the Flathead National Forest by alternative

Alternative	Primitive (%)	Semiprimitive nonmotorized (%)	Semiprimitive motorized (%)	Roaded Natural (%)	Rural (%)
A	48	14	34	4	< 1
B modified	53	11	32	4	< 1
C	66	5	25	4	< 1
D	45	16	34	5	< 1

Effects common to all action alternatives

Recreational use is expected to increase in the analysis area. With restrictions on new overnight development (NCDE definition) within the primary conservation area, the number and capacity of developed recreation sites (NCDE definition) on NFS lands that are designed and managed for overnight use by the public during the non-denning season shall be limited to one new developed recreation site per decade per bear management unit, or one increase in the overnight capacity at one site per decade per bear management unit above the baseline (see glossary), with listed exceptions. A change in the number or capacity of developed recreation sites might be offset by an equivalent reduction at another site or sites in the same bear management unit. Overnight developed recreation sites (NCDE definition) on the Forest include campgrounds, cabins, recreation residences, and lodges. Overnight developed recreation sites might reach capacity, with limited ability to expand to meet increased demand within the primary conservation area. Outside of the primary conservation area, the limitation on overnight developed recreation sites is not applied. See table 113 for a summary of recreation capacity within the primary conservation area.

Table 113. Current capacity of developed recreation sites in the primary conservation area on the Flathead National Forest

Site Type	Capacity[1]
Campgrounds	552
Cabins	48
Residences	63
Lodges	13
Bunkhouses	7

1. In the Northern Continental Divide Ecosystem, measurement of capacity varies by site type. Campground capacity is defined as the number of sites in the campground; cabins and residences as the number of cabins and residences; and lodges as the number of rooms.

There are 12 bear management units within the primary conservation area on the Forest. Out of these 12, 6 are shared with other Forests or agencies (e.g., National Park Service). Depending on decisions of the other Forests or agencies within the shared bear management units, the Forest has the ability to increase 6 to 12 overnight developed recreation sites in the primary conservation area.

In addition, there are certain exemptions to the one increase in overnight developed recreation (NCDE definition) sites to one per bear management unit per decade that allow the Forest to increase overnight developed recreation sites:

- allowing a change in the number or overnight capacity of developed recreation sites that is necessary to comply with Federal laws (e.g., Federal Rehabilitation Act);
- allowing a change in the number or overnight capacity of developed recreation sites that is necessary to address grizzly bear-human conflicts, resource damage, or human safety concerns;
- allowing an increase in the number of developed recreation sites due to the Forest Service acquiring lands with developed recreation sites.

In addition, if the Forest proposes any further increase in the number or capacity of developed recreation sites that are designed and managed for overnight use in the bear management unit (i.e., more than one per decade), such an increase must be offset by a reduction of an equal amount at another recreation site(s) in the same bear management unit so that there is no net increase in overnight capacity in the bear management unit. This allows some flexibility to increase developed recreation sites that have reached capacity while decreasing sites that may be less used and not meeting capacity.

On the Forest, one developed ski area (Whitefish Mountain Resort) is located in the primary conservation area, and it does not have overnight capacity on NFS lands. There have been no known grizzly bear mortalities at the existing ski area. The Whitefish Mountain Resort special-use permit has mitigation measures in place to reduce grizzly bear-human conflicts, and these would continue to apply under all alternatives.

There is no limitation to dispersed recreation sites, which have minimal to no agency improvements that are made out of manmade materials. Dispersed sites include, but are not limited to, outfitter camps or other primitive camping spots along a road, trail, or waterbody or at a road closure.

Some people may shift their uses to areas not occupied by grizzly bears or rely on uses that give them an increased sense of security, such as using a hard-sided camper, staying at a developed campground or renting a cabin , day hiking on heavily used trails, or relying upon guided services. For other people, recreating in bear country may be an added attraction and an allure of wild country.

As recreational use increases and developed recreation sites are constrained, users may adapt as developed recreation sites reach capacity. Potential outcomes of restricting developed site capacity are

- change in use from developed recreation sites to dispersed recreation sites;
- change in the time visitors use the areas to a different time of year when use is lower, such as spring or fall;
- change in use to other areas outside the primary conservation area on the Flathead National Forest, on the amendment Forests, or off-Forest in areas where use is lower;
- use of the national reservation system at campgrounds that have reached capacity to assist users to reserve sites at specific campgrounds that have reached capacity; and
- creation of new developed sites on private land by private enterprise to accommodate increasing use.

Developed recreation sites

See the section above titled Effects common to all action alternatives.

Focused recreation areas (management area 7)

Focused recreation areas typically feature certain types of recreation activities that take place near or at large lakes or reservoirs, developed ski areas or year-round resorts, large campgrounds, or trail systems. Focused recreation areas recognize a variety of sustainable recreation settings and opportunities throughout the year on the Forest. Recreational use is already occurring in many of these areas, but in some cases the use would be enhanced through an emphasis on trail, road, and facility maintenance; increased visitor contact and education; and/or the development of additional recreation opportunities such as mountain bike trails, hiking trails, or boat ramps. These areas would accommodate existing as well as additional recreation growth and are intended to benefit local economies by having robust recreation settings that are responsive to changing conditions and changing use patterns and demands. This management area provides a focal point not only for existing recreation but also for new and/or enhanced recreation activities.

Additional motorized and nonmotorized recreation opportunities not specifically designated as management area 7 (focused recreation) are also broadly available across the Flathead National Forest, such as hiking, horseback riding, mountain biking, and motorized over-snow vehicle use. Although table 109 lists the featured activities at particular focused recreation areas, other activities not listed may also take place in these areas, such as dispersed camping, mountain biking, and winter nonmotorized activities.

Table 114 lists the focused recreation areas for each action alternative along with a brief description of featured activities and acres. Management for focused recreation areas ranges from managing in a natural setting with minimal developments such as Ingall Mountain and Krause Basin focused recreation areas to a higher development scale and intensified management such as Big Mountain and Blacktail focused recreation areas. Alternatives B modified and D have 21 areas in management area 7 covering about 61,000 acres (about 3 percent of the Forest). There are very slight changes in acres between alternative B modified and alternative D due to better mapping of four focused recreation areas. Alternative C has 14 areas totaling about 31,200. Alternatives B modified and D have the highest number of sites and acreage, and alternative C has less than B and C in management area 7.

Table 114. Focused recreation areas (management area 7) by action alternative

Focused Recreation Area	Featured Activities	Alternative B modified (acres)	Alternative C (acres)	Alternative D (acres)
Ashley Lake (two sites: north and south)	Developed recreation, including camping, fishing, and boating	103	103	103
Big Creek Campground and Work Station	Developed recreation, including camping, boating, fishing, and hiking; youth conservation education	57	57	57
Big Mountain (includes Whitefish Mountain Resort)	Downhill skiing, cross-country skiing, hiking, mountain biking, conservation education	4,111	4,111	4,111
Blacktail Mountain Ski Area	Downhill skiing, hiking, mountain biking	911	891	891
Blacktail Wild Bill Off-Highway Vehicle Trail System	Motorized trail riding	4,966	4,966	4,966

Focused Recreation Area	Featured Activities	Alternative B modified (acres)	Alternative C (acres)	Alternative D (acres)
Blacktail-Foy's Trails	Hiking, mountain biking, horseback riding close to communities; includes Lakeside to Blacktail and Foy's to Blacktail trails	1,027	N/A	1,047
Camp Misery Trailhead	Access to Jewel Basin hiking area	330	N/A	330
Cedar Flats Off-Highway Vehicle Area	Motorized trail riding	2,008	2,008	2,008
Crane Mountain	Mountain biking and dispersed recreation	1,023	1,023	1,023
Crystal-Cedar Area	Dispersed nonmotorized recreation, hiking, mountain biking, and horseback riding close to communities	13,395	NA	13,396
Holland Lake Campground	Developed recreation including camping, boating, fishing, and hiking	593	593	593
Hungry Horse Off-Highway Vehicle Area	Motorized trail riding	71	71	71
Hungry Horse Reservoir	Developed and dispersed recreation, including camping, boating, fishing, and hiking	13,113	13,113	13,113
Ingalls Mountain	Single-track wheeled motorized use on existing open roads; n	2,431	N/A	2,431
Krause Basin	Nonmotorized trails and limited motorized trails on designated and signed routes	1,566	N/A	1,578
Lion Lake	Day-use picnic site, hiking, fishing, and, swimming	99	99	99
Nordic groomed ski areas	Groomed cross-country ski areas: Round Meadow, Essex, and Blacktail Mountain	3,906	3,906	3,906
Swan Lake Campground and day-use area	Developed recreation, including camping, boating, fishing, and hiking	95	95	95
Tally Lake Campground	Developed recreation, including camping, boating, fishing, and hiking	159	159	159
Tally Mountain	Mountain bike loop trail opportunities	4,692	N/A	4,692

Focused Recreation Area	Featured Activities	Alternative B modified (acres)	Alternative C (acres)	Alternative D (acres)
Werner-Nicola	Dispersed nonmotorized recreation, hiking, mountain biking, and horseback riding close to communities	6,392	NA	6,392

Dispersed sites

Caves

Desired conditions FW-DC-CAVES-01 through 06 and guidelines FW-GDL-CAVES-01 through 03 for cave and karst features protect the cave resource. Caves and karst features provide habitat for wildlife species, particularly bats, that require specialized niches for raising young, roosting, and overwintering. The desired condition to educate cavers about the risk of spreading disease (FW-DC-CAVES-06) would also help to protect bats. Desired conditions (FW-DC-CAVES-05 and 06) state: “Recreational use or scientific studies in caves/karst features protect and maintain cave-dependent species and paleontological and archaeological resources” and “Educational/informational materials are available to cavers on topics such as reducing impacts of human disturbance on species, ecological conditions associated with caves, and measures cavers can use to prevent the spread of diseases such as white-nose syndrome from cave to cave.”

There is one specific guideline (MA1s-GDL-04) for caves within designated wilderness areas: “To protect wilderness character and cave resources, wilderness caves should not be signed, disclosed on maps, mentioned in brochures, or have monument markers indicating a cave name or number outside of the cave.” Refer to “Cliff, cave, scree, and rock habitats” in section 3.7.4 for additional discussion of environmental consequences and cumulative effects.

Access

Motorized recreation

Motorized use is analyzed in terms of wheeled motorized use and motorized over-snow vehicle use.

Wheeled motorized use is only on designated roads, trails, or areas and varies by alternative based on management area direction, primarily due to designated wilderness, allocation of recommended wilderness management areas, and backcountry management areas. Future suitability for wheeled motorized use is determined by the desired recreation opportunity spectrum as mapped for each alternative. See figures 1-52 to 1-59 for the recreation opportunity spectrum map for each alternative, summer and winter.

The identified suitability for motorized over-snow vehicle use varies by alternative and is mapped in figures 1-42 to 1-45.

An area may be suitable for motorized use, but that does not mean motorized use is allowable everywhere in that setting. Motorized use (by wheeled and/or over-snow vehicles) is restricted to designated trails, roads, and areas as shown on the motor vehicle use maps for the Flathead National Forest. Travel management decisions are separate, project-level decisions that determine the specific areas and routes for motorized recreation consistent with the desired recreation opportunity spectrum as mapped.

Trails

Currently, there are about 2,220 miles of NFS system trails on the Forest; 1,107 miles (50 percent) of trails are located outside of designated wilderness areas and 1,115 miles (50 percent) are within designated wilderness. Outside of designated wilderness, there are 226 miles (10 percent) of wheeled motorized trails on the Forest. Ninety-one percent of the Forest trail system allows pack and saddle use, with 92 percent of trails allowing hiking (some trails are groomed snowmobile trails; these are not considered hiking trails). Conflict between motorized and nonmotorized uses may sometimes occur because there are a few trails on the Forest where both types of uses are allowed (only 10 percent of the Forest trail system allows both wheeled motorized use and nonmotorized use). In addition, not only are there many trails that nonmotorized users may legally use (compared to the number that motorized users can legally use), but motorized trails are clearly marked as such on the district motorized use map and usually by a physical sign on the trail or trailhead, offering nonmotorized users the choice of whether to share that trail with wheeled motorized users or find a substitute, nonmotorized trail.

Under alternatives B modified and C, existing wheeled motorized use and mechanized transport is not suitable in recommended wilderness areas, reducing the amount of motorized opportunity for wheeled motor vehicles. Under alternative C, about 75 miles of trails that allow wheeled motorized use are within recommended wilderness and would need to be closed to this use after site-specific analysis is completed. Under alternatives B modified and D, there would be no change to wheeled motor vehicle use.

Under alternative B modified, due to the suitability plan component for recommended wilderness, about 96 miles of mechanized transport might be closed, and under alternative C about 417 miles of mechanized transport might be closed after site-specific analysis is completed. Alternative D does not have recommended wilderness, so the suitability plan component would not affect mechanized transport under this alternative.

Under alternatives B modified and C, trails open to public motorized use within the Salish demographic connectivity area portion of the Salish Mountains geographic area would not exceed baseline levels, but some additional motorized trail access could occur in zone 1 outside of the Salish demographic connectivity area. This might result in an overall reduction in opportunities for motorized trails under this alternative.

Motorized over-snow vehicle use

For suitability of motorized over-snow vehicle use for each alternative, refer to figures 1-42 to 1-45. These maps show where motorized over-snow vehicle use is identified as suitable and not suitable on the Forest. Where it is identified as not suitable, motorized over-snow vehicle use is not suitable all year long. Where it shows motorized over-snow vehicle use would be suitable, a portion of the areas change suitability based on season: grizzly bear denning season (December 1 to March 31), outside of grizzly bear denning season (April 1 to November 30), routes/roads open to motorized over-snow vehicle use to May 14 (conditions permitting), and roads open yearlong (conditions permitting). Table 115 shows the acres identified as suitable for motorized over-snow use in areas by alternative. This table displays the miles identified as suitable for motorized over-snow vehicle use on routes by alternative. Some suitable areas have routes going through them, and other areas do not. Any nonlinear feature is listed in table 115 as acres. Any linear routes are listed in table 116 as miles.

Currently, motorized over-snow vehicle use is suitable on about 31 percent of the Forest and not suitable on 69 percent of the Forest. The actual use of the 31 percent of the Forest suitable for

motorized over-snow use is less as terrain and vegetation also influence where motorized over-snow vehicles can physically go. Vegetation conditions are dynamic over time and change in response to disturbance and succession. Whereas fire may open up dense forest for over-snow use, succession is closing areas to over-snow use in areas suitable for over-snow use. Nonmotorized and non-mechanized transport winter use such as Nordic skiing, backcountry skiing and snow shoeing are allowable on 100 percent of the Forest. Mechanized transport such as fat-tire bikes that ride over snow are not allowed in designated wilderness and are not suitable in recommended wilderness and specific areas on the Forest that have closure orders prohibiting mechanized transport.

As shown in table 115, alternative D has the most overall acres and miles suitable for over-snow vehicle use (approximately 32 percent of the Forest), while alternative C has the least (25 percent of the Forest). This change in suitability between alternatives is because of changes in management area allocation as some management areas have plan components that prohibit motorized over-snow vehicles use, after site-specific analysis is completed. For instance, management area 1b (recommended wilderness) has a suitability plan component in alternatives B modified and C where motorized over-snow vehicles are not suitable in recommended wilderness; this management area varies in the amount of acres between alternatives B modified and C.

There are four late-season areas (outside of grizzly bear denning season) within the primary conservation area (Canyon Creek, Challenge-Skyland, Lost Johnny, and Six Mile as identified in amendment 24) where motorized over-snow vehicle use is suitable April 1 to Nov 30 (see table 115 and table 116). These late-season areas also includes routes on the Forest, primarily in the Salish geographic area, that allow motorized over-snow vehicle use until May 14. For late-season motorized over-snow vehicle use there is a slight increase in acres suitable under alternative D and a slight decrease under alternative B modified from current. Under alternative C, no acres are suitable for late-season use.

In addition, there are routes and areas that are open yearlong (conditions permitting) to motorized over-snow vehicle use (see table 116). There are route corridors in the North Fork and Salish geographic areas with a 200 foot corridor (100 feet on either side of the road). There are also roads that are open yearlong (conditions permitting) to motorized over-snow vehicle use in the Hungry Horse, Swan Valley, and Middle Fork geographic areas that do not have the 200-foot corridor. There is no change in miles of routes open to motorized over-snow vehicle use under any of the alternatives.

Table 115. Acreage and forestwide percentage of motorized over-snow areas and corridors within the Forest, by season allowed and by alternative

Alternative	Dec. 1 to March 31 acres (percent)	April 1 to Nov. 30[1] acres (percent)	Yearlong[2] acres (percent)
A	459,255 (19%)	53,905 (2%)	240,337 (10%)
B modified	458,118 (19%)	55,641 (2%)	240,334 (10%)
C	351,740 (15%)	862 (0%)	240,085 (10%)
D	459,198 (20%)	55,556 (2%)	240,337 (10%)

1. These areas are open Dec. 1 to March 31 and are also open for a portion of April 1 to Nov. 30, snow conditions permitting.
2. Yearlong routes are open to motorized over-snow vehicle use during the rest of the year as conditions permit.

Table 116. Miles of motorized over-snow vehicle routes within the Forest, by season allowed and by alternative

Alternative	Dec. 1 to March 31 miles	April 1 to Nov. 30[1] miles	Yearlong[2] miles
A	295	623	1,046
B modified	295	623	1,046
C	292	623	1,044
D	295	623	1,046

1. These areas are open Dec. 1 to March 31 and are also open for a portion of April 1 to Nov. 30, snow conditions permitting.
2. Yearlong route are open to motorized over-snow use during the rest of the year as conditions permit.

Consequences to sustainable recreation and access from forest plan components associated with other resource programs or management activities

Effects from vegetation management

Commercial timber harvest activities will generally result in road reconstruction and continued application of best management practices on existing NFS roads. New road construction is likely to be limited and temporary road construction is likely to be used as a more common method for short-term access needs.

Administrative use of gated roads that normally prohibit motor vehicle use yearlong is likely when management activities such as precommercial thinning, invasive weed treatments, or other noncommercial silvicultural treatments are planned.

Because general forest (management area 6) management area allocations are lowest in alternative C, this alternative would generally be expected to result in the least vegetation management activities and a lower amount of road use compared to alternatives A, B modified, and D. Consequently, reduced traffic (i.e., number of vehicles on roads), both commercial and administrative, could be expected. Associated with reduced commercial use is the reduction of road reconstruction and best management practices work. Road maintenance activities would also occur less often since the need for road maintenance is closely tied to use.

Timber harvest has the potential to affect recreation experiences and opportunities in several ways. Short-term effects may include increased noise and dust levels; the sight of landscapes altered by differing types of harvesting; the presence of slash piles and roads reconstructed or constructed for timber sales; conflicts with logging trucks on roads used by other drivers or by bicyclists; and the removal of snow for winter log hauling from roads frequented by winter recreational users. Users may be temporarily displaced to other locations because of log truck traffic, helicopter operations, or the noise from chainsaws.

Alternative A has the highest number of acres in management areas 6a, 6b, and 6c, where most of the timber harvest and other vegetation management activities will take place, followed by alternatives D, B modified, and C, in that order. Refer to table 3 in volume 1 for the proposed management areas and equivalent 1986 forest plan management areas. Refer to table 5 in volume 1 for a comparison of alternatives by actual acres of management area allocation.

Road development for timber management purposes in undeveloped areas has the potential to attract more visitors to the interior of the Forest where access previously has been limited. As use increases, visitors would experience less solitude and remoteness. Primitive and semiprimitive nonmotorized settings could change to semiprimitive motorized and roaded natural settings.

Recreational benefits from vegetation management can include new roads and trails and the opportunity to gather firewood, access for hunting, or collecting other forest products such as mushrooms and huckleberries. In many cases, roads constructed for logging operations are then used by recreationists, although these roads typically are closed and/or decommissioned after completion of the timber harvest activity. Depending on resource objectives, some logging roads can be left open to create additional dispersed recreation opportunities.

Effects from fish and wildlife management

Forest plan management direction for recreation that addresses riparian and aquatics resources (e.g., FW-GDL-REC-06) could affect developed recreation facilities by restricting new facilities in the "inner" riparian management zones (see FW-STD-RMZ-01). However, developed recreation facilities may still be constructed outside of the inner riparian management zones. They may also be constructed within the inner riparian management zone if they are a water-related site such as a boat ramp.

Forest plan wildlife management direction (e.g., GA-SM-GDL-01) can affect motorized recreation opportunities. Restrictions that limit types of access and impose seasonal closures during sensitive periods, such as mating, calving, and when animals emerge from dens, can temporarily displace recreationists to other areas. The Forest's motor vehicle use map limits motor vehicle use to designated routes or areas, yearlong or seasonally, often in response to wildlife and fish needs. Recreational benefits from wildlife management could include increased hunter and wildlife viewer satisfaction as well as maintaining angler satisfaction. The effect on recreation from wildlife management is the same for all action alternatives.

All alternatives have management direction that would continue to support the recovery of the NCDE grizzly bear population. Alternatives differ in the range of future actions that could occur. Alternative A would close and/or reclaim an additional 518 miles of motorized roads (see "road" in glossary). Additionally, 57 miles of motorized trails would be closed to motorized use. Alternatives B modified, C, and D would be required to maintain the baseline (see glossary) access conditions in the grizzly bear primary conservation area and zone 1.

Effects from fire and fuels management

Fuels management activities (e.g., prescribed burning) are likely to continue. Fuels management effects on recreation are similar to the effects described under vegetation management. An increase in fire extent, creating a long-lasting change to the setting, could cause a shift in recreational use. The degree of these effects is difficult to determine and is based on the size and intensity of a wildfire event. Prescribed fire has some level of predictability of time, location, and intensity, which may decrease the short-term impacts on visitors. These effects are common to all alternatives.

Fire suppression actions are also likely to continue and could result in the use of gated roads, as described above. In some cases, roads that are impassible to motor vehicle use (due to revegetation or other restrictive condition) might be opened in order to facilitate suppression actions. These roads would probably be used for the duration of the suppression efforts and post-fire work and then returned to their previous status.

Effects from minerals management

Proposals for exploration and development are driven by external parties and market forces and are regulated by existing mining law. Access and road development (long-term or temporary) is often associated with mineral exploration and development, but a site-specific analysis is required prior to any approval for exploration or development activities.

If any mine reclamation activities occur, they would likely use existing roads. These might be roads that are not currently designated for motor vehicle use. They would probably be used for the duration of the reclamation work and then returned to their previous status.

Recreation could be affected by mineral exploration and extraction in all alternatives. Short-term effects might include noise and visual impacts from open-pit or underground mining operations. Over the long term, effects might include development from a more naturally appearing landscape; new permanent underground or open-pit mines and physical structures; and new roads and road corridors constructed for mining or drilling operations that might change the recreation setting.

The potential for oil and gas development on the Flathead National Forest varies from low to high across the Forest. Portions of the Forest having a high potential for development are lands east of the Great Bear Wilderness and the lands surrounding the western boundary of the Great Bear Wilderness from the town of West Glacier, Montana, to the north to Horse Ridge near Spotted Bear Ranger Station to the south. The rest of the Forest has moderate or low potential for oil and gas leasing. Mineral facilities could affect visitors, depending on the location of development and the setting affected.

Cumulative effects

The analysis area for cumulative effects includes the Flathead National Forest and adjacent public lands, including the Kootenai, Lolo, and Helena-Lewis and Clark National Forests, Glacier National Park, Montana State lands, Flathead and Missoula Counties, and local parks. These public lands provide a wide range of recreation opportunities in addition to those provided by the Flathead National Forest. However, differences in agency missions often result in different types of recreation experiences. The National Park Service tends to manage visitor activities more closely. They provide highly developed and managed visitor facilities as well as offer permitted backcountry opportunities. The other national forests provide opportunities similar to the Flathead National Forest. Montana’s State parks typically emphasize particular land features such as a lake and offer related recreation opportunities such as boating, fishing, swimming, and camping. Local and county park facilities are typically oriented towards day users (some offer camping) and more urban recreation opportunities such as soccer fields, picnic shelters, and playgrounds. Flathead National Forest management emphasizes dispersed recreation over developed recreation, although the Forest does have developed recreation sites such as campgrounds. The Forest provides opportunities for a wide variety of recreational activities, from primitive backcountry backpacking to downhill skiing. Adjacent national forests receive recreation visitation similar to that of the Flathead National Forest, but overall recreation visitation is higher in and around the Flathead National Forest due to the proximity of Glacier National Park. In order to address the impacts associated with increased visitations, all public land agencies have employed additional recreation management actions or have installed additional facilities to prevent damage to natural and cultural resources.

Within the planning period (the next 15 years), human population growth—as well as growth in the demand for a variety of recreation settings, experiences, and opportunities—is expected to increase. The Flathead County population has been growing at a far greater rate than the state and national averages, which is likely to continue throughout the life of this plan. A growing population places increasing demands on recreation, which could result in more human concentration and use at existing recreation areas, increased conflicts, increased number of watercraft and off-highway vehicles, and a reduction in the quality of recreation settings. The increasing use of off-highway vehicles may result in increased conflict among motorized and nonmotorized user groups throughout the cumulative effects analysis area. As use increases, compliance with regulations could become a greater challenge as recreational participants increase in number and compete for

space and resources. This is likely to result in the greatest impact on the areas close to communities that offer semiprimitive and primitive recreation settings, which emphasize solitude, challenge, risk, unmodified natural environments, and minimal encounters with and/or signs of other users.

As the population of Montana and especially Flathead County increases, the demand for recreational opportunities and open space will likely grow. Land-management agencies will continue to provide a variety of recreation opportunities but are not likely to be able to meet all the demand for every activity desired. All alternatives accommodate a mix of recreation opportunities and settings for recreationists. Alternative C would provide the most nonmotorized settings for both summer and winter, the most primitive settings, and the fewest focused recreation settings compared to alternatives B modified and D. Alternative D provides the most motorized settings for both summer and winter and the most roaded settings on the Forest compared to alternatives B modified and C. Alternatives B modified and D both provide the most focused recreation management areas. Alternative A provides the fewest focused recreation areas.

Motorized recreation opportunities that are road dependent have decreased over the decades due to road decommissioning and closures that have occurred primarily in grizzly bear recovery areas and bull trout watersheds. A total of 787 miles of NFS and non-NFS roads have been decommissioned between 1995 and 2015. During this time, the Forest has also constructed 19 miles of NFS roads and acquired 411 miles of roads from land acquisitions, for a net reduction of road mileage by 357 miles. The amount of nonmotorized recreation opportunities has increased with these changes; the amount of motorized or road-related recreation opportunities has decreased across the Forest.

Wheeled motorized trail use opportunities have also decreased, and currently 226 miles (10 percent of the trail system) are wheeled motorized trails. It is problematic to say exactly how much wheeled motorized trails existed in 1995 as the trail database capturing this information was just starting to be populated in 1995; therefore, the data for comparison with the current data is incomplete. Considering that past management and regulations regarding off-highway vehicle use (wheeled motorized use) were not as restrictive regarding access, it is likely there were significantly more miles available for motorized opportunities. The cumulative effect of these reductions has led to concentrated use and maintenance needs on remaining trails open to wheeled motorized use as well as the displacing of motorized recreationists who seek opportunities elsewhere.

Motorized over-snow vehicle use has decreased primarily as a result of a settlement agreement and the subsequent amendment 24 (the winter motorized recreation amendment) to the forest plan. Previous areas available to motorized over-snow vehicle use, especially in the North Fork and Swan Valley geographic areas, are no longer available, which concentrates more use on the remaining motorized over-snow vehicle use areas as well as displaces motorized over-snow vehicle users elsewhere.

3.11 Scenery

3.11.1 Introduction

Regulatory framework

Federal law

Organic Administration Act of June 4, 1897 (30 Stat. 11, as amended): This act authorizes the establishment of national forests.

Multiple-Use Sustained-Yield Act of June 12, 1960 (Pub. L.86-517, 74 Stat. 215): This act provides direction to the NFS lands to provide access and recreation opportunities. The act states, "The policy of Congress is that national forests are established and administered for outdoor recreation . . ."

Key indicator

- Percentage of scenic integrity objectives by alternative.

Methodology and analysis process

The Forest completed an inventory of landscape visibility and scenic attractiveness and compiled scenic classes. In 2011, the Forest Service's Northern Region completed existing scenic integrity mapping at a regional scale.

The scenery management system is a systematic approach to inventorying, analyzing, and monitoring the Forest's scenic resources. This system recognizes natural disturbance processes such as fire, insects, and disease as part of the dynamic natural landscape and important in maintaining healthy, sustainable, and scenic landscapes. The scenery management system is used in the context of ecosystem management to determine the relative value, stability, resiliency, and importance of scenery; assist in establishing overall resource objectives; and ensure high-quality scenery for future generations.

Major components of the scenery management system are

- scenic character descriptions,
- scenic attractiveness,
- landscape visibility (concern levels, distance zones, and viewsheds),
- existing scenic integrity, and
- scenic classes.

The 1986 forest plan used the visual management system, which was a systematic approach to inventorying, analyzing, and monitoring scenic resources but did not recognize or incorporate natural disturbance processes such as fire, insects, and disease. Alternative A, the no-action alternative, utilizes this system. Table 117 provides a cross-reference of visual management system terminology (based on visual quality objectives) and scenery management system terminology (based on scenic integrity objectives).

Table 117. Cross-reference of terms used in the visual management system (alternative A) and the scenery management system (alternatives B modified, C, and D)

Visual Management System Terminology	Scenery Management System Terminology
Preservation	Very High
Retention	High
Partial retention	Moderate
Modification	Low
Maximum modification	Very Low

Information sources

Information used to conduct the analysis generally comes from spatial information contained in GIS data. See also Moore (2017), which is the Forest's process paper on mapping scenic integrity objectives.

Analysis area

The analysis area includes the viewsheds of Forest lands and non-Forest lands. The temporal scope is the anticipated life of the plan (15 years).

3.11.2 Affected environment (existing condition)

Flathead National Forest scenic character description

Scenic character is defined as the combination of the physical, biological, and cultural images that gives an area its scenic identity and contributes to its sense of place. Scenic character provides a frame of reference from which to determine scenic attractiveness and to measure scenic integrity. See appendix F of the forest plan for a description of the scenic character by geographic area.

Located in the heart of the northern Rocky Mountains and amidst the mountains and valleys of western Montana, the Forest is part of a large and intact ecosystem that includes Glacier National Park, multiple national forests (Kootenai, Lewis and Clark, Lolo) and other State, Federal and tribal lands. The Forest is part of the Northern Continental Divide Ecosystem as well as part of the Crown of the Continent.

Awe-inspiring natural features serve to delineate the Forest's boundaries. The North and Middle Forks of the Flathead River and the Continental Divide delineate much of its eastern boundary, while to the west the Forest is bounded by the Mission Range, Flathead Lake, the Salish Mountains, and the Whitefish Range. The Forest abuts Canada to the north and the Swan Range and Swan Valley to the south.

Landforms vary greatly, from the magnificent and craggy, rocky peaks of the Mission Range to the more rounded, glacial landforms of the Swan Valley and Salish Mountains. Diversity in geology, elevation, climate, and annual precipitation result in a wide variety of plant life, from lush groves of cedars cloaked in moss to whitebark pine clinging to the tops of windswept mountain ridges. Forest vegetation types occupy over 90 percent of the Forest's landscapes and are dominated by subalpine fir, lodgepole pine, Douglas-fir, western larch, and Engelmann spruce. Grand fir, western white pine, ponderosa pine, and aspen are less common but are also present in portions of the Forest. Green pockets of maple, willow, and birch are scattered across the northern edge of the Bob Marshall Wilderness. Outstanding multi-colored displays of wildflowers in the alpine meadows and high basins are evident in late summer. Dominant scenery attributes include open, park-like conifer

and mixed-conifer forest settings dominated by large trees with a diverse forest canopy and mosaic vegetative patterns, including vivid fall stands of yellow cottonwoods and aspen groves, contrasting with the reds and oranges of the Rocky Mountain maple and huckleberry shrubs.

Elevations generally range from 3,000 to 9,500 feet. The tree line is generally at about 8,000 feet, with alpine vegetation above tree line. Water is abundant, including rivers, streams, lakes, reservoirs, glacial potholes, fens, and bogs. Mean annual precipitation ranges from 20 to 60 inches. Streams flow into the Swan, Stillwater, and the three forks of the world-renowned Flathead River headwaters. These drainages are moderately to deeply incised. They eventually flow into Flathead Lake, the largest freshwater lake west of the Great Lakes. Many other lakes occur in glaciated terrain and at higher elevations. The abundance of water in this landscape adds to the richness of the scenery. Several large and small crystal-clear lake and lush wetland areas are scattered throughout the Forest, creating thick pockets of vegetation and picturesque landscapes. These distinctive Flathead National Forest landscapes that include a variety of landforms, water features, and vegetation are highly scenic. Research shows that people prefer more visually complex scenes to more monotonous ones (Ryan, 2005).

Cultural features are evident across the Forest and include Native American travel routes and cultural sites, log cabins and other physical remains of early Euro-American settlements, and Forest Service ranger stations and fire lookouts. Many of the structures, trails, and sites have retained their historic integrity and add to the area’s character and sense of place.

Flathead National Forest scenic attractiveness

Scenic attractiveness is the primary indicator of the intrinsic beauty of a landscape. It helps determine the level of importance of scenic beauty based on perceptions of landform, vegetation patterns, compositions, water, and land-use patterns and cultural features. Landscape elements are rated at various levels of scenic values or attractiveness, and the Forest scenic character descriptions serve as the frame of reference for determining scenic attractiveness.

Scenic attractiveness classifications were determined for the Forest using information describing the landform, elevation, slope, vegetation, and percentage rock outcrop from soil survey of Flathead National Forest area, Montana (Martinson & Basko, 1998).

Table 118 shows the area of the Flathead National Forest within each scenic attractiveness classification. The majority of the Forest lands are distinctive relative to the surrounding landscape. Higher levels of scenic attractiveness occur in landscapes with a greater degree of naturalness, diversity of features, and uniqueness.

Table 118. Acres and percent of the Forest within each scenic attractiveness rating

Scenic Attractiveness	Areas (acres)	Areas (percent)
A Distinctive: Areas of unusual, unique, or outstanding scenic quality	1,751,382	73
B Typical: Areas that provide ordinary or common scenic quality	474,275	20
C Indistinctive: Areas of low scenic quality	165,141	7

Existing scenic integrity

Scenic integrity measures the degree to which a landscape is free from visible disturbances that detract from its natural or socially valued appearance, including any visible disturbances due to

human activities or extreme natural events outside of the natural range of variation. Scenic integrity measures these disturbance effects in degrees of consistency, harmony, dominance, and contrast with the valued scenic character. Scenic integrity uses a graduated scale of five levels. These levels and photographic examples of each are shown in table 119, and table 120 gives the total acreages of each of these levels.

Table 119. Scenic integrity levels and pictorial examples

Scenic Integrity Level	Example
Very high integrity—The valued scenery appears natural or unaltered. Only minute visual disturbances to the valued scenery, if any, are present.	
High integrity—The valued scenery appears natural or unaltered; visual disturbances are present but remain unnoticed because they repeat the form, line, color, texture, pattern, and scale of the valued scenery	
Moderate integrity—The valued scenery appears slightly altered. Noticeable disturbances are minor and visually subordinate to the valued scenery because they repeat its form, line, color, texture, pattern, and scale.	
Low integrity—The valued scenery appears moderately altered. Visual disturbances are co-dominant with the valued scenery and may create a focal point of moderate contrast. Disturbances may reflect, introduce, or “borrow” valued scenery attributes from outside the landscape being viewed.	
Very low integrity—The valued scenery appears heavily altered. Disturbances dominate the valued scenery being viewed, and they may only slightly borrow from, or reflect, valued scenery attributes within or beyond the viewed landscape.	

Table 120. Existing scenic integrity of the Forest

Scenic Integrity	Area of Forest (%)
Very High	48
High	37
Moderate	4
Low	11

The Forest has a wide range of existing scenic integrity (see figure 1-60). Areas designated for very high scenic integrity are often remote and pristine, such as the Bob Marshall Wilderness and other designated wilderness and recommended wilderness areas. The majority of non-wilderness lands that mostly appear natural are rated high, which includes the majority of Forest lands showing little human-made modifications. Forest lands that have been heavily harvested or that have heavily modified landscapes because of roads or other human-made visually intrusive infrastructure are rated low. For example, portions of the Tally Lake Ranger District and portions of the Swan Lake Ranger District near Lakeside, Montana, show past vegetation harvest units in geometric shapes and contrasting road cut and fill elements that would classify as low scenic integrity.

Scenic classes

Scenic classes represent the relative value of a landscape by combining visibility mapping inventories and scenic attractiveness inventories. Generally, scenic classes 1 and 2 have high public value; classes 3, 4, and 5 have moderate value; and classes 6 and 7 have low value. Scenic classes also identify the relative priority of public scenery concerns during the forest plan alternative formulation process.

Scenic integrity objectives

Scenic integrity objectives are developed in coordination with the recreational settings, management direction, and scenic classes that were developed from the scenic inventory.

3.11.3 Environmental consequences

The scenic resource is affected by management activities that may alter the appearance of the landscape. Short-term effects to scenery are usually considered in terms of degree of deviation from desired conditions. The scenic character can be changed over the long term or cumulatively by the alteration of the landscape. Management activities that have the greatest potential of affecting scenery include the following:

- vegetation management and road construction/reconstruction,
- special-use utility rights-of-way,
- mineral extraction, and
- fire suppression.

Alternative A—No action

Project implementation would meet or move towards desired visual quality objectives in the 1986 forest plan. Timber harvest and road construction/reconstruction would continue to occur on the landscape; approximately 33 percent of the Forest is in management areas 6a to 6c general forest area (low-, medium-, and high-intensity vegetation management), with 29 percent in general forest medium- and high-intensity vegetation management. Combining designated wilderness and

recommended wilderness, approximately 49 percent of the Forest would not be available for timber production or timber harvest. Refer to figure 1-60 for alternative A's existing visual quality objectives map.

See table 117 earlier in this section for a cross-reference of the objectives in the visual management system (alternative A) and the terminology used in the scenery management system (alternatives B modified, C, and D). Alternative A (table 121) has a higher percentage of low scenic integrity objectives than the other three alternatives. This is primarily due to the higher percentage of management areas 6b and 6c (timber production) than the other alternatives and the use of the older scenery system. Alternatives A and D have the same percentage in very high scenic integrity (46 percent) but less than alternatives B modified and C. Refer to figure 1-60 for the alternative A existing visual quality objectives map.

Table 121. Scenic integrity objectives (and corresponding visual quality objectives) for alternative A as percent of the Forest

Scenic Integrity Objective (Visual Quality Objectives)	Area of Forest (%)
Very High (Preservation)	46
High (Retention)	13
Moderate (Partial Retention)	8
Low (Modification)	33

Alternative B modified

Project implementation would meet or move towards desired scenic integrity objectives. Timber harvest and road construction/reconstruction would continue to occur on the landscape; approximately 29 percent of the Forest is in general forest area (low-, medium-, and high-intensity vegetation management), with 11 percent in general forest high-intensity timber management. Combining designated wilderness and recommended wilderness, approximately 53 percent of the Forest would not be available for timber production or timber harvest. These two management areas have a scenic integrity level of very high. Refer to figure 1-61 for the alternative B modified scenic integrity objective map.

Alternative B modified (shown in table 122) has more acreage in very high and high scenic integrity objectives than alternatives A and D but less than alternative C.

Table 122. Scenic integrity objectives for alternative B modified as percent of the Forest

Scenic Integrity Objective	Area of Forest (%)
Very High	53
High	12
Moderate	17
Low	19

Alternative C

Project implementation would meet or move towards desired scenic integrity objectives. Timber harvest and road construction/reconstruction would continue to occur on the landscape; approximately 25 percent of the Forest is in general forest area (low-, medium-, and high-intensity vegetation management), with 5 percent in general forest high-intensity vegetation management. Combining designated wilderness and recommended wilderness, approximately 66 percent of the

Forest would not be available for timber production or timber harvest. Refer to figure 1-62 for the alternative C scenic integrity objective map.

Alternative C (shown in table 123) has the highest acreage in very high and high scenic integrity objectives of all the alternatives and the lowest amount in the low scenic integrity objective.

Table 123. Scenic integrity objectives of alternative C as percent of the Forest

Scenic Integrity objective	Area of Forest (percent)
Very High	66
High	9
Moderate	11
Low	14

Alternative D

Project implementation would meet or move towards desired scenic integrity objectives. Timber harvest and road construction/reconstruction would continue to occur on the landscape. Approximately 30 percent of the Forest is in general forest area (low-, medium-, and high-intensity vegetation management), with 12 percent in general forest high-intensity vegetation management. Designated wilderness is approximately 45 percent of the Forest (there is no recommended wilderness in this alternative) and would not be available for timber production or timber harvest. Refer to Figure 1-63 for the alternative D scenic integrity objective map.

Alternative D has an equal amount in very high scenic integrity objective as alternative A. This alternative has more acreage in the low scenic integrity objective than alternatives B modified and C and less than A.

Table 124. Scenic integrity objectives of alternative D as percent of the Forest

Scenic Integrity Objective	Area of Forest (percent)
Very High	46
High	20
Moderate	12
Low	22

Consequences to scenery from forest plan components associated with other resource programs or management activities

Effects of management area allocation

Alternative C contains the most very high scenic integrity objectives, primarily due to its having the most designated and recommended wilderness. It also has the fewest low scenic integrity objectives. Alternative A has the most acres assigned to the low scenic integrity objectives, followed by alternative D, alternative B modified, and alternative C, in that order.

Effects from fire and fuel management

Blackened vegetation and soil, charred tree trunks, and red needles on dead trees would be the main visual effects of fire, and these would decrease in time. In areas where mechanical equipment was used to suppress fire, a visual contrast from fireline construction could be evident depending on slope, the amount of vegetation removed by the fire, and the amount of mineral dirt exposed. Some

effects from fire in fire-adapted ecosystems might be beneficial to scenery, such as increased overall visual diversity due mosaics of vegetative types that reflect natural conditions. Alternative C would have the least impact from fire and fuel management because this alternative would achieve desired conditions for wildlife and other resources primarily through greater use of natural ecosystem processes, such as planned and unplanned fire ignitions.

Effects from vegetation management and roads

Commercial timber harvest activities might result in road construction and reconstruction. New road construction would likely be limited, with temporary road construction used as a more common method for short-term access needs. Timber harvesting would have a variety of effects that might be evident to visitors based on type of logging system used, type of silvicultural treatment, slope, and visibility from roads and trails. Road construction might introduce unnatural visual elements into the landscape, resulting in form, line, color, and texture contrasts.

Because general forest management area (6b and 6c) allocations are lowest in alternative C, which has a greater emphasis on the use of natural ecosystem processes rather than mechanized methods to achieve desired conditions, alternative C would be expected to result in the least vegetation management activities and a lower amount of constructed/reconstructed roads compared to alternatives B modified, A, and D.

Effects from minerals management

Mining activities can involve major landform alteration, as well as form, line, color and texture contrasts, resulting in adverse scenic impacts. The majority of lands outside of designated wilderness would be suitable for mineral in all alternatives. Therefore, the impacts from minerals management would be similar in all four alternatives.

Cumulative effects

Areas modified by timber harvest would continue to appear highly managed over the next 10 to 15 years, and scenic integrity would remain low to very low in those areas. Timber harvest on adjacent private, State, and Federal lands might influence overall scenic integrity in northwestern Montana. Fuel reduction treatments in the wildland-urban interface might also add to these effects. However, the scenic backdrop above the valleys would remain generally unchanged regardless of alternative. Driving for pleasure and other scenery dependent activities on the Forest could be affected slightly by human disturbance to areas under other administrations. Wildland fire and other disturbance processes, if large in scale and intensity, might result in lowered scenic attractiveness for a few years in those areas affected by the disturbance. These effects cannot be predicted or analyzed, but the area would naturally recover over time.

3.12 Infrastructure

3.12.1 Introduction

The Flathead National Forest expects to maintain an appropriately sized and environmentally sustainable road system that is responsive to ecological, economic, and social concerns. The NFS road system would continue to provide access for recreation and resource management as well as to support watershed restoration and resource protection to sustain healthy ecosystems.

Regulatory framework

Law and regulation

Term Permit Act of March 4, 1915 (Pub. L. 63-293, Ch. 144, 38 Stat. 1101, as amended; 16 U.S.C. 497): This act provides direction authorizing occupancy of NFS lands for a wide variety of uses through permits not exceeding 30 years.

National Forest Roads and Trails Act of October 13, 1964 (Pub. L. 88-657, 78 Stat. 1089, as amended): This act declares that an adequate system of roads and trails should be constructed and maintained to meet the increasing demand for recreation and other uses. This act authorizes road and trail systems for the national forests. It authorizes granting of easements across NFS lands, construction and financing of maximum-economy roads (Forest Service Manual 7705), and imposition of requirements on road users for maintaining and reconstructing roads, including cooperative deposits for that work.

Highway Safety Act of September 9, 1966 (Pub. L. 89-564, 80 Stat. 731, as amended): This act authorizes State and local governments and participating Federal agencies to identify and survey accident locations; to design, construct, and maintain roads in accordance with safety standards; to apply sound traffic control principles and standards; and to promote pedestrian safety. The Highway Safety Improvement Program and the Safety Performance Management Measures Final Rules (effective April 14, 2016) address the requirements of the Moving Ahead for Progress in the 21st Century Act and the Fixing America’s Surface Transportation Act. Updates to the existing Highway Safety Improvement Program requirements under 23 CFR § 924 are consistent with Moving Ahead for Progress in the 21st Century Act and the Fixing America’s Surface Transportation Act, and clarify existing program requirements. The Safety Performance Management Measures Final Rule adds part 490 to title 23 of the CFR to implement the performance management requirements under 23 U.S.C. 150, including specific safety performance measure requirements for the purpose of carrying out the Highway Safety Improvement Program to assess serious injuries and fatalities on all public roads.

Federal Aid Highway Act of 1968, as amended (23 U.S.C. 109(a) and (h), 144, 151, 319, and 351): This act establishes the National Bridge Inspection Standards (23 CFR § 650, Subpart C) and the requirement that each state have a current inventory of bridges on all public roads, including NFS roads open to public travel (Forest Service Manual 1535.11).

Surface Transportation Assistance Act of 1978 (Pub. L. 95-599, as amended): This act supersedes the Forest Highway Act of 1958 and authorizes appropriations for Forest highways and public lands highways. Establishes criteria for Forest highways; defines Forest roads, Forest development roads, and Forest development trails (referred to as “NFS roads” and “NFS trails” in Forest Service regulations and directives); and limits the size of projects performed by Forest Service employees on Forest roads. Establishes the Federal Lands Highway Program.

Secure Rural Schools and Community Self-Determination Act of October 30, 2000 (Pub. L. 106-393, 114 Stat. 1607; 16 U.S.C.500 note): This act provides provisions to make additional investments in, and create additional employment opportunities through, projects that improve the maintenance of existing infrastructure, implement stewardship objectives that enhance Forest ecosystems, and restore and improve land health and water quality.

National Best Management Practices for Water Quality Management on National Forest System Lands, Volume 1: National Core BMP Technical Guide, April 2012: This is the first volume of guidance for the Forest Service, U.S. Department of Agriculture, and National Best Management Practices Program. The National Best Management Practices Program was developed to improve agency performance and accountability in managing water quality consistent with the Federal Clean Water Act and State water quality programs. Current Forest Service policy directs compliance with required Federal Clean Water Act permits and State regulations and requires the use of the National Best Management Practices Program to control nonpoint source pollution to meet applicable water quality standards and other Federal Clean Water Act requirements. It includes the National Best Management Practices Program for construction, operation, and maintenance of roads and motorized trails.

Moving Ahead for Progress in the 21st-Century Act of July 6, 2012 (Pub. L. 112-141): This act replaces the Federal Lands Highway Program with the Federal Lands Transportation Program and Federal Lands Access Program. This act authorizes funding for Federal lands transportation facilities and Federal lands access transportation facilities under a unified program, with policy similar to Federal-aid highways and other public transportation facilities. It requires Federal land management agencies to identify a comprehensive inventory of public Federal lands transportation facilities that, at a minimum, includes the transportation facilities that provide access to high-use Federal recreation sites or Federal economic generators.

36 CFR § 212—Travel Management This final rule requires designation of those roads, trails, and areas that are open to motor vehicle use. Designations are made by class of vehicle and, if appropriate, by time of year. This rule prohibits the use of motor vehicles off the designated system, as well as use of motor vehicles on routes and in areas that is not consistent with the designations. Subpart B provides for a system of NFS roads, NFS trails, and areas on NFS lands that are designated for motor vehicle use. After these roads, trails, and areas are designated, motor vehicle use, including the class of vehicle and time of year, not in accordance with these designations is prohibited by 36 CFR § 261.13. Motor vehicle use off designated roads and trails and outside designated areas is prohibited by 36 CFR § 261.13. Subpart C provides for a system of NFS roads, NFS trails, and areas on NFS lands that are designated for over-snow vehicle use. After these roads, trails, and areas are designated, motorized over-snow vehicle use not in accordance with these designations is prohibited by 36 CFR § 261.14. Motorized over-snow vehicle use off designated roads and trails and outside designated areas is prohibited by 36 CFR § 261.14.

Methodology and analysis process

Information sources

Information used to conduct the analysis generally comes from the national infrastructure database. This database is a collection of Web-based data entry forms, reporting tools, and mapping tools (geographic information system) that enables the Forest to manage and report accurate information about the Forest's inventory of constructed features and land units.

Analysis area

The geographic scope of the analysis is NFS lands administered by the Forest. All lands within the Forest boundary form the geographic scope for cumulative effects. The temporal scope of the analysis is the anticipated life of the plan (15 years).

Notable changes between draft and final EIS

Under the “Affected environment” section (section 3.12.2), additional information on the 2001 Road Management Rule and the 2014 Flathead travel analysis report was added.

3.12.2 Affected environment (existing condition)

National Forest System roads

The transportation system for the Forest is defined as the system of NFS roads, NFS trails, and airfields on NFS lands (36 CFR § 212.1). This section covers the existing condition of the NFS roads. See section 3.10 for a discussion of access and effects to NFS trails and motorized over-snow vehicle use.

National Forest System roads are roads under the jurisdiction of the Forest Service, wholly or partly within or adjacent to and serving the NFS, that the Forest Service determines are necessary for the protection, administration, and utilization of the NFS and for the use and development of its resources. Roads managed by public road agencies such as States, counties, and municipalities that help provide access to NFS lands are also informally considered part of the overall regional transportation system but do not fall under the jurisdiction or direction of the national forest. These roads are not included in this evaluation.

The Road Management Rule was published in the Federal Register on January 12, 2001.The Rule “removes the [prior rule’s] emphasis on transportation development and adds a requirement for science-based transportation analysis.” In addition, “The intended effect of this final rule is to help ensure that additions to the National Forest System network of roads are those deemed essential for resource management and use; that, construction, reconstruction, and maintenance of roads minimize adverse environmental impacts; and, finally, that unneeded roads are decommissioned and restoration of ecological processes are initiated” (Federal Register Vol. 66, No 9, p. 3206).

Subpart A of the rule pertains to administration of the Forest transportation system. In part, Subpart A requires each unit of the NFS to (1) identify the minimum road system needed for safe and efficient travel and for protection, management, and use of NFS lands (36 § CFR 212.5(b)(1)) and (2) identify roads that are no longer needed to meet forest resource management objectives (36 CFR § 212.5 (b)(2)). In determining the minimum road system, the responsible official must incorporate a science-based roads analysis at the appropriate scale. It is Forest Service policy (Forest Service Manual 7710.3) that the travel analysis process (defined at Forest Service Handbook 7709.55, chap. 20) is to serve as the “science-based roads analysis” required by 36 CFR § 212.5 (b)(1). Travel analysis is not a decisionmaking process. Rather, travel analysis informs decisions relating to administration of the Forest transportation system and helps to identify proposals for change (Forest Service Manual 7712).

The Forest completed a travel analysis report in 2014 (USDA, 2014f). This broad-scale analysis encompasses all existing NFS roads on the Forest. The report provides an assessment of the road infrastructure and a set of findings and opportunities for change to the Forest transportation system. This report provides information to Forest managers regarding the minimum road system needed for safe and efficient travel and for administration, utilization, and protection of NFS lands.

The travel analysis report is used by the Forest to prioritize maintenance needs and identify opportunities to decommission roads or put them into intermittent stored service as the Forest works to identify the minimum number of routes needed for an efficient transportation system, as directed in 36 CFR § 212 subpart A. The travel analysis report identified approximately 54 miles of NFS roads as "not likely needed for future use" that may be considered candidates for conversion to another use, storage for future use, or removal through decommissioning. Other roads that were rated as "high risk" were identified as candidates for storage for future use, reconstruction, relocation of the road, or additional road maintenance. Roads considered "low risk" are the first to be considered for reduced road maintenance (i.e., a change to a lower maintenance level).

Neither the travel analysis report nor the forest plan makes travel management decisions. Site-specific, project-level analysis under the National Environmental Policy Act (NEPA) is required to make travel management decisions, including road closure, storage, or decommissioning.

National forest system roads are designated by the design (vehicle classifications and use) and maintenance standards for each road. Roads are generally constructed and maintained wide enough (> 12 feet) for typical cars and trucks. Since many of the roads were initially constructed for vegetation management objectives, the design vehicles were lowboys or logging trucks. Roads are constructed to grades of usually less that 12 percent to allow travel by most highway vehicles. The Forest Service uses five maintenance levels to define the general design standards, uses, and associated type of maintenance required. These five maintenance levels are as follows:

- Maintenance level 1. Assigned to roads that have been placed in storage between intermittent uses. The period of storage must exceed one year. Basic custodial maintenance is performed to prevent damage to adjacent resources and to perpetuate the road for future resource management needs. Emphasis is normally given to maintaining drainage facilities and runoff patterns. Planned road deterioration may occur at this level. Roads managed at this maintenance level are described as being in basic custodial care.
- Maintenance level 2. Assigned to roads open for use by high-clearance vehicles. Passenger car traffic, user comfort, and user convenience are not considerations. Warning signs and traffic control devices are generally not provided. Motorists should have no expectations of being alerted to potential hazards while driving these roads. Traffic is normally minor, usually consisting of one or more of a combination of administrative, permitted, dispersed recreation, or other specialized uses. Roads managed at this maintenance level are described as high-clearance vehicle roads.
- Maintenance level 3. Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities. Roads in this maintenance level are typically low speed with single lanes and turnouts and are included in the term "passenger car" roads.
- Maintenance level 4. Assigned to roads that provide a moderate degree of user comfort and convenience at slow to moderate travel speeds. Most roads are double lane and aggregate surfaced. However, some roads may be single lane. Some roads may be paved and/or dust abated.
- Maintenance level 5. Assigned to roads that provide a high level of user comfort and convenience at slow to moderate travel speeds. The roads are normally double-lane, paved facilities. Some may be aggregate surfaced and dust abated.

Maintenance level 3 through 5 roads are collectively maintained for travel by a prudent driver in a standard passenger car. These roads fall under the requirements of the National Highway Safety Act

and the Manual of Uniform Traffic Control Devices. Warning signs and traffic control devices are provided to alert motorists of situations that may violate expectations.

Forestwide, there are 3,559 miles of NFS roads; 60 percent (2,130 miles) of these roads are in custodial care (closed to public motorized use); 40 percent (1,427 miles) are open to public motorized use (either yearlong or seasonally), with 33 percent open for high-clearance vehicles and 66 percent open for passenger cars. The following tables (table 125 through table 128) provide information related to the distribution of roads on the Forest by maintenance level grouping (basic custodial care, high-clearance vehicles, and passenger cars) and availability for public motor vehicle use.

Table 125. Percentage of NFS roads by maintenance level grouping on the Forest, primary conservation area (PCA), demographic connectivity area (DCA), and zone 1

Area	Basic Custodial Care (%)	High-Clearance Vehicles (%)	Passenger Cars (%)
Forest	59	14	27
PCA	64	10	26
Salish DCA	43	25	32
Zone 1, outside DCA	54	18	28

Table 126. Miles of NFS roads open to the public by maintenance level on the Forest, primary conservation area (PCA), demographic connectivity area (DCA), and zone 1

Area	Basic Custodial Care (Miles)	High-Clearance Vehicles (Miles)	Passenger Cars (Miles)
Forest	5	464	958
PCA	4	211	603
Salish DCA	< 1	93	119
Zone 1, outside DCA	1	139	217

Table 127. Miles of NFS roads closed to the public by maintenance level on the Forest, primary conservation area (PCA), demographic connectivity area (DCA), and zone 1

Area	Basic Custodial Care	High-Clearance Vehicles	Passenger Car
Forest	2,101	27	3
PCA	1486	23	3
Salish DCA	161	2	0
Zone 1, outside DCA	414	3	0

Table 128. Miles of NFS roads receiving maintenance, percentage of passenger car system and high-clearance car system receiving maintenance, on the Forest for 2010 to 2015

Year	NFS roads Receiving Maintenance (Miles)	Passenger Car System Receiving Maintenance (%)	High-Clearance Car System Receiving Maintenance (%)
2015	494	73	16
2014	401	66	14
2013	690	62	4
2012	691	62	2

Year	NFS roads Receiving Maintenance (Miles)	Passenger Car System Receiving Maintenance (%)	High-Clearance Car System Receiving Maintenance (%)
2011	1,446	99	22
2010	1,454	99	20

As shown in table 129, the total number of roads on the Forest has been steadily decreasing since 1995. A total of about 787 miles of NFS roads and non-NFS roads have been decommissioned during this time. Most of this decommissioning has taken place in grizzly bear recovery areas and bull trout watersheds. However, there have been additions to the NFS road system. These additions include the construction of new roads for vegetation management (19 miles), acquisition related to cooperative road right-of-way agreements with the Montana Department of Natural Resources and Conservation (approximately 12 miles), Plum Creek Timber Company acquisition (411 miles), and database cleanup (remapping existing roads). The majority of the increase is due to the acquisition of lands previously owned by Plum Creek Timber Company located in the Swan Valley.

Table 129. Miles of NFS and non-NFS roads decommissioned from 2004 to 2015 on the Forest

Decommissioned Roads	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Miles	42	28	47	42	48	22	55	12	13	4	13	25

Aviation

Public airstrips on the Forest are considered infrastructure and are a segment of the transportation system. Four existing open airstrips on the Forest are available for public use: Schafer Airstrip (a wilderness airstrip), Meadow Creek Airstrip along the South Fork of the Flathead River, Spotted Bear Airstrip, and Condon Airstrip. There are 20 private airstrips in the Flathead Valley area that may be available for public use. The State of Montana in 2011 had a total of 258 airstrips: 121 were open for public use, 15 were commercial service airports, and 134 were private airstrips (Federal Aviation Administration, 2017).

3.12.3 Environmental consequences

Alternative A—No action

The no-action alternative would fully implement amendment 19 of the Flathead forest plan. This amendment requires that bear management subunits that have >75 percent of NFS lands must meet the following direction, also known as "19-19-68":

- Open motorized access density: ≤ 19 percent of subunit to be ≤ 1.0 mile/square mile.
- Total motorized access density: ≤ 19 percent of subunits to be ≤ 2.0 miles/square mile.
- Security core: ≥ 68 percent of subunit to be in security core as defined in the glossary.

To achieve this direction, an additional estimated 518 miles of roads on the Forest would need to be reclaimed. About 57 miles of trails would no longer allow motorized wheeled use in order to fully meet amendment 19 in each bear management subunit, unless site-specifically amended. These figures are an estimated programmatic assessment of the number of miles needed to meet amendment 19 management direction. The actual number may be higher or lower depending upon changing access condition on adjacent lands and the site-specific factors that must be considered when evaluating access and grizzly bear habitat needs. About 79 miles of roads that are open either yearlong or seasonally would be closed to public use. This alternative would provide the least

opportunity for wheeled motor vehicle use (allowed on designated roads) on 1,262 miles of the Forest.

Amendment 19 applies only to 54 bear management subunits on the Forest within the NCDE primary conservation area that are mostly non-wilderness. It does not apply to the portions of the Salish Mountains geographic area west of U.S. Highway 93 because it is outside of the primary conservation area zone; therefore, motorized use would not be reduced there.

The Forest's trail system could increase by roughly 25 miles because a segment of a road becomes a trail when a road segment is closed and the trailhead has to be relocated. This could result in an increase in nonmotorized as well as motorized trails. See table 130 and table 131 for additional information.

Table 130. List of bear management subunits and the estimated miles of NFS roads to close necessary to meet amendment 19 requirements

Bear Management Subunit Name	Estimated miles of road to close to meet amendment 19 requirements
Hay Creek	11
Canyon McGinnis	2
Peters Ridge	10
Swan Lake	9
Crane Mountain	33
Beaver Creek	13
Emery Firefighter	9
Logan Dry Park	19
Skyland Challenge	4
Buck Holland[2]	40
Cold Jim[2]	68
Glacier Loon[2]	56
Hemlock Elk[2]	25
Lion Creek[1, 2]	36
Meadow Smith[2]	58
Piper Creek[2]	43

1. Lion Creek bear management subunit still does not meet the amendment 19 motorized access standards even with this reduction in miles due to mixed ownership.
2. This subunit in the Swan Valley geographic area now has > 75 percent NFS lands due to the recent acquisition of lands from Plum Creek Timber Company through the Montana Legacy Project.

Table 131. Summary of travel management actions needed to meet motorized access direction for full implementation of amendment 19 in all bear management subunits

Current Travel Management	Potential Travel Management	Miles
Open yearlong/seasonal roads	Closed yearlong by gate	7
Open yearlong/seasonal roads	Closed yearlong by physical barrier	55
Open yearlong/seasonal roads	To be reclaimed	17
Closed yearlong signed/gated roads	Closed by physical barrier	91
Gated yearlong roads	To be reclaimed	280

Current Travel Management	Potential Travel Management	Miles
Roads with physical barriers	To be reclaimed	215
Currently impassable roads	To be reclaimed	30

Alternative B modified

Under alternative B modified, bear management subunits within the Forest's primary conservation area would need to maintain or be below baseline levels for motorized road access. This alternative and alternative D would provide the most opportunity for wheeled motor vehicle use—1,431 miles of designated NFS roads on the Forest.

In order to support the continued recovery of the NCDE grizzly bear population, roads open to public motorized use in the Salish geographic area would not exceed baseline levels.

Under alternative B modified, existing wheeled motorized trails and areas are not included in any recommended wilderness areas, so there would be no change in miles or acres. Alternatives B modified and D provide the same amount of wheeled motor trail opportunity, which is higher than under alternatives A or C.

About 4.5 miles of closed roads (maintenance level 1) that are currently within the areas recommended as wilderness under this alternative might need to be to be removed from the system after site-specific analysis.

Alternative C

Under alternative C, to continue to support the recovery of the NCDE grizzly bear population, roads open to public motorized use in the Salish Mountains geographic area would not exceed baseline levels, but some additional motorized trail access could occur in zone 1, including the Salish demographic connectivity area. For the primary conservation area bear management subunits, motorized access standards would not necessitate additional road closures, but the baseline levels that support the continued recovery of the NCDE grizzly bear population would be maintained.

Under alternative C, existing wheeled motorized use would not be suitable in recommended wilderness areas, which would reduce the motorized trail opportunity for wheeled motorized vehicles by 75 miles on the Forest.

In addition, about 48 miles of closed roads (maintenance level 1) that are currently within the recommended wilderness areas may need to be to be removed from the system after site-specific analysis.

This alternative provides more wheeled motorized vehicle use than alternative A but less than alternatives B modified and D.

Alternative D

Under alternative D, to support the continued recovery of the NCDE grizzly bear population, roads open to public motorized use in the Salish geographic area would not exceed baseline levels, but some additional motorized trail access could occur in zone 1, including the Salish demographic connectivity area. Bear management subunits in the primary conservation area that do not yet meet the motorized access standards would not need additional road closures, but the baseline levels that support the continued recovery of the NCDE grizzly bear population would be maintained.

Under alternative D, existing motorized use would not be affected. This alternative would provide the opportunity for wheeled motor vehicle use (on designated roads) on 1,427 miles of the Forest. Alternative D and alternative B modified would provide the most opportunity for wheeled motor vehicle use (on designated roads).

Aviation

All action alternatives include a suitability plan component for new airstrip development in desired recreation opportunity spectrum classes of semiprimitive motorized and roaded natural in management areas 6b (general forest medium-intensity vegetation management and 6c (general forest high-intensity vegetation management). Alternative B modified, has 548,279 acres of semiprimitive motorized and roaded natural recreation opportunity spectrum classes in management areas 6b and 6c; alternative C has 375,993 acres of semiprimitive motorized and roaded natural recreation opportunity spectrum classes in management areas 6b and 6c; and alternative D has 589,967 acres of semiprimitive motorized and roaded natural recreation opportunity spectrum classes in management areas 6b and 6c.

Consequences to infrastructure from forest plan components associated with other resource programs or management activities

Effects of management allocation

Road maintenance (both recurrent and deferred) will continue to occur, as funding allows. Physical conditions will continue to be addressed through maintenance activities and will be based on public health and safety, resource protection, and mission priorities. Annual operating budgets and supplemental funding will likely fluctuate, resulting in varying maintenance levels achieved from year to year.

The condition (e.g., drivability) of roads may vary between alternatives. This is mainly a result of the different levels of road maintenance work that might be accomplished under the four alternatives. Since alternative C has the fewest acres allocated to general forest (management areas 6a to 6c), fewer road maintenance activities may be accomplished because commercial use and associated maintenance is expected to be less. Under alternative D, which has the most acres allocated to general forest, more commercial use might be expected, which might result in the most road maintenance.

Routine road maintenance work (brushing, blading, ditch and culvert cleaning, etc.) is periodically performed on approximately 1,451 miles of maintenance level 2, 3, 4, and 5 roads as funding allows, and in most cases they are kept in a drivable condition for their designed use. The approximately 2,106 miles in maintenance level 1 (which includes roads treated for intermittent stored service), however, do not receive routine maintenance work. The drivability of these maintenance level 1 roads can be expected to continue to diminish as roads revegetate.

Effects from vegetation management

Commercial timber harvest activities will generally result in road maintenance and reconstruction and the continued application of best management practices on existing NFS roads. New road construction is likely to be limited; temporary road construction will be used more to meet short-term access needs.

Administrative use of gated roads that normally prohibit motor vehicle use yearlong is likely when management activities such as precommercial thinning, invasive weed treatments, or other noncommercial silvicultural treatments are planned.

Because general forest (management areas 6a, 6b, and 6c) allocations are lowest under alternative C (25 percent), this alternative would generally be expected to result in the least amount of vegetation management activities and a lower amount of road use compared to alternatives A (33 percent), and D (30 percent), and B modified (29 percent). Consequently, reduced traffic (i.e., number of vehicles on roads), both commercial and administrative, would be expected under alternative C. Associated with reduced commercial use would be less road reconstruction to standard and best management practices work. Road maintenance activities typically done in conjunction with commercial use would also occur less often because the need for road maintenance is closely tied to use.

Effects from fire and fuels management

Fuels management activities (e.g., prescribed burning) and fire suppression actions are likely to continue. Administrative use of gated roads that normally prohibit motor vehicle use yearlong is likely when these management activities occur.

Fire suppression actions are also likely to continue and could also result in the administrative use of gated roads. In some cases, roads in storage (maintenance level 1) that are impassible to motor vehicle use (due to revegetation or other restrictive conditions) may be opened in order to facilitate suppression actions. These roads would probably be used for the duration of the suppression efforts and post-fire work and then returned to their previous status.

Effects from wildlife management

All alternatives would support the continued recovery of the NCDE grizzly bear population. For example, all alternatives would retain levels of open or total road densities and secure core that have supported grizzly bear recovery on the Flathead National Forest. Alternatives differ in the range of future actions that could occur. Alternative A would close approximately 518 additional miles of motorized roads. Alternative B modified would maintain baseline motorized access levels (see “baseline” in glossary). Alternative C would greatly increase the amount of recommended wilderness, whereas alternative D would not recommend any areas for wilderness.

Alternatives B modified and D would allow the greatest temporary increases in motorized access for projects in the primary conservation area because these two alternatives have the greatest number of acres in management areas 6b and 6c. Alternative C would allow the least temporary increase in motorized access for projects in the primary conservation area as this alternative has the lowest number of acres in management areas 6b and 6c and the highest number of acres in recommended wilderness and nonmotorized backcountry management areas. Under alternative A, there would be few temporary changes in motorized access due to projects in security core (with the exception of emergency access) and few changes in areas with decommissioned roads. There would be temporary increases in motorized access for projects on gated roads.

Effects from minerals management

The Forest Service does not initiate exploration or development of mineral or energy resources. Proposals for exploration and development are driven by external parties and market forces and regulated by existing mining law. Access and road development (long-term or temporary) is often associated with mineral exploration and development, but a site-specific analysis is required prior to any approval of exploration or development activities.

If any mine reclamation activities occur, they would likely use existing roads. These may be roads that are not currently designated for motor vehicle use. They would probably be used for the duration of the reclamation work and then returned to their previous status.

Effects from aquatic management

Watershed improvement activities are likely to continue. The consequences on motor vehicle access of the implementation of watershed improvements are expected to be minimal. One activity that may occur on roads that are generally not designated for motor vehicle use is the treating of roads to reduce sediment production and transport to surface waters or to provide for aquatic organism passage. Actions taken might be culvert removal, outsloping of road prisms, or the removal of unstable fills. Roads that receive these types of treatments are generally no longer drivable. On occasion, these treatments may be completed on roads that are currently designated for motor vehicle use and may result in traffic delays or temporary closures of open roads while construction occurs, but this is expected to occur infrequently.

Numerous plan components related to infrastructure (FW-STD-IFS-06 and 07; FW-GDL-IFS-03 through 10 and 13) are designed to minimize the transport of sediment from roads to waterbodies. Generally, these plan components would not affect the public use of roads except for the decommissioning of roads, which may restrict motorized travel depending on the site-specific decision. Road conditions on existing roads would have improved conditions through proper best management practices and maintenance, and decommissioned roads would have improved hydrologic conditions due to the disconnection of the road from the stream system.

Cumulative effects

Access across the Forest is likely to be influenced by a variety of factors. Given the mixed land ownership (State lands, corporate timberlands) in and around the Forest and the ongoing management actions taken on these lands, new access opportunities may arise through cooperative and cost-share agreements.

Commercial traffic (timber hauling) can be expected to fluctuate to some degree, depending on vegetation management activities. Market conditions and other external factors often influence activity levels. These traffic conditions are usually limited to relatively small geographic areas and short periods of time. Hauling occurs more often during the summer months but is not uncommon during the winter months.

Changes in ownership of private lands can result in continued requests for road access across NFS lands. Depending on the circumstances, these may be requests for Forest or private road special-use authorizations. Depending on the terms and conditions written into any new authorizations, new opportunities for access to NFS lands may be created.

State and local government agencies with road management authority can be expected to continue to maintain their existing road network across the Forest. Some changes, such as widening, resurfacing, and bridge replacements, are probable but are dependent on budgets and funding allocations. The likelihood of jurisdiction of NFS roads being passed to other public road agencies is low.

3.13 Lands and Special Uses

3.13.1 Introduction

This section addresses land ownership administration and adjustments and special uses of NFS lands on the Forest. The management of NFS land includes the surveying and marking of boundaries, acquisition and exchange of lands, handling of title claims and encroachments, acquisition of rights-of-way, and authorization and management of special uses to protect resource values and the interests of the Federal government.

Adjustments of land ownership can occur through congressionally mandated conveyances, exchanges, and acquisitions or through Forest Service administrative activities. The objectives of the Forest Service land ownership adjustment program (Forest Service Manual 5402) are to

- achieve the optimum land ownership pattern to provide for the protection and management of resource uses to meet the needs of the nation now and in the future;
- avoid land use conflicts with non-Federal landowners by settling land claims equitably and promptly; and
- provide resource administrators readily accessible and understandable title information affecting the status and use of the lands and resources they administer.

Land occupancy and use by private parties and other government entities is managed through the issuance of special-use authorizations. Authorized special uses on the Flathead include industrial or commercial uses, private uses, and a variety of recreational uses.

All occupancy, use, or improvements on NFS lands that are not directly related to timber harvest, grazing, mining activities, and recreation are referred to as “non-recreation special uses.” Typically, non-recreation special uses include roads, utilities, storage facilities, communications sites, research, and commercial filming. Recreation special uses include resorts, ski areas, outfitters and guides, and a variety of uses that provide access to NFS lands through commercial ventures. Use and occupancy of NFS lands may be authorized when such use is determined to be in the public interest.

Regulatory framework

The following is a select set of the statutory authorities that govern landownership adjustments and the issuance and administration of special-use authorizations on the Flathead National Forest. They are briefly identified and described below to provide context to the management and evaluation of these resources. There are multiple other laws, regulations, and policies not described below that also guide the management of these programs; see Forest Service Manuals 2700, 5400, and 5500 for a comprehensive listing.

Laws and executive orders

Organic Administration Act of June 4, 1897 (16 U.S.C. 477-482, 551): This act authorizes the Secretary of Agriculture to issue rules and regulations for the occupancy and use of the national forests. This is the basic authority for authorizing use of NFS lands for other than rights-of-way.

Preservation of American Antiquities Act of June 8, 1906 (16 U.S.C. § 431 et seq.): This act authorizes permits for archeological and paleontological exploration involving excavation, removal, and storage of objects of antiquity or permits necessary for investigative work requiring site disturbance or sampling that results in the collection of such objects.

Occupancy Permits Act of March 4, 1915 (16 U.S.C. § 497 et seq.), as amended: This act authorizes use and occupancy on NFS lands for recreational purposes, including resorts and recreation residences.

General Exchange Act of March 20, 1922 (16 U.S.C. 485, 486): This act authorized the Forest Service to consolidate its holdings in national forests where a large percentage of private lands are intermingled with national forest lands. It makes possible the exchange of inholdings within national forests for private lands of equal value and within the same State.

Section 7 of the Granger-Thye Act of April 24, 1950 (16 U.S.C. 490, 504, 504a, 555, 557, 571c, 572, 579a, 580c-5801, 581i-1): This act authorizes special-use permits not to exceed 30 years in duration for the use of structures or improvements under the administrative control of the Forest Service and for the use of land in connection therewith, without acreage limitation.

Highway Act of August 27, 1958 (23 U.S.C. 317), supplemented by the Act of October 15, 1966 (49 U.S.C. 1651): This act authorizes the Federal Highway Administration to grant easements to States for highways that are part of the federal-aid system or that are constructed under the provision of chapter 2 of the Highway Act. The Forest Service consents to the grant of these easements in a form agreed upon by the two agencies and upon the state highway agency's execution of stipulations. This is the only authority for granting rights-of-way for projects on the federal-aid system or projects constructed under the provisions of chapter 2 of the Highway Act (Forest Service Manual 2731).

Wilderness Act of September 3, 1964 (16 U.S.C. 1131-1136): This act establishes requirements for special use authorizations in designated wilderness areas for temporary structures, commercial public services and access to valid mining claims and non-federal lands. Under this act, Presidential approval is necessary for the establishment of new water facilities, power projects, and transmission lines. Except for the Alaska National Interest Lands Conservation Act of December 2, 1980, this act is the exclusive authority for rights-of-way occurring within designated wilderness areas.

Land and Water Conservation Fund Act of September 3, 1964, as amended (16 U.S.C. 4601-6a(c)): Section 4(c) of this act authorizes permits for recreation, such as group activities, organized events, motorized recreational vehicle use, and other specialized recreation activities of limited duration.

National Forest Roads and Trails Act of October 13, 1964 (16 U.S.C. 532-38): This act authorizes the Secretary of Agriculture to grant temporary or permanent easements to landowners who join the Forest Service in providing a permanent road system that serves lands administered by the Forest Service and lands or resources of the landowner. It also authorizes the grant of easements to public road agencies for public roads that are not a part of the federal-aid system (Forest Service Manual 2732).

Sisk Act of December 4, 1967, as amended (16 U.S.C. 484a): This act authorizes the exchange of lands with states and local governments.

National Environmental Policy Act of January 1, 1970 (42 U.S.C. 4321, 4331-4335, 4341-4347): This act directs all agencies of the Federal government to utilize a systematic interdisciplinary approach to ensure the integrated use of the natural and social sciences in planning and decisionmaking that may have an impact on the human environment.

The Act of November 16, 1973 (30 U.S.C. 185): This act, amending Section 28 of the 1920 Mineral Leasing Act, authorizes the Forest Service to issue authorizations for oil and gas pipelines and related facilities located wholly on NFS land. When the land is under the jurisdiction of two or more Federal agencies, authority for issuance is reserved to the U.S. Department of the Interior, Bureau of Land Management, subject to approval by the agencies involved.

Endangered Species Act of 1973 (16 U.S.C. 1531-1536, 1538-1540): This act provides for the conservation of endangered and threatened species and their habitats.

Federal Land Policy and Management Act of October 21, 1976 (43 U.S.C. 1761-1771): Title V of the Federal Land Policy and Management Act authorizes the Secretary of Agriculture to issue permits, leases, or easements to occupy, use, or traverse NFS lands. The Federal Land Policy and Management Act directs the United States to receive fair market value unless otherwise provided for by statute and provides for reimbursement of administrative costs in addition to the collection of land use fees (43 U.S.C. 1764(g)).

Alaska National Interest Lands Conservation Act of 1980 (16 U.S.C. 3210): The Alaska National Interest Lands Conservation Act (ANILCA) provides numerous authorities related to access that are specific to national forests in Alaska. The provisions of section 1323(a) (16 U.S.C. 3210) of this act, however, apply to all NFS lands. This section provides that, subject to terms and conditions established by the Secretary of Agriculture, the owners of non-Federal land within the NFS shall be provided adequate access to their land. Regulations implementing section 1323(a) are set forth in 36 CFR § 251, subpart D—Access to Non-federal Lands. See Forest Service Manual 2701.3, paragraph 3, for the summary of the provisions of 36 CFR § 251, subpart D.

Small Tracts Act of January 12, 1983 (16 U.S.C. 521c-521i): This act authorizes the sale, exchange, or interchange of certain parcels of minimal size.

National Forest Ski Area Permit Act of 1986 (16 U.S.C. 497b): This Act authorizes the Secretary of Agriculture to issue permits for ski areas and other snow sports and recreational uses on NFS lands.

Act of May 26, 2000 (16 U.S.C. 406l-6d): This act supplements the authority of the Secretary of Agriculture to regulate commercial filming and still photography on NFS lands. It also authorizes the Secretary to retain and spend land-use fees collected for commercial filming and still photography without further appropriation and provides for recovery of administrative and personnel costs in addition to the collection of the land use fee.

Federal Lands Recreation Enhancement Act of 2004 (16 U.S.C. 6801-6814): This act authorizes the Forest Service to charge standard and expanded amenity recreation fees and to require and charge fees for special recreation permits. Fee revenues may be retained and spent by the Forest Service in accordance with the act’s requirements.

Cabin Fee Act of December 22, 2014 (16 U.S.C. 3193, 6901, 6201): This act directs the Forest Service to modify the Recreation Residence Program as the program applies to units of the NFS derived from the public domain by implementing a simple, equitable, and predictable procedure for determining cabin user fees.

Code of Federal Regulations (CFR): The following regulations provide direction for the management of special uses on NFS lands:

- **36 CFR § 251**— Land Uses, subparts A: Miscellaneous Land Uses; B: Special Uses; C: Appeal of Decisions Relating to Occupancy and Use of NFS Lands; D: Access to Non-Federal Lands; and E: Revenue-Producing Visitor Services in Alaska.
- **36 CFR § 254** — Landownership Adjustments, Subparts A: Land Exchanges; B: National Forest Townsites; C: Conveyance of Small Tracts.

Key indicators

- Potential change to acres of NFS land administered
- Potential change to number of special-use authorizations

Methodology and analysis process

The number of acres of NFS lands currently administered by the Flathead and the number of special-use authorizations currently in effect were compared to potential changes that might result from implementation of any of the alternatives considered.

The official acreage for NFS lands comes from the Forest Service's Land Status Record System. The data source for the number of special-use authorizations is the national special-uses database system.

Information sources

The Forest Service uses the Land Status Record System as the repository for all realty records and land title documents. The Land Status Record System includes accurate information on ownership acreages, condition of title, administrative jurisdiction, rights held by the United States, administrative and legal use restrictions, encumbrances, and access rights on land or interests in land in the NFS.

The Forest Service uses the special-uses data system to create and administer special-use authorizations. This data is supported by hard-copy files held at the ranger district and Forest Supervisor's offices.

3.13.2 Affected environment (existing condition)

Lands

There are 2,413,573 acres of NFS lands that are the administrative responsibility of the Flathead National Forest.[1] This is the result of the original congressionally designated lands and the conveyances (acquisitions, disposals, and exchanges) that have occurred to date.

The Flathead landownership pattern varies with location (see figure 2 in volume 1).The pattern can be characterized as

- large blocks of uninterrupted, contiguous NFS lands;
- isolated tracts of private lands surrounded by NFS lands;
- isolated tracts of NFS lands surrounded by private lands; and
- large blocks owned by corporate landowners.

[1] Note that the source of this acreage is the Land Areas of the National Forest System report (USDA, 2015f), which differs from the Flathead National Forest GIS acreage.

Within the proclaimed boundaries of the Flathead National Forest, other individuals or entities own 237,215 acres. Landowners include the State of Montana, Plum Creek Timber Company, The Nature Conservancy, the USFWS, and numerous private landowners.

About 1,050 miles of property boundary lines have been surveyed, marked, and posted out of a total of 1,430 miles (73 percent complete). An additional approximately 610 miles of non-property boundaries, such as wilderness boundaries, have been identified as needing to be surveyed and posted.

Ownership

In 1986, when the current forest plan went into effect, the Forest included 2,350,383 acres of NFS lands. Since then, the Forest has acquired 63,190 acres of lands through the Land and Water Conservation Fund, a Federal program set up for acquiring land and water, and easements on land and water for the benefit of all Americans. Most of these lands are in the Swan Valley and were acquired through the Montana Legacy Project and subsequent Land and Water Conservation Fund purchases by the United States. The Montana Legacy Project included a large donation from The Nature Conservancy of land they had purchased from Plum Creek Timber Company in partnership with the Trust for Public Land. This former Plum Creek land was intermingled with NFS lands in a checkerboard pattern in the Swan Valley. This change to a mostly NFS lands ownership pattern allows the Forest to manage its lands for multiple resources more effectively. If additional funding becomes available, the Forest can purchase the rest of the property (approximately 160 acres) that The Nature Conservancy has acquired from Plum Creek.

There have been other land acquisitions across the Forest obtained with Land and Water Conservation Fund funds. Additionally, the Forest periodically exchanges lands for the mutual benefit of each party. Although there are still some areas of the Flathead that have intermingled ownerships of land, there are no significant acquisitions or exchanges of lands in process, partly due to decreased available funding.

Special uses

Some uses of NFS lands are covered by special-use authorizations, including permits, leases, and easements that allow occupancy, use, rights, or privileges on the Flathead National Forest. Special-use authorizations are legal instruments whose terms and conditions are fully enforceable when consistent with laws, regulations, and policies. The mission of the Forest Service's Special Use Program is to manage the use and occupancy of NFS lands in a manner that protects natural resource values, promotes public health and safety, and is consistent with the forest plan.

The Forest currently administers 574 issued special-use permits, of which 145 are categorized as recreation permits and 429 as lands permits. Recreation permits range from outfitter/guide permits to developed ski areas and other resorts. There are two developed ski areas under permit on the Forest: Blacktail Mountain Ski Area west of the town of Lakeside, Montana in the Salish Mountains geographic area and Whitefish Mountain Resort north of the city of Whitefish, Montana, which borders the Salish Mountains and North Fork geographic areas.

Lands special uses range from permits for individuals to use NFS land for their driveways to more extensive uses such as power lines, fiber optic cable, telephone lines, and oil and gas pipelines that cover many miles of NFS lands. Other land uses under permits include communications towers, research studies, fences, signs, and service buildings.

Partial interests

Various parties hold partial land interests within and near the plan area, such as mineral rights or conservation easements. Over the life of the current forest plan (since 1986), the Forest has acquired 65 conservation easements on private lands in the plan area, under the authority of the Wild and Scenic Rivers Act. Of these, 58 were purchased or acquired as part of land exchanges, six were donated to the Forest, and one was acquired through condemnation. Sixty-two of the conservation easements are in the wild and scenic river corridors of the North Fork and Middle Fork of the Flathead River. The other three are in the Swan Valley. The purpose of these easements is to maintain the integrity of the wild and scenic rivers. There are additional benefits to these conservation easements, such as the maintenance of fish and wildlife habitat.

Rights-of-way and easements affect both private and public lands throughout the plan area. The Forest has reserved or acquired rights-of-way needed for public and administrative access and has granted private or other public entities rights-of-way for access across NFS lands.

Access

In this section, access refers to the legal rights-of-way acquired by the Forest Service across non-NFS land for the management and use of NFS lands. Of the 2,413,573 acres of NFS lands on the Forest, the Forest has legal access to all but approximately 850 acres of land in 11 parcels. Those 11 parcels are scattered across the Forest—two of them are on the North Fork of the Flathead River, two of them are on the Middle Fork of the Flathead River, and two of them are on the main stem of the Flathead River. Four other parcels are located in the Salish Mountains geographic area, and one parcel is located in the Swan Valley. Most of these parcels could be accessed legally from rivers, but they are considered inaccessible since they cannot be accessed by land. Other than the parcels noted above, all NFS lands on the Forest have legal access by road or trail.

3.13.3 Environmental consequences

Alternative A—No action

This alternative reflects the 1986 forest plan, as amended, and accounts for current laws and regulations that have been issued since the original forest plan and the amendments that were adopted. The 1986 forest plan recognized the desirability of adjusting landownership in order to improve manageability of NFS lands.

The number of special-use permits, rights-of-way, and easements might be impacted by a change in access. Under this alternative, based on amendment 19, it is estimated that 518 miles of roads would need to be closed or reclaimed in the primary conservation area. Additionally, roughly 57 miles of wheeled motorized trails would need to be closed to motorized use. Because of this, alternative A has the highest potential impact on special-use permits, rights-of-way, and easements due to reduced access to NFS lands.

Alternatives B modified, C, and D

None of the alternatives propose any site-specific changes to the existing land ownership on the Forest. No conveyances (acquisitions, disposals, or exchanges) are proposed. Any of these actions would only be considered at the project level. Until an external entity presents a proposal, there would be no changes to the existing landownership pattern.

Since no changes in land ownership are proposed, the acreage of NFS lands would remain the same for all alternatives. The number of special-use permits, rights-of-way, and easements might be

impacted by a change in access. For all action alternatives, bear management subunits in the primary conservation area would need to maintain or be below baseline levels for motorized road access. This would have no impact on access for special uses, rights-of way, or easements.

Under alternatives B modified and D, there would be no change in wheeled motor vehicle use (allowed on designated roads). Under alternative C, wheeled motorized use would not be suitable in recommended wilderness areas, which would reduce the amount of motorized trail opportunity for wheeled motor vehicle use by 75 miles on the Forest. Alternative C would therefore have a higher potential impact on special uses, rights-of-way, and easements than alternatives B modified and D, but it would have less potential impact than alternative A.

Consequences to lands and special uses from forest plan components associated with other resource programs or management activities

Effects from management area direction for alternatives B modified, C, and D

Some management area allocations, such as NFS lands that have not been statutorily designated for a specific use (e.g., management area 1b (recommended wilderness), management area 2b (eligible wild and scenic rivers), or lands that have been administratively designated for a specific use (e.g., management area 3, special areas, or management area 4a, research natural areas) are less likely to be considered for disposal or exchange. Based on management area allocations, primarily recommended wilderness allocations, alternative C would have the greatest number of acres that would be less likely to be considered for disposal or exchange, followed by alternative B modified, D, and A.

Similar to lands, some special-use authorizations (such as power lines, communications towers, fences, etc.) are less likely to be considered in management areas 1b, 2a, 2 b, 3, or 4. Based on management area allocations, alternative C would have the greatest number of acres that would be less likely to be considered for these types of special-use authorizations, followed by alternatives B modified, D, and A. Other special-use authorizations such as outfitter and guide permits may be more likely to be considered in management areas 1b, 2a, 2b, and 3.

Focused recreation areas typically feature certain types of recreation activities that take place near or on large lakes or reservoirs, developed ski areas or year-round resorts, large campgrounds, or trail systems for featured recreational activities. This allocation may result in increased demand for more recreational special-use authorizations and thus an increase in recreational special-use authorizations for all action alternatives. Alternatives B modified and D have the same number of focused recreation areas; alternative C has fewer than alternative B modified and more then alternative A.

Effects from vegetation management

Vegetation treatments tend to affect the appraised value of NFS lands. Depending on the type of treatment, the value may decrease or increase. Since alternative D has the most acreage in management areas 6a, 6b, and 6c and thus the greatest likelihood of vegetation treatments, it is most likely to result in fluctuations in land values, followed by alternatives A, B modified, and C.

Effects of wildlife management

National forest system lands that provide secure habitat or contribute to habitat connectivity or linkage areas are less likely to be considered for disposal or exchange. All alternatives have lynx standards ALLS1 and LINKS1 to maintain habitat connectivity and linkage areas. The action alternatives place more emphasis on habitat connectivity for multiple species. Some special uses

may be affected by motorized access. Under alternative A, continued implementation of amendment 19 of the 1986 forest plan would limit motorized access in the future more than under the action alternatives.

Cumulative effects

Cumulative effects evaluate the potential impacts to NFS lands and special uses from the proposed action when combined with past, present, and reasonably foreseeable actions. The lands within the Forest boundary form the geographic scope for cumulative effects since this is the scope for the analysis. The temporal bound would be the life of the forest plan, which is estimated to be 15 years.

In order to integrate the contributions of past actions to the cumulative effects of the proposed action and alternatives, existing conditions are used as a proxy for the impacts of past actions. This is because existing conditions reflect the collective impact of all prior actions that have affected landownership and special uses and might contribute to cumulative effects. Landownership and special uses can be expected to be influenced by a variety of factors.

As described in section 3.13.2 above, the Forest has administrative responsibilities for 2,413,573 acres of NFS lands. Adjustments in landownership on the Forest will continue, including a proposal for the purchase of three parcels utilizing the Land and Water Conservation Fund and the sale of an administrative site, both expected in 2017. External entities have made land acquisitions and have held them until they can be conveyed to the national forests, and it is likely that these types of actions may continue. Any change (increase or decrease in total NFS lands) is dependent on the actions that are initiated. Outright purchases and transfers would most likely result in an increase in the acreage of NFS lands. Land exchanges, on the other hand, may result in a decrease in the acreage of NFS lands.

The Forest can expect requests for special-use authorizations to increase. As more private land is subdivided, there is usually an associated increase in requests for special-use authorizations such as road and utilities. Requests for modification of existing authorized communications sites and designation of new communications sites can reasonably be expected as technological advances (e.g., cell phones) are made. On the Forest, these sites typically occupy small acreages (one to two acres).

Boundary surveying and marking will continue, and encroachments are likely to be discovered.

3.14 Designated Wilderness

3.14.1 Introduction

In 1964, Congress passed the Wilderness Act of 1964 (Pub. L. 88-577) and defined wilderness as a place,

> in contrast with those areas where man and his own works dominate the landscape, . . . where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain . . . an area of undeveloped Federal lands retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other feature of scientific educational, scenic, or historical value. (p. 891)

The Wilderness Act of 1964 requires the preservation of wilderness character and recognizes the multiple values and public benefits found in these areas. Wilderness provides outstanding opportunities for solitude and for primitive and unconfined recreational experiences. Wilderness is also important for the maintenance of species diversity, protection of threatened and endangered species, protection of watersheds, scientific research, and various social values. Wilderness is part of the national forest mission of multiple-use management.

Regulatory framework

Laws and executive orders

Wilderness Act of September 3, 1964 (16 U.S.C. 1131-1136): This act provides the statutory definition of wilderness and management requirements for these congressionally designated areas. The act established a National Wilderness Preservation System to be administered in such a manner as to leave these areas unimpaired for future use and enjoyment as wilderness.

National Forest Management Act of 1976, as amended (16 U.S.C. 1600): Provides that management direction for wilderness be incorporated into forest plans and sets minimum standards for the content of the plans.

Code of Federal Regulations (CFR)

- **36 CFR § 293**: Wilderness - Primitive areas: These regulations define a wilderness - primitive area and provide direction on objectives; control of uses; maintenance of records; establishment, modification, or elimination of a wilderness area; commercial enterprises, roads, motor vehicles, etc.; grazing of livestock; permanent structures and commercial services; and other topics.

- **36 CFR § 261.18**: The following are prohibited in National Forest wilderness: (a) Possessing or using a motor vehicle, motorboat or motorized equipment except as authorized by Federal Law or regulation; (b) Possessing or using a hang glider or bicycle; (c) Landing of aircraft, or dropping or picking up of any material, supplies, or person by means of aircraft, including a helicopter.

Methodology and analysis process

Information sources

Information sources include the Forest's GIS data and the National Visitor Use Monitoring program. Note that acreages used in the analysis, which are generated by GIS, differ from USFS official acreages (USDA, 2015f).

Analysis area

The geographic scope of the analysis is all NFS lands administered by the Forest. All lands within the Forest boundary form the geographic scope for cumulative effects. The temporal scope of the analysis is the anticipated life of the plan (15 years).

3.14.2 Affected environment (existing condition)

Wilderness areas provide a wide variety of user opportunities for exploration, solitude, natural environment, risk, challenge, and primitive and unconfined recreation. Designated wilderness represents the highest concentration of quiet places on the Forest, places where the sights and sounds of human presence are relatively unnoticeable. Primary recreational activities within the wilderness include hiking, horseback riding, hunting, fishing, floating, and rafting. Many visitors use the services of an outfitter and guide operating under Forest Service special-use permits in wilderness areas.

The existing wilderness areas are managed in order to preserve the areas' wilderness character. Five qualities help describe wilderness character (Landres, Hennessy, Schlenker, Cole, & Boutcher, 2008):

- **Untrammeled**. Wilderness is essentially unhindered and free from modern human control or manipulation.
- **Naturalness.** Wilderness ecological systems are substantially free from the effects of modern civilization.
- **Undeveloped.** Wilderness is essentially without permanent improvements or modern human occupation.
- **Outstanding opportunities for solitude or a primitive and unconfined type of recreation**. Wilderness provides outstanding opportunities for people to experience solitude or primitive and unconfined recreation, including the values of inspiration and physical and mental challenge.
- **Other features of value**. Wilderness may contain ecological, geological, or other features of scientific, educational, scenic, or historical value.

The National Visitor Use Monitoring program (USDA, 2017b) monitors visitor use every five years on the Forest. The 2015 visitation to designated wilderness on the Flathead National Forest was 54,000 (the national visitor use monitoring does not separate out the visits to the Forest's three designated wilderness areas). This is about 5 percent of the total visitation in 2015 for the Flathead National Forest.

Designated wilderness comprises 45 percent of the Forest, for a total of 1,075,559 acres (official acres) (USDA, 2015f). There are three designated wilderness areas within the administrative boundary of the Forest. These are the Bob Marshall, Great Bear, and Mission Mountains Wilderness Areas. For a map of these areas, refer to figure 2 in volume 1 of the final EIS.

The Bob Marshall Wilderness Complex includes the Bob Marshall, Great Bear, and Scapegoat Wilderness areas and makes up an area of more than 1.5 million acres. The Bob Marshall Wilderness Complex is jointly managed by five ranger districts on three national forests.

Bob Marshall Wilderness

The Bob Marshall Wilderness was named for Bob Marshall, an early wilderness advocate, explorer, and conservationist who promoted the development of wilderness management. The Bob Marshall Wilderness was designated in 1964. At 1,063,703 acres (official acres), it is the largest wilderness in the Bob Marshall Wilderness Complex, with 712,351 acres on the Flathead National Forest. The South Fork of the Flathead River, a wild and scenic river, is included in this wilderness area.

Great Bear Wilderness

The Great Bear Wilderness is 286,990 acres (official acres) and was congressionally designated in 1978. The Great Bear Wilderness is located on the western side of the Continental Divide and is entirely within the Flathead National Forest (Hungry Horse and Spotted Bear Ranger Districts). About 50 miles of the Middle Fork of the Flathead River, a wild and scenic river, is within this wilderness. Schafer Meadows Airstrip is the only open airstrip within the Bob Marshall Wilderness Complex, and it provides a primary access point for the Schafer area as well as the Middle Fork of the Flathead River. This wilderness is also part of the Bob Marshall Wilderness Complex.

Mission Mountains Wilderness

The Mission Mountains Wilderness is 76,218 acres (official acres) and is made up of high peaks, small active glaciers, alpine lakes, meadows, vertical cliff faces, and talus slopes. The region was set aside as the Mission Mountains Primitive Area in 1931 and designated as wilderness in 1975. The Mission Mountains Wilderness shares its entire western and southern boundaries with the Flathead Indian Reservation; a portion of the Mission Mountains Wilderness is adjacent to the Mission Mountains Tribal Wilderness.

3.14.3 Environmental consequences

Human use of designated wilderness is largely governed by the terms of the Wilderness Act of 1964. Project-specific proposals within designated wilderness are also evaluated through forest plan direction and a minimum requirement analysis to evaluate how the proposal may affect wilderness values. Commercial uses of wilderness are controlled by special-use permits and the plans of operation that are required under the special-use permit.

Because direction for wilderness management is detailed in laws, regulations, agency policy, and specific management plans, management under the four alternatives would not differ.

Alternatives A, B modified, C, and D

There is no change in the amount of designated wilderness under any alternative. A primitive experience would be maintained for all three wilderness areas under all alternatives. Natural ecological processes and disturbances are the primary forces affecting the composition, structure, and patterns of vegetation. All alternatives would continue to be managed to protect and maintain their wilderness character.

All alternatives would carry forward the need for wilderness patrols, rehabilitation of any impacted sites, wilderness education, and wilderness-specific management plans. These activities are common to all alternatives.

Consequences to designated wilderness from forest plan components associated with other resource programs or management activities

Effects from fire *and fuels management*

Natural, unplanned ignitions would continue the long-term ecological processes in these areas. These could lead to a temporary loss of vegetation, reduction in water quality due to sedimentation, or air pollution; however, these effects are part of the natural ecological processes.

Effects from vegetative management

These lands are withdrawn from timber production and therefore are not suitable for timber production or timber harvest. There would be no effect to designated wilderness from timber harvest.

Effects from recreation and access

The Bob Marshall Wilderness, Great Bear Wilderness, and Mission Mountains Wilderness may be affected by recreational use. Visitors to the wilderness may affect solitude, and camping may negatively affect vegetation and water quality through site compaction and improper disposal of human waste. Stock and hiking use on trails may negatively affect natural vegetation by introducing noxious weeds and may also reduce water quality.

Effects from minerals management

The Bob Marshall, Great Bear, and Mission Mountains Wildernesses have been withdrawn from mineral entry and are not available for new leases or claims. Surface and mineral rights within the wilderness are entirely Federal.

Cumulative effects

Generally, wilderness areas are in a more natural vegetation condition (in terms of composition and structure) than non-wilderness areas. As large tracts of land relatively free of human-caused disturbance and where natural ecological processes and disturbances are the primary forces, they contribute to maintaining biological diversity while minimizing the effects of human development on habitat connectivity. These wilderness areas have played a role in maintaining strongholds of a number of threatened, endangered, and sensitive species such as grizzly bear, lynx, and bull trout. Designated wilderness areas on the Forest provide outstanding opportunities to experience solitude and/or primitive and unconfined recreation, including the values of inspiration and physical and mental challenge. They provide undeveloped areas without permanent improvements or modern human occupation and areas that are essentially free from modern human control or manipulation.

Population growth and development increases the need for public open space. Growth in Flathead, Lake, Missoula, and Lincoln counties is likely to increase recreational use of the Forest, which may include an increase in wilderness use. Increased recreational use may impact the wilderness character, particularly the opportunities for solitude and natural quality. Examples of potential impacts include increased opportunity for crowding in high use areas, soil compaction or erosion, and threats to native plant species from the spread of noxious weeds from sources outside the wilderness. The effects of urbanization and population growth on wilderness use and resource conditions are likely to be gradual and to extend well beyond the planning period. These areas may be affected by management of adjacent lands, such as sights or sounds from vegetation treatments, motorized use, or private development.

Currently, the Flathead National Forest manages approximately 30 percent of the designated wilderness within Montana and 10 percent within the National Wilderness Preservation System.

3.15 Recommended Wilderness

3.15.1 Introduction

The wilderness recommendation process occurs in four primary steps: inventory, evaluation, analysis, and recommendation. All plan revisions must complete this process before the responsible official determines whether to recommend lands within the plan area to Congress for wilderness designation.

The demand for wilderness goes beyond recreation opportunities. Other values include long-term environmental monitoring, scenic backdrops for tourism, watershed protection, and maintenance of biological diversity. Many people who do not regularly visit primitive, roadless, or designated wilderness areas still value protection of such areas to maintain the opportunity for visits in the future (option value). People also gain benefits simply from knowing that natural areas exist (existence value) and that their protection today sustains them for future generations (bequest value) (Rosenberger & Loomis, 2000).

Several studies have shown the importance and value people place on these passive-use benefits of wilderness (Cordell, Betz, Stephens, Mou, & Green, 2008). These values or needs are reflected in the National Survey on Recreation and the Environment, which found that roughly 70 percent of those surveyed responded favorably to the question, "How do you feel about designating more Federal lands in your state as wilderness?" Over 96 percent agreed or strongly agreed with the statement, "I enjoy knowing that future generations will be able to visit and experience wilderness areas."

Wilderness provides outstanding opportunities for solitude and for primitive and unconfined recreational experiences. Wilderness is also important for the maintenance of species diversity, protection of threatened and endangered species, protection of watersheds, scientific research, and various social values. Wilderness is part of the national forests' multiple-use management mission.

Regulatory framework

36 CFR § **219 sec. 219.7**: This regulation requires the following during revision of a forest plan: identify and evaluate lands that may be suitable for inclusion in the National Wilderness Preservation System and determine whether to recommend any such lands for wilderness designation.

Forest Service Handbook 1909.12 chap. 70: This direction contains the framework for the wilderness recommendation process.

Key indicators

These indicators were developed in response to comments and to show how elements are affected by recommended wilderness management area allocation:

- Acres of recommended wilderness
- Acres of inventoried roadless area within recommended wilderness
- Acres of motorized over-snow vehicle use areas in recommended wilderness
- Miles of motorized over-snow vehicle use in recommended wilderness
- Miles of wheeled motorized use in recommended wilderness

- Miles of trails that allow mechanized transport in recommended wilderness
- Acres of underrepresented ecological groups of the National Wilderness Preservation System in recommended wilderness

Methodology and analysis process

The directives contain the framework for the wilderness recommendation process. The Flathead National Forest developed the wilderness inventory areas based on the process in Forest Service Handbook 1909.12 chapter 70 section 71. The inventory process is documented in appendix 4 of the final EIS. The primary function of the identification and inventory step is to identify all lands within the plan area that may have wilderness characteristics as defined in the Wilderness Act of 1964, using a transparent process. Lands included in the inventory are documented and identified on a map and carried forward for further evaluation. The draft methodology paper for the identification and inventory of lands that may be suitable for inclusion in the National Wilderness Preservation System went through a 45-day public comment period. In addition, an interactive map was made available on the Flathead National Forest website displaying an initial identification and inventory of lands that may be suitable for inclusion in the National Wilderness Preservation System. Based on comments received, the draft methodology paper was revised in August 2014. The wilderness inventory area (643,000 acres) was separated into 25 named areas. The methodology did not specifically look at inventoried roadless areas; to be included in the wilderness inventory, lands had to meet the criteria set forth in the the first step (identification and inventory, pp.5-10) of the wilderness recommendation process, appendix 4. Approximately 8,445 acres of inventoried roadless area were not included in the wilderness inventory areas; the primary reason they were not included was due to past timber harvests that met the criteria of being substantially noticeable.

All 25 wilderness inventory areas went through a wilderness evaluation, which is documented by a wilderness evaluation worksheet for each area (see appendix 4).

For each alternative, the following indicators were used to evaluate the effects of the wilderness recommendations:

- acres of inventoried roadless areas within recommended wilderness
- changes in wheeled motorized opportunities compared with the existing condition
- changes in motorized over-snow vehicle opportunities compared with the existing condition
- changes in trail miles[2] that allow mechanized transport compared with the existing condition
- the amount of underrepresented ecological groups that the recommended wilderness areas would add to the National Wilderness Preservation System if these areas were designated and made part of the National Wilderness Preservation System

To determine whether any recommended wilderness areas contain ecological systems that are not currently represented or are minimally represented within the wilderness system or system of research natural areas, the Forest analyzed the U.S. Geological Survey Gap Analysis Program national land cover dataset version 2 (USGS, 2011). This dataset provides detailed (30-meter resolution) information on vegetation and land-use patterns of the United States using consistent satellite base data and classification systems. The data at the ecological system level are compared to the six highest levels of the National Vegetation Classification Standard (USGS, 2008). The

[2] Because mechanized transports such as mountain bikes or game carts generally stay on trails, the indicator looks at miles of trails that allow this use and not acres open to mechanized transport.

Forest analyzed the ecosystem representation at the sixth level (the finest scale at which consistent land-cover data are available) of the National Vegetation Classification Standard, which is considered the group or ecological system.

The U.S. Geological Survey Gap Analysis Program land-cover dataset within the Flathead National Forest boundary was determined using GIS and acreages were calculated for the ecological systems within the different recommended wilderness areas. These values were then analyzed against the acreages of the ecological systems on the Forest. Finally, the output was amended with the national information provided by the Aldo Leopold Wilderness Research Institute, including the total acreage of each ecological system within the National Wilderness Preservation System along with the proportional percentage of each ecological system found on Federal lands that is represented in wilderness. This was a part of a national assessment (Dietz, Belote, Aplet, & Aycrigg, 2015).

From the calculations above, a listing of 47 ecological groups within the Forest was reviewed, and those ecological groups having greater or equal to 20 percent of that ecological type represented in the National Wilderness Preservation System compared to all NFS land acres in the lower 48 states were dropped (15 groups). Out of the remaining 32 ecological groups, some groups such as cultivated hay/pasture, harvested, or water type were dropped. The remaining 22 ecological groups were dropped if they were less than four acres or were a group that does not occur on the Forest. The end result was that 14 ecological groups were determined to be underrepresented within the recommended wilderness areas on the Forest (based on what was determined to be underrepresented within the designated wilderness areas on the Forest; see table 132).

Table 132. Underrepresented ecological groups in recommended wilderness areas on the Forest

Underrepresented Ecological Groups
Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland
Inter-Mountain Basins Big Sagebrush Steppe
Middle Rocky Mountain Montane Douglas-Fir Forest and Woodland
North American Arid West Emergent Marsh
Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest
Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland
Northern Rocky Mountain Lower Montane Foothill and Valley Grassland
Northern Rocky Mountain Mesic Montane Mixed Conifer Forest
Northern Rocky Mountain Montane-Foothill Deciduous Shrubland
Northern Rocky Mountain Ponderosa Pine Woodland and Savanna
Northern Rocky Mountain Western Larch Savanna
Rocky Mountain Aspen Forest and Woodland
Rocky Mountain Lodgepole Pine Forest
Rocky Mountain Subalpine-Montane Fen

Appendix 4 displays each recommended wilderness area and how it responds to required criteria set forth in Forest Service Handbook 1909.12 chapter 70 section 73. In addition, appendix 4 displays a summary of each wilderness inventory area and which management area it was allocated to by alternative, as well as the rationale for the allocation.

The following terms are used in the analysis: ecological and social characteristics and wilderness characteristics. The ecological and social characteristics of recommended wilderness areas that

provide the basis for suitability for inclusion in the National Wilderness Preservation System are identified for each recommended wilderness area and can be found in appendix 4.

Wilderness characteristics are *natural quality, undeveloped, unconfined or primitive recreation or solitude and unique or other features*. Oftentimes, the ecological characteristics are discussed in terms of *natural quality* and *undeveloped* and can be represented by landscapes where evidence of human disturbance is not readily apparent or where the intactness of an ecosystem is evident. Social characteristics can be discussed in terms of *solitude* or *unconfined or primitive recreation* and are often represented by remote, quiet landscapes where recreation activities such as hiking, climbing, fishing, and hunting are predominant.

Information sources

Geospatial analysis was used for the indicators. See above for the datasets associated with the underrepresented ecological groups.

Analysis area

The geographic scope of the analysis is NFS lands administered by the Flathead National Forest. All lands within the Forest boundary form the geographic scope for cumulative effects. The temporal scope of the analysis is the anticipated life of the plan (15 years).

Notable changes between draft and final EIS

Alternative B modified incorporates new suitability plan component for recommended wilderness that makes motorized uses and mechanized transport not suitable in these areas (MA 1b).

3.15.2 Affected environment (existing condition)

The 1986 forest plan recommended about 98,400 acres for wilderness. The five areas are Alcove, Jewel Basin, Limestone, Slippery Bill, and the Swan Front (see figure 1-64).

These areas overlay management areas that range from unroaded lands to lands that are roaded and suitable for timber management. The 1986 forest plan standard for recommended wilderness states that the management standards for these areas will be consistent with the standards of the non-wilderness management area designation, except that no action can occur that would reduce the areas' wilderness attributes until Congress has made a decision on wilderness classification or otherwise specified how these areas will be managed.

The Swan Front, Alcove, and Limestone recommended wilderness areas are currently closed to mechanized transport and motorized use (wheeled and motorized over-snow vehicles) because of a 1986 forest plan standard that requires recommended wilderness areas adjacent to designated wilderness be managed like designated wilderness.

3.15.3 Environmental consequences

Alternative A—No action

As the no-action alternative, this alternative does not propose any changes to what was recommended as wilderness in the 1986 forest plan (98,446 acres). Table 133 lists the five areas recommended as wilderness in the 1986 forest plan, and table 134 lists the indicators that were used. National direction requires that areas recommended for wilderness are not available for any use or activity that might reduce the wilderness potential of an area. Recommended wilderness areas such as Alcove, Limestone, and the Swan Front have closure orders that prohibit mechanized

transport (e.g., mountain bicycles or game carts) and motorized use (wheeled and motorized over-snow vehicles). The Slippery Bill recommended wilderness area is open to mechanized transport, which could affect its undeveloped and primitive recreation wilderness characteristic. This alternative represents approximately 20 percent (95,278 acres) of the inventoried roadless areas on the Forest.

Table 133. Recommended wilderness areas and acres in alternative A

Recommended Wilderness Area	Acres
Alcove	9,998
Jewel Basin	32,972
Limestone Cave	5,076
Slippery Bill	5,585
Swan Front	44,815

Table 134. Indicators for recommended wilderness in alternative A

Indicators	Unit of measure
Acres of recommended wilderness	98,388 acres
Acres of inventoried roadless areas within recommended wilderness	95,278 acres
Acres of suitable motorized over-snow vehicle areas	12,600 acres
Miles of motorized over-snow vehicle routes	none
Miles of wheeled motorized use	2 miles
Mechanized transport on system trails	26 miles
Acres of underrepresented ecological groups of the National Wilderness Preservation System	23,685 acres

The total amount of recommended wilderness when combined with existing designated wilderness (1,072,040[3] acres) would bring the total acreage to about 1,170,428 acres or about 49 percent of the Flathead National Forest that is in designated or recommended wilderness. These acres would provide a recreation opportunity spectrum primitive setting across the Forest. These acres would provide a primitive setting on 48 percent of the Forest, where wheeled motorized use, motorized over-snow vehicle use, and mechanized transport (e.g., mountain bicycles) would decrease and recreational opportunities such as hiking, horseback riding, and skiing would increase. The primitive setting is characterized by large, remote, wild, and predominantly unmodified landscapes with no motorized activity and little probability of seeing other people. Primitive settings are managed for quiet solitude away from roads, people, and development. There are few, if any, facilities or developments. This alternative provides opportunity for a primitive recreation opportunity spectrum setting through recommending 98,446 acres for wilderness designation. Alternative A has more primitive setting than alternative D and less than alternatives B modified and C, and it therefore it would provide the third highest amount of primitive setting on the Forest.

Alternative A includes 23,161 acres of underrepresented ecological groups, which is higher than alternative D and lower than alternatives B modified and C. This is the amount this alternative would add of underrepresented ecological groups to the National Wilderness Preservation System if these areas were designated as wilderness.

[3] These acres are from GIS data and differ from the official wilderness acres, which total 1,075,559 acres.

Under this alternative, the Jewel Basin hiking area (about 15,315 acres) would continue to be within the Jewel Basin recommended wilderness area (32,972 acres). The Jewel Basin hiking area would still retain prohibitions on stock and pack animals as well as mechanized transport and motorized uses. Outside of the Jewel Basin hiking area but still within the Jewel Basin recommended wilderness area (17,689 area), there is an area that allows mechanized transport on 26 miles of trail and wheeled motorized use on 2 miles of trail, and these uses would continue.

Alternative B modified

The names of the eight areas recommended for wilderness under alternative B modified are listed in table 135 and total approximately 190,403 acres. Table 136 lists the indicators that were used to describe the effects analysis. This represents approximately 37 percent (179,176 acres) of the inventoried roadless areas on the Forest (which totals 479,710 acres). This alternative does not allow for mechanized transport (e.g., mountain bikes) or motorized uses in recommended wilderness areas (see plan component MA1b-SUIT-06).

Table 135. Recommended wilderness areas and acres under alternative B modified

Recommended Wilderness Area	Acres
Alcove	18,901
Elk Creek	1,442
Java-Bear Creek	1,824
Jewel Basin	18,462
Limestone-Dean Ridge	15,026
Slippery Bill-Puzzle	12,393
Swan Front	42,534
Tuchuck-Whale	79,821

Table 136. Indicators for recommended wilderness under alternative B modified

Indicators	Unit of measure
Acres of recommended wilderness	190,403 acres
Acres of inventoried roadless area within recommended wilderness	179,060 acres
Acres of suitable motorized over-snow vehicle areas	344 acres
Miles of motorized over-snow vehicle routes	< 1 mile
Miles of wheeled motorized use	none
Mechanized transport on system trails	96 miles
Acres of underrepresented ecological groups of the National Wilderness Preservation System	27,396 acres

This alternative includes a plan component (MA1b-SUIT-06) stating that mechanized transport and motorized travel and uses are not suitable in recommended wilderness areas. This is a change from the DEIS alternative B where *existing* mechanized transport and motorized use was suitable in recommended wilderness areas. The DEIS for alternative B states that 111 miles of trails would continue to allow mechanized transport (page 61). Mechanized transport is mostly concentrated in the Tuchuck-Whale recommended wilderness area with 87 miles of system trails open to mechanized transport. The remaining trails are scattered throughout the recommended wilderness areas with the largest mileage in the Limestone recommended wilderness area with 8 miles of trail,

the Swan Front recommended wilderness area at 4 miles, the Slippery Bill recommended wilderness area at 4 miles, and the Jewel Basin recommended wilderness area at 6 miles; the remaining two areas have short segments generally 1 mile or less.

The change in suitability reflects the comments from the public at large and serves to guide the future management of the areas being recommended for wilderness to protect and maintain the ecological and social characteristics that provide the basis for wilderness recommendation. With the new suitability plan component (MA1b-SUIT-06), the following changes could occur:

- Mechanized transport on system trails within recommended wilderness areas could decrease from 96[4] miles to 0 miles after site-specific analysis is completed.
- Acres suitable for motorized over-snow vehicle use areas could decrease from 344 acres to 0 acres on the Forest in the Slippery Bill- Puzzle recommended wilderness area after site-specific analysis is completed.

There would be no change to the following uses because recommended wilderness areas do not include these uses:

- wheeled motorized use on designated routes
- motorized over-snow vehicle use on designated routes

Mechanized transport and motorized use would continue until a site-specific analysis prohibits these uses; the time frame of when this would occur is unknown. The effect on the ecological and social characteristics that provide the basis for wilderness recommendation and the wilderness characteristics by continuing these uses is discussed here.

- Java-Bear Creek recommended wilderness area currently allows 1.3 miles of mechanized trail. Motorized transport is currently prohibited in this area.
- The Limestone-Dean recommended wilderness area currently allows 8 miles of mechanized transport. Motorized transport is currently prohibited.
- The Slippery Bill-Puzzle recommended wilderness area currently allows 4 miles of mechanized transport and 344 acres of motorized over-snow vehicle use.
- The Tuchuck-Whale recommended wilderness area has about 82 miles of mechanized trails. Motorized transport is currently prohibited in this area.

Mechanized transport (e.g., bicycles, carts) and motorized uses might affect the undeveloped nature (ecological characteristic) and primitive recreation (social characteristic) of the recommended wilderness, which characterize the areas as essentially without permanent improvements or modern human occupation. In addition, motorized uses such as motorized over-snow vehicle use or the use of chainsaws could impact the area’s solitude and primitive recreation (social characteristic).

Not every person traveling through these recommended wilderness areas would meet a mountain biker or snowmobiler. The four recommended wilderness areas that currently allow mechanized transport or motorized over-snow vehicle use have relatively low amounts of use for these activities. Any type of trail, whether for hikers or horseback riders, could affect the undeveloped wilderness characteristics (ecological characteristic) because a trail is considered a development. Solitude

[4] Because of the change in recommended wilderness areas from the DEIS to the FEIS, the miles of mechanized trails was reduced in recommended wilderness areas from 111 miles to 96 miles.

could be affected by noise but also could be affected by encounters with other people who are hiking or horseback riding.

There are 4.5 miles of existing system roads under this alternative in the Tuchuck-Whale recommended wilderness area. These roads would be decommissioned after site-specific analysis is completed. These roads are currently closed to motorized use, so there would be no change in existing access. Over time, these roads would revegetate and become more natural in appearance.

The total amount of recommended wilderness when combined with existing designated wilderness (1,072,040[5] acres) would bring the total acreage of the Forest that is in designated or recommended wilderness to about 1,265,443 acres, or approximately 53 percent. These acres would provide a primitive recreation setting on the majority of the Forest; wheeled motorized use, motorized over-snow vehicle use, and mechanized transport (e.g., mountain bicycles) would not be allowed, and nonmotorized recreational opportunities such as hiking, horseback riding, and cross-country skiing would increase across the Forest within the primitive setting.

The primitive setting is characterized by large, remote, wild, and predominantly unmodified landscapes with no motorized activity and little probability of seeing other people. Primitive settings are managed for opportunities for solitude away from roads, people, and development. There are few facilities or developments. This alternative provides increased opportunity for a primitive recreation opportunity spectrum setting through recommending 190,403 acres for wilderness designation. This alternative would provide more primitive setting on the Forest than all the other alternatives. It would provide more primitive setting than alternatives A and D but less than alternative C, and therefore it would provide the second highest amount of primitive setting on the Forest.

This alternative includes 27,396 acres of underrepresented ecological groups, which is higher than alternatives A and D and lower than alternative C. This acreage is the amount this alternative would add of underrepresented ecological groups to the National Wilderness Preservation System if these areas were designated as wilderness. The Jewel Basin hiking area (about 15,315 acres) is part of the Jewel Basin recommended wilderness area (18,462 acres). The Jewel Basin hiking area within the recommended wilderness area would still retain prohibitions on stock and pack animals, mechanized transport, and motorized uses. The Jewel Basin recommended wilderness area under alternative B modified is smaller than what was recommended for wilderness in the 1986 forest plan by about 14,510 acres. There are 3,147 acres of the Jewel Basin recommended wilderness area that are not within the Jewel Basin hiking area.

Alternative C

Table 137 lists the 17 areas recommended for wilderness in this alternative for a total of 506,919 acres, and table 138 lists the indicators that were used (see figure 1-66 for a map of these areas). This area represents approximately 98 percent (467,461 acres) of the inventoried roadless areas on the Forest.

Table 137. Recommended wilderness areas and acres under alternative C

Recommended Wilderness Area Name	Acres
Alcove-Bunker	63,962
Canyon	7,939

[5] These acres are from GIS data and differ from the official wilderness acres, which total 1,075,559 acres.

Recommended Wilderness Area Name	Acres
Coal	45,257
Cold Jim	317
Elk Creek	2,964
Essex	13,788
Fatty-Woodard Creek	2,133
Hungry Horse East	33,503
Java-Bear Creek	3,725
Jewel Basin-Swan Crest	135,759
Le Beau	5,950
Limestone-Dean Ridge	26,294
Piper Creek	642
Sky West	5,193
Slippery Bill-Puzzle	20,703
Swan Front	48,151
Tuchuck-Whale	90,638

Table 138. Indicators for recommended wilderness for alternative C

Indicators	Unit of measure
Acres of recommended wilderness	506,919 acres
Acres of inventoried roadless areas within recommended wilderness	467,465 acres
Acres of suitable motorized over-snow vehicle areas	169,248 acres
Miles of motorized over-snow vehicle routes	4 miles
Miles of wheeled motorized use	75 miles
Mechanized transport on system trails	417 miles
Acres of underrepresented ecological groups of the National Wilderness Preservation System	130,007 acres

This alternative includes the plan component (MA1b-SUIT-06): Mechanized transport and motorized use are not suitable in recommended wilderness areas. Therefore, the following changes could occur:

- Mechanized transport on system trails within recommended wilderness areas could decrease from 417 miles to 0 miles after site-specific analysis is completed.
- Wheeled motorized use on designated routes could decrease from 75 miles to 0 miles within recommended wilderness areas after site-specific analysis is completed.
- Motorized over-snow vehicle use on designated routes within recommended wilderness areas could decrease from 4 miles to 0 miles after site-specific analysis is completed.
- Acres suitable for motorized over-snow vehicle use areas could decrease from 169,248 acres to 0 acres on the Forest after site-specific analysis is completed.

This alternative would result in the most changes to wheeled motorized use, mechanical transport, and motorized over-snow vehicle use opportunities on the Forest. Forestwide, wheeled motorized use would decrease from 226 miles to 151 miles of designated trails; mechanized transport on

system trails would decrease from 836 miles to 419 miles; motorized over-snow vehicle use on designated routes would decrease from 1,964 to 1,960 miles; and motorized over-snow vehicle use on designated areas would decrease from to 457,133 to 287,855 acres. Displacement of motorized (wheeled and motorized over-snow vehicles) and mechanized transport on the Forest could occur when and if a site-specific decision is completed to prohibit these uses in recommended wilderness. Should these closures occur, use might become concentrated in areas that remain suitable for motorized wheeled and motorized over-snow vehicle, causing some users to have negative experiences and/or go elsewhere to an off-Forest location or to other lands open to motorized use and mechanized transport.

Under alternative C, there are 48 miles of existing system roads within the recommended wilderness areas; these roads would be decommissioned after site-specific analysis is completed. These roads are currently closed to motorized use, so there would be no change in existing access. Over time, these roads would revegetate and become more natural in appearance.

The total amount of recommended wilderness when combined with existing designated wilderness (1,072,040 acres[6]) would bring the total acreage of the Forest that is in designated or recommended wilderness to about 1,578,963 acres, or approximately 66 percent. These acres would provide a primitive setting on the majority of the Forest, where wheeled motorized use, motorized over-snow vehicle use, and mechanized transport (e.g., mountain bicycles) would decrease and recreational opportunities such as hiking, horseback riding, and skiing would increase.

The primitive setting is characterized by large, remote, wild, and predominantly unmodified landscapes with no motorized activity and little probability of seeing other people. Primitive settings are managed for quiet solitude away from roads, people, and development. There are few, if any, facilities or developments. This alternative would provide opportunity for a primitive setting through recommending 506,919 acres for wilderness designation. This alternative would provide more primitive setting on the Forest than any of the other alternatives.

This alternative would include 130,007 acres of underrepresented ecological groups that would be added to the National Wilderness Preservation System if these areas were designated as wilderness. This is the most of all the alternatives.

The Jewel Basin hiking area (15,315 acres) would become part of the Jewel Basin recommended wilderness area (135,759 acres). The Jewel Basin hiking area within the recommended wilderness area would still retain prohibitions on stock and pack animals, mechanized transport, and motorized uses. The recommended wilderness area is larger than the area recommended for wilderness in the 1986 plan by 102,787 acres.

Alternative D

There are no areas recommended for wilderness in this alternative; recommended wilderness areas allocated in the 1986 forest plan are not included under this alternative. The following is management area allocations for this alternative for the five areas that were recommended wilderness in the 1986 plan.

- Alcove recommended wilderness area is 100 percent management area 5a (backcountry nonmotorized year-round primitive).

[6] These acres are from GIS data and differ from the official wilderness acres, which total 1,075,559 acres.

- Jewel Basin recommended wilderness area is 40 percent management area 3b (special management area for the Jewel Basin hiking area), 30 percent management area 5c (backcountry winter motorized), 17 percent management area 5a (backcountry nonmotorized year-round primitive), 6 percent management area 2b (eligible wild and scenic river), and 5 percent management area 5b (backcountry motorized year-round).
- Limestone Cave recommended wilderness area is 74 percent management area 5a (backcountry nonmotorized year-round primitive) and 26 percent management area 2b (eligible wild and scenic river).
- Slippery Bill recommended wilderness area is 95 percent management area 5a (backcountry nonmotorized year-round primitive), 4 percent management area 6a (general forest low-intensity vegetation management) and 1 percent management area 5c (backcountry winter motorized).
- Swan Front recommended wilderness area is 93 percent management area 5a (backcountry nonmotorized year-round primitive) and 6 percent management area 2b (eligible wild and scenic river).

Under this alternative, some wilderness characteristics within inventoried roadless areas would be generally maintained by the requirements of the Roadless Area Conservation Rule, which prohibits building roads and limits timber harvest, although motorized use is allowable under the Roadless Area Conservation Rule, which can affect solitude and primitive recreation. Refer to section 3.16 for additional information. The Forest would continue to provide primitive experience on the existing designated wilderness of 1.1 million acres (45 percent of the Forest).

There would be no changes to miles of mechanized trails, miles of wheeled motorized trails, miles or acres of motorized over-snow vehicle use, or miles of hiking and stock trails.

Table 139. Indicators for recommended wilderness for alternative D

Indicators	Unit of measure
Acres of recommended wilderness	0 acres
Acres of inventoried roadless areas	0 acres
Acres of suitable motorized over-snow vehicle areas	0 acres
Miles of motorized over-snow vehicle routes	0 miles
Mechanized transport on system trails	0 miles
Acres of underrepresented ecological groups of the National Wilderness Preservation System	0 acres

Approximately 45 percent (1,072,040[7] acres) of the Forest is in designated wilderness. These acres would provide a primitive recreation setting on the Forest where wheeled motorized use, motorized over-snow vehicle use, and mechanical transport (e.g., mountain bicycles) would not be suitable. However, because this alternative recommends no additional areas for wilderness, opportunities for solitude and remoteness in a primitive setting that offers remote and predominantly unmodified landscapes would decrease across the Forest. Therefore, this alternative provides the least amount of primitive setting of all the alternatives.

[7] These acres are from GIS data and differ from the official wilderness acres, which total 1,075,559 acres.

This alternative includes 0 acres of underrepresented ecological groups; therefore, this alternative would provide the least amount of additions of underrepresented ecological groups to wilderness of all the alternatives.

The Jewel Basin hiking area (about 15,315 acres) would continue to retain prohibitions on stock and pack animals, mechanized transport, and motorized uses.

Consequences to recommended wilderness areas from forest plan components associated with other resource programs or management activities

Effects from management area allocations

Management area allocations vary between alternatives. Wilderness characteristics and the ecological and social characteristics that provide the suitability for inclusion in the National Wilderness Preservation System would be protected and maintained under alternatives A, B modified, and C.

Effects from fire and fuels management

Effective fire suppression, insect and disease infestations, and native vegetation and fuel types on the Forest create fuel conditions that could support moderate- to high-severity wildfires in some areas. Lightning-caused fires may be managed to meet resource benefits to trend vegetation towards the desired conditions. Likewise, prescribed fire for restoration purposes may be used to trend vegetation towards the desired conditions.

The use of natural, unplanned ignitions would be more likely in alternatives B modified and C, which emphasize the use of natural disturbances and have the highest and the second highest acres of recommended wilderness. The use of natural, unplanned ignitions would continue the long-term ecological processes in these areas. There could be a substantial changes in existing forest cover, reduction in water quality due to sedimentation, and increased air pollution; however, these effects are part of the natural ecological processes. The opportunity to use natural, unplanned ignitions within some of the recommended wilderness would be limited due to their shape, size, and location relative to values at risk, should a wildfire occur. Refer to section 3.5.1 for a detailed discussion of this effect related to restoration activities for whitebark pine. Recommended wilderness is suitable for restoration activities where the outcomes will protect the wilderness characteristics of the areas, as long as the ecological and social characteristics that provide the basis for each area's suitability for wilderness recommendation are maintained and protected. Prescribed fire for restoration purposes could affect the natural quality and solitude wilderness characteristics, especially where crews are burning or are monitoring burns.

Effects from vegetative management

These lands are not suitable for timber production; timber harvest is not allowed. Most lands within recommended wilderness are within inventoried roadless areas that have high to outstanding wilderness characteristics, primarily due to restrictions on road building and to timber harvesting not occurring in much of these areas. Inventoried roadless areas are identified as not suitable for timber production, and therefore there are very few acres within recommended wilderness where timber production would have been considered suitable. Refer to section 3.21 for more information.

Recommended wilderness areas are characterized by a natural environment where ecological processes such as natural succession, wildfire, avalanches, insects, and disease function with a limited amount of human influence. However, recommended wilderness is suitable for restoration activities where the outcomes will protect the wilderness characteristics of the areas as long as the

ecological and social characteristics that provide the basis for each area's suitability for wilderness recommendation are maintained and protected. Restoration activities could include restoration of whitebark pine (currently a candidate species under the Endangered Species Act), which could consist of prescribed burning, seeding, planting of rust-resistant whitebark pine seedlings, thinning with an emphasis on hand thinning over mechanical, and protecting phenotypically superior seed-producing whitebark pine trees from loss due to fire, bark beetles, or other stressors. Control of invasive plant species by hand pulling and/or herbicide spraying and the planting or seeding of native plant species could also occur. Vegetation management options would likely change in the future if recommended wilderness areas are designated as wilderness. Refer to the vegetation section 3.3.10, the plant species section 3.5.1, and the fire and fuels management section 3.8.3 for additional information on these effects to vegetation management.

Effects from recreation and access

As discussed in the environmental consequence section, the greatest change from existing conditions in the amount of suitable motorized use, mechanized transport, and nonmotorized/nonmechanized transport use would be under alternative C, which has the most area not suitable for wheeled motorized use, motorized over-snow vehicle use, or mechanized transport and has the most acres suitable for nonmotorized/nonmechanized transport such as hiking and stock use. Alternative B modified would have less of a change than alternative C in the amount of suitable motorized use, mechanized transport, and nonmotorized/nonmechanized transport. Alternative D has the least amount of change because it has no recommended wilderness, followed by alternative A.

New road construction or reconstruction is not suitable in recommended wilderness areas, which limits the amount of new access on the Forest. Alternative C would have the largest area not suitable for new roads or road reconstruction, followed by alternatives B modified, A, and D.

Recommended wilderness is not suitable for developed recreation facilities that provide for user comforts such as picnic tables, fire grills, and vault toilets. These areas are generally in the primitive recreation opportunity spectrum setting providing challenges and predominantly unmodified landscapes and are managed for quiet solitude away from roads, people, and development. Alternative C would have the most area not suitable to recreation facilities that provide for user comforts, followed by alternatives B modified, A, and D.

Effects from wildlife and fish management

Recommended wilderness areas are characterized by a natural environment where ecological processes such as natural succession, wildfire, avalanches, insects, and disease function with a limited amount of human influence. Impacts from visitation do not detract from the natural setting. However, recommended wilderness is suitable for restoration activities where the outcomes will protect the wilderness characteristics of the areas, as long as the ecological and social characteristics that provide the basis for each area's suitability for wilderness recommendation are maintained and protected. Restoration activities or management activities for wildlife and fish could include monitoring, relocation of animals, habitat improvements such as use of prescribed fire, removal of non-native fish species, and stream improvements.

Refer to the wildlife habitat connectivity section 3.7.6 and the aquatics species section 3.2.9 for additional information.

Effects from minerals management

Recommended wilderness areas are not withdrawn from mineral entry and are available for new leases or claims as long as the social and ecological characteristics that provide a basis for wilderness designation are maintained and protected. Therefore, the effects of minerals management would be the same with all alternatives, and the social and ecological characteristics that form the basis of wilderness designation would be protected and maintained.

Cumulative effects

In general, cumulative effects are the past, present, and reasonably foreseeable future effects from management activities on the Forest and adjacent lands.

Reasonable and foreseeable future actions on NFS lands include vegetation management, mining, expansion of ski areas, and reduction of fuels in the wildland-urban interface. These actions could impact the wilderness characteristics of solitude, depending on how close and pervasive these actions were, although typically just the sights and sounds *within* the recommended wilderness area are used to determine effects on wilderness characteristics. For example, vegetation management activities such as harvesting adjacent to a recommended wilderness area might increase the sights and sounds of logging equipment such as chainsaws and skidders within the recommended wilderness area, but because the harvesting is being done outside of the recommended wilderness area, it would not be considered as degrading the wilderness characteristic of solitude. However, an expansion of a ski area adjacent to recommended wilderness could increase use levels within the recommended wilderness, which might affect solitude as the number of encounters with others could increase within the recommended wilderness area.

Growth in Flathead, Lake, Lincoln, and Missoula Counties, as well as the surrounding areas in Idaho and Washington, is likely to increase recreational use of the Forest, including use within recommended wilderness areas. The effects of urbanization and population growth on recommended wilderness use and resource conditions are likely to be gradual and to extend well beyond the planning period. Increased recreational use may negatively affect wilderness characteristics, particularly the opportunity for solitude and natural quality. Examples of potential impacts include increased opportunity for crowding in certain locations, soil compaction or erosion, and threats to native plant species from the spread of noxious weeds from sources outside the area.

Currently, the Flathead National Forest manages approximately 30 percent of the designated wilderness within Montana and 10 percent of the National Wilderness Preservation System. Alternative C could potentially add the most acres to the National Wilderness Preservation System, followed by alternatives B modified and A. Alternatives D, A, B modified, and C, in that order, contain the least to the most area retaining wilderness characteristics over the next 15 years. In terms of wilderness recommendation, alternatives C, B modified, A, and D, in that order, contain the most to the least area recommended for wilderness.

Three recommended wilderness areas on the Forest (Swan Front, Tuchuck-Whale, and Le Beau) are adjacent to other Forests. The Swan Front recommended wilderness area shares about 2 miles of boundary with the Lolo National Forest, which does not have a recommended wilderness adjacent to the Swan Front recommended wilderness area. About 1 mile of the shared boundary is adjacent to a roadless area management allocation for the Lolo National Forest. This specific area (near Ptarmigan Mountain) does not have any system trails within the vicinity, and motorized over-snow vehicle use is prohibited in this area. This shared boundary and roadless area allocation is also part of proposed wilderness under the Forest Jobs and Recreation Act for the West Clearwater

Wilderness Addition. This roadless area on the Lolo National Forest is adjacent to the Bob Marshall Wilderness.

The Tuchuck-Whale recommended wilderness area shares its western boundary with the Kootenai National Forest for about 20 miles along the Whitefish Divide. The Kootenai National Forest does not have any recommended wilderness area adjacent to the shared boundary with this recommended wilderness area; about 5 miles of the boundary is management area 5b, which allows motorized use yearlong on designated trails and areas, and about 15 miles of the boundary is management area 5a, which does not allow motorized use. The Ten Lakes Wilderness Study Area on the Kootenai National Forest is about 3 miles from the Tuchuck-Whale recommended wilderness area.

The Le Beau recommended wilderness area shares the western and portions of its northern boundary for about 6 miles with the Kootenai National Forest, which does not have any recommended wilderness areas adjacent to the Le Beau recommended wilderness area. About 1 mile of its northern boundary is adjacent to a research natural area, and 1 mile is adjacent to management area 5b, which allows motorized use yearlong on designated trails and areas. The western boundary is adjacent to management area 6, which is general forest area and allows motorized use on designated trails and areas.

3.16 Inventoried Roadless Areas

3.16.1 Introduction

Inventoried roadless areas are designated areas under the Roadless Area Conservation Rule (36 CFR § 294) (USDA, 2001). These areas were first inventoried by the Forest Service in 1972 as part of the Roadless Area Review and Evaluation, phase I. In 1972, the Forest Service initiated a review of roadless areas on NFS lands that were generally larger than 5,000 acres to determine their suitability for inclusion in the National Wilderness Preservation System. A second review process completed in 1979, known as the Roadless Area Review and Evaluation II, resulted in another nationwide inventory of roadless areas.

Regulatory framework

Regulations

2001 Roadless Area Conservation Rule (36 CFR § 294 Subpart B): The 2001 Roadless Rule establishes prohibitions on road construction and road reconstruction and limitations on timber cutting, sale, or removal within inventoried roadless areas on NFS lands. The intent of the 2001 Roadless Rule is to provide lasting protection for inventoried roadless areas within the NFS in the context of multiple-use management. Refer to figures B-25 and B-26 for the inventoried roadless areas on the Flathead National Forest. These areas were identified in the Forest Service Roadless Area Conservation Final Environmental Impact Statement, volume 2 (USDA, 2000a).

Key indicators

- Percentage and acres of management area 1b (recommended wilderness)
- Percentage in management areas 2a and 2b (designated and eligible wild and scenic rivers)
- Percentage in management area 3b (special areas)
- Percentage in management area 4a (research natural areas)
- Percentage in management area 5a to 5d (backcountry)
- Percentage in management area 6a (general forest low-intensity vegetation management)
- Summer and winter recreation opportunity spectrum classes in inventoried roadless areas by alternatives

Methodology and analysis process

Indicators are presented under each alternative under the “Affected environment” section.

Information sources

The geographic information system (GIS) is the primary information source. A small percentage (0.20 percent or 952 acres) of inventoried roadless area is not on NFS lands, primarily due to mapping issues. The inventoried roadless area GIS layer is raster based (lines are blocky and have a stair-step appearance), and currently the Forest Service uses a vector-based GIS that results in smooth lines. When the raster-based inventoried roadless area layer is overlaid with the vector-based lines, slivers are created along the edges of the lines, which affects the acreage results. The Forest is not allowed to change the location of the original inventoried roadless area lines; it is thus not possible to align the inventoried roadless area to the intended NFS boundaries.

Analysis area

The geographic scope of the analysis is NFS lands administered by the Forest. All lands within the Flathead National Forest boundary form the geographic scope for cumulative effects. The temporal scope of the analysis is the anticipated life of the plan (15 years).

3.16.2 Affected environment (existing condition)

The Forest has 478,758 acres of inventoried roadless areas (see figures B-25 and B-26). The acreage designated as inventoried roadless areas constitutes 20 percent of the lands administered by the Forest. Twenty percent of the recommended wilderness areas from the 1986 forest plan are within inventoried roadless area lands on the Forest. Inventoried roadless areas have also been allocated to management areas other than recommended wilderness. Inventoried roadless areas, although allocated to various management areas, are also managed under the 2001 Roadless Area Conservation Rule. Table 140 shows the percentage of management area groups within the inventoried roadless area on the Forest, based on the 1986 forest plan, as amended, and includes what is currently suitable or unsuitable for timber production. The forest plan allocates about 75 percent of inventoried roadless areas as unsuitable for timber. About 4,000 acres have been harvested in inventoried roadless areas since 1985, which is less than 1 percent of the inventoried roadless area acreage on the Forest.

Table 140. Percentage of the largest **management area** groupings within inventoried roadless areas on the Forest, based on the 1986 forest plan, as amended

Management area group and description	Percentage within inventoried roadless areas (%)
Management areas 2, 2a, 2b, 2c Unroaded lands, unsuitable for timber management	41
Management areas 11, 11a Grizzly bear habitat, unsuitable for timber management	28
Management areas 15, 15a, 15b, 15e Roaded timber lands, suitable for timber management	9
Management areas 3, 3a Unsuitable for timber management	5
Management areas 13, 13a, 13d Roaded/unroaded lands, winter range *Management area 13* Suitable for timber management *Management areas 13a, 13d* Unsuitable for timber management	4
Management areas 16a, 16b, 16c Unroaded timberlands, suitable for timber	3

There was little road construction in the inventoried roadless area prior to the 2001 Roadless Area Conservation Rule; a total of 3 miles in the inventoried roadless areas on the Forest and less than 1 mile of road suitable for passenger cars have been constructed under the 1986 forest plan (see table 141).

Table 141. Summary of wheeled motorized trails, motorized over-snow vehicle motorized areas**, and motorized over-snow vehicle in acres and roads within the inventoried roadless areas on the Forest**

Total acres	Wheeled motorized trails	Motorized over-snow vehicle routes	Motorized over-snow vehicle areas	Roads suitable for high-clearance vehicles	Roads suitable for passenger cars
478,758	72 miles	4 miles	160,570 acres	3 miles	< 1 mile

Roadless area characteristics:

- high-quality or undisturbed soil, water, and air
- source of public drinking water
- diversity of plant and animal communities
- habitat for threatened, endangered, candidate, proposed, and sensitive species on large areas
- natural-appearing landscapes with high or very high scenic integrity
- primitive, semiprimitive nonmotorized, and semiprimitive motorized recreation opportunity classes of dispersed recreation
- referenced landscapes
- other locally identified unique characteristics
- traditional cultural properties and scared sites

3.16.3 Environmental consequences

Alternative A—No action

Twenty percent of the inventoried roadless areas on the Forest are also allocated as recommended wilderness under this alternative (see table 142). This alternative has the third highest amount of inventoried roadless area allocated to recommended wilderness. Because the 1986 forest plan was completed before the 2001 Roadless Area Conservation Rule, this alternative has some management areas that are suitable for timber production (according to the 1986 plan) that are within inventoried roadless areas.

Table 142. Inventoried roadless area indicators for alternative A

Indicator	Percentage and acreage of management areas within inventoried roadless areas
Percentage and acres of inventoried roadless areas on the Forest in management area 1b (recommended wilderness)	20% (95,278 acres)
Percentage in management areas 2a and 2b (designated and eligible wild and scenic rivers)	< 1%
Percentage in management area 3b (special areas)	none
Percentage in management area 4a (research natural areas)	2%
Percentage in management area 5a to 5d (backcountry)	58%
Percentage in management area 6a (general forest low-intensity vegetation management)	6%

Indicator	Percentage and acreage of management areas within inventoried roadless areas
Percentage in summer recreation opportunity spectrum classes	primitive 18%; semiprimitive nonmotorized 72%; semiprimitive motorized 5%; roaded natural 6%
Percentage in winter recreation opportunity spectrum classes	primitive 17%; semiprimitive nonmotorized 44%; semiprimitive motorized 38%; roaded natural 1%; < 1% rural

Table 142 shows that the largest class of the summer recreation opportunity spectrum within the inventoried roadless areas of the Forest is semiprimitive nonmotorized (72 percent), followed by primitive (18 percent), roaded natural (6 percent), and then semiprimitive motorized (5 percent). Semiprimitive nonmotorized settings encompass remote, large, natural landscapes that offer opportunities for exploration, challenge, solitude, and self-reliance. This alternative provides a summer nonmotorized setting on 90 percent and a summer motorized setting on 10 percent of the inventoried roadless areas of the Forest. This alternative would provide a higher amount of summer nonmotorized setting than alternative D and a lower amount of summer nonmotorized setting than alternatives B modified and C within the inventoried roadless areas on the Forest. Conversely, this alternative provides a higher amount of summer motorized setting than alternatives B modified and C and a lower amount of summer motorized setting than alternative C within inventoried roadless areas on the Forest.

Table 142 also shows that the largest class of the winter recreation opportunity spectrum within the inventoried roadless areas of the Forest is semiprimitive nonmotorized (44 percent), followed by semiprimitive motorized (38 percent) and then primitive (17 percent). This alternative provides 61 percent winter nonmotorized setting and 39 percent winter motorized setting within the inventoried roadless areas on the Forest. This alternative would provide the lowest amount of winter nonmotorized setting within the inventoried roadless areas on the Forest of all the alternatives. Conversely, this alternative would provide the highest amount of winter motorized setting within inventoried roadless areas on the Forest of all the alternatives.

Alternative B modified

According to table 143, 37 percent of the area within inventoried roadless areas is in management area 1b (recommended wilderness), which is unsuitable for timber production and does not allow timber harvest. Some restoration activity (e.g., whitebark pine planting, prescribed burning, protecting superior whitebark pine trees, fish restoration projects) would be suitable, however, where the outcomes would protect the wilderness characteristics of the areas, as long as the ecological and social characteristics that provide the basis for each area’s suitability for wilderness recommendation are maintained and protected.

Table 143. Inventoried roadless area indicators for alternative B modified

Indicator	Percentage and acreage of management areas within inventoried roadless areas
Percentage and acres of inventoried roadless areas on the Forest in management area 1b (recommended wilderness)	37% (179,160 acres)
Percentage in management areas 2a and 2b (designated and eligible wild and scenic rivers)	3%
Percentage in management area 3b (special areas)	0%

Indicator	Percentage and acreage of management areas within inventoried roadless areas
Percentage in management area 4a (research natural areas)	2%
Percentage in management area 5a to 5d (backcountry)	54%
Percentage in management area 6a (general forest low-intensity vegetation management)	4%
Percentage in summer recreation opportunity spectrum classes	semiprimitive nonmotorized 54%; primitive 38%; semiprimitive motorized 5%, roaded natural 3%;
Percentage in winter recreation opportunity spectrum classes	primitive 38%; semiprimitive motorized 32%; semiprimitive nonmotorized 29%; roaded natural 1%

Management areas 2a, 2b, 3b, 4a, 5a, 5b, 5c, 5d, and 6a would be unsuitable for timber production under alternative B modified, although low levels of timber harvest for multiple-use purposes, for salvage logging, and to achieve desired vegetation conditions could occur. About 37 percent of inventoried roadless areas would be allocated to recommended wilderness and a large percentage (54 percent) to backcountry management areas (5a-5d), with 4 percent to management area 6a. About 3 percent would be allocated to designated or eligible rivers. This alternative would allocate 37 percent of the inventoried roadless areas on the Forest as recommended wilderness, in contrast to alternative A, which allocated 20 percent of the inventoried roadless areas as recommended wilderness. This alternative has the second highest amount of inventoried roadless areas allocated to recommended wilderness.

Table 143 shows that the largest class of the summer desired recreation opportunity spectrum is semiprimitive nonmotorized (54 percent), followed by primitive (38 percent) and semiprimitive motorized (5 percent). This alternative provides a summer nonmotorized setting on 92 percent and summer motorized setting on 8 percent of the inventoried roadless areas on the Forest. This alternative would provide a higher amount of summer nonmotorized setting within the inventoried roadless areas on the Forest compared to alternatives A and D and a lower amount than alternative C. Conversely, this alternative would provide a higher summer motorized setting within inventoried roadless areas than alternative C and a lower motorized setting within inventoried roadless areas than alternatives A and D.

Table 143 also shows that the largest class of the winter recreation opportunity spectrum is primitive (38 percent), followed by semiprimitive motorized (32 percent) and then semiprimitive nonmotorized (29 percent). This alternative provides 67 percent winter nonmotorized setting and 33 percent of winter motorized setting within inventoried roadless areas on the Forest. This alternative would provide more winter nonmotorized setting of the inventoried roadless areas on the Forest compared to alternatives A and D and a lower amount than alternative C. Conversely, this alternative provides a higher amount of motorized setting within inventoried roadless areas on the Forest compared to alternative C and a lower amount than alternatives A and D.

Roadless area characteristics would be maintained with this alternative, and some timber harvesting might occur following the 2001 Roadless Area Conservation Rule specific exceptions for road construction and timber cutting, sale, and removal in inventoried roadless areas.

Alternative C

According to table 144, this alternative has 97 percent of management area 1b (recommended wilderness) in inventoried roadless areas, which is unsuitable for timber production and does not allow timber harvest. Some restoration activity (e.g., whitebark pine planting, prescribed burning, protecting superior whitebark pine trees) is suitable, however, where the outcomes will protect the wilderness characteristics of the areas, as long as the ecological and social characteristics that provide the basis for each area's suitability for wilderness recommendation are maintained and protected. Management areas 2a, 2b, 3b, 4a, 5a, 5b, 5c, 5d, and 6a are unsuitable for timber production, although low levels of timber harvest for multiple-use purposes, for salvage logging, and to achieve desired vegetation conditions could occur. About 97 percent of inventoried roadless areas on the Forest are allocated to recommended wilderness, plus a small percentage (1 percent) to backcountry management areas and an additional 1 percent to management area 6a. Under this alternative, the highest amount of inventoried roadless areas is allocated to recommended wilderness.

Table 144. Inventoried roadless area indicators for alternative C

Indicator	Percentage and acreage of management areas within inventoried roadless areas
Percentage and acreage of inventoried roadless area on the Forest in management area 1b (recommended wilderness)	97% (466,315 acres)
Percentage in management areas 2a and 2b (designated and eligible wild and scenic rivers)	3%
Percentage in management area 3b (special areas)	0%
Percentage in management area 4a (research natural areas)	1%
Percentage in management areas 5a to 5d (backcountry)	1%
Percentage in management area 6a (general forest low-intensity vegetation management)	1%
Percentage in summer recreation opportunity spectrum classes	primitive 98%, semiprimitive nonmotorized 1%, roaded natural 1%, semiprimitive motorized < 1%
Percentage in winter recreation opportunity spectrum classes	primitive 98%, semiprimitive nonmotorized 1%, semiprimitive motorized 1%, roaded natural < 1%

Table 144 shows that the largest class of the recreation opportunity spectrum for both summer and winter is primitive, at 98 percent. Combining primitive with semiprimitive nonmotorized provides a nonmotorized setting on 99 percent of the inventoried roadless areas, whereas alternative A would provide a summer nonmotorized setting on 90 percent of the inventoried roadless areas of the Forest. Alternative C would provide the highest amount of nonmotorized settings within inventoried roadless areas on the Forest of all the alternatives and give the highest protection to roadless characteristics of the inventoried roadless areas because 97 percent of inventoried roadless areas on the Forest would be allocated to recommended wilderness. Conversely, alternative C would provide the least amount of motorized settings within inventoried roadless areas on the Forest.

Roadless area characteristics would be maintained under this alternative, and some timber harvesting might occur following the 2001 Roadless Area Conservation Rule exceptions for road construction and tree cutting, sale, or removal in inventoried roadless areas.

Alternative D

As shown in table 145, management areas 2a, 2b, 3b, 4a, 5a, 5b, 5c, 5d, and 6a would be unsuitable for timber production under alternative D, although low levels of timber harvest for multiple-use purposes, for salvage logging, and to achieve desired vegetation conditions could occur. None of the inventoried roadless areas would be allocated to recommended wilderness under this alternative; a large percentage (89 percent) is allocated to backcountry management areas, which vary from no motorized to wheeled motorized and motorized over-snow vehicle use in a backcountry setting. This alternative allocates 4 percent to management area 6a. It has the least amount of area allocated to recommended wilderness.

Table 145. Inventoried roadless area indicators for alternative D

Indicator	Percentage and acreage of management areas within inventoried roadless areas
Percentage and acres in management area 1b (recommended wilderness)	0 % (0 acres)
Percentage in management areas 2a and 2b (designated and eligible wild and scenic rivers)	3%
Percentage in management area 3b (special areas)	3%
Percentage in management area 4a (research natural areas)	2%
Percentage in management area 5a to 5d (backcountry)	89%
Percentage in management area 6a (general forest low-intensity vegetation management)	4%
Percentage in summer recreation opportunity spectrum classes	semiprimitive nonmotorized 57%; semiprimitive motorized 35%; roaded natural 5%, primitive 3%
Percentage in winter recreation opportunity spectrum classes	semiprimitive nonmotorized 59%; semiprimitive motorized 36%; primitive 3%; roaded natural 1%

Table 145 shows that the largest classes of summer recreation opportunity spectrum are semiprimitive nonmotorized (57 percent), semiprimitive motorized (35 percent), and primitive (3 percent). The primitive setting, when combined with the semiprimitive nonmotorized setting, provides a nonmotorized setting on 60 percent of the inventoried roadless areas on the Forest. Conversely, this alternative provides a motorized setting on 40 percent of the inventoried roadless areas on the Forest.

Table 145 also shows that the two largest classes of winter recreation opportunity spectrum are semiprimitive nonmotorized (59 percent), semiprimitive motorized (36 percent), and primitive (3 percent). The primitive setting, when combined with the semiprimitive nonmotorized setting, provides a nonmotorized setting on 62 percent of the inventoried roadless areas on the Forest. Conversely, this alternative provides a motorized setting on 37 percent of the inventoried roadless area on the Forest. This alternative provides the least amount of summer and winter nonmotorized settings of all the alternatives.

Roadless area characteristics would be maintained under this alternative, and some timber harvesting might occur following the 2001 Roadless Area Conservation Rule exceptions for road construction and tree cutting, sale, or removal in inventoried roadless areas.

Consequences to inventoried roadless areas from forest plan components associated with other resource programs or management activities

Effects of management area prescription

Alternative D has the most inventoried roadless areas allocated in backcountry management areas, with alternative B modified the second highest and alternative C the third highest. The backcountry management area ranges from no motorized use suitable to wheeled motorized and motorized over-snow vehicle use suitable. Alternative D has the highest amount of inventoried roadless area allocated to general forest low-intensity vegetation management (management area 6a) compared to alternatives B modified and C. Management area 6a is generally located in areas with a higher level of other resource considerations or site limitations that would restrict active vegetation management (such as inventoried roadless areas), but it is suitable for timber production. Alternative C has the most inventoried roadless area allocated to recommended wilderness, followed by alternatives B modified, A, and D.

Effects from fire and fuels management

Effective fire suppression, insect and disease infestations, and vegetation and fuel types on the Flathead National Forest have led to excessive fuel buildup in some areas. Lightning-caused fires may be managed to trend vegetation towards desired conditions. Likewise, prescribed fire may be used to trend vegetation towards the desired conditions while serving other important ecosystem functions.

Inventoried roadless areas allocated to management areas 5a to 5d would use prescribed fire and natural, unplanned ignitions to meet resource objectives as the primary mechanism for managing vegetation. The use of natural, unplanned ignitions would be more likely in alternative C, which emphasizes the use of natural disturbances and allocates 97 percent of the inventoried roadless areas allocated to recommended wilderness.

Prescribed fire and the use of natural, unplanned ignitions would continue the long-term ecological processes in these areas. There could be a temporary loss of vegetation, reduction in water quality due to sedimentation, and increase in air pollution. These activities generally would not affect the roadless area character.

Prescribed fire and the use of natural, unplanned ignitions could affect primitive recreation, although recreational use of burned-over areas might drop for a period of years after the fire. Lethal fire in heavy timber stands would also increase trail maintenance needs from continued downfall of snags across trails.

Effects from vegetative management

No timber harvesting would occur in management area 1b, although restoration activities could occur where the outcomes would protect the wilderness characteristics of the areas, as long as the ecological and social characteristics that provide the basis for each area’s suitability for wilderness recommendation were maintained and protected. In the management areas 2a, 2b, 3b, 4a, 5a, 5b, 5c, 5d and 6a timber harvest is expected to be limited and generally would be done for purposes that would result in retaining natural integrity of the ecosystem. Timber harvesting that is done to reduce hazardous fuels may be more intensive and change the undeveloped characteristics, to some degree, until vegetation regrows. This is most likely to happen on the edges of an inventoried roadless area nearer communities. Any timber harvesting within these areas would meet the requirements of the 2001 Roadless Area Conservation Rule. Timber production is not suitable in alternatives B modified, C, and D.

Effects from recreation and access

Opportunities for primitive and nonmotorized recreation would be found in inventoried roadless areas. Inventoried roadless areas that are assigned to other management areas would be managed for the mapped desired recreation opportunities classes. The existing settings generally fall into primitive, semiprimitive nonmotorized or semiprimitive motorized classes.

Trail maintenance and new trail construction would usually be compatible with maintaining the undeveloped character of inventoried roadless areas

In inventoried roadless areas allocated to recommended wilderness, foot and horse travel would be permitted except in the Jewel Basin hiking area, where stock use is prohibited. Under alternative C, inventoried roadless areas allocated to recommended wilderness management areas and to motorized and mechanized transport would be prohibited. Under alternative B modified, existing motorized uses and mechanized transport would be allowed to continue in inventoried roadless areas allocated to recommended wilderness as long as the ecological and social characteristics that provide the basis for each area’s suitability for wilderness recommendation are maintained and protected.

Inventoried roadless areas not recommended for wilderness might have a variety of motorized or mechanized transport opportunities depending on the management area assigned and the desired recreation opportunity spectrum, as mapped. Alternative C would provide the highest amount of primitive and semiprimitive nonmotorized class compared to alternatives B modified, A, and D.

Effects of mineral development

These areas would not be withdrawn from mineral entry. Mining activities could result in both short-term and long-term effects from associated structures, vegetation clearing, and general ground-disturbing activities.

Cumulative effects

Cumulative effects are the past, present, and reasonably foreseeable future activities that were considered with regard to cumulative effects to the roadless resource. Cumulative effects were considered for the life of the plan, and the area of consideration is the Forest. Reasonable and foreseeable actions on NFS lands include future vegetation management, mining/reclamation, population growth in adjacent areas, expansion of ski areas, and reduction of fuels in the wildland-urban interface.

Population growth and development increases the need for public open space. Growth in Flathead, Lake, and Lincoln Counties is expected to increase recreational use of the Forest, including within inventoried roadless areas. The effects of urbanization and population growth on inventoried roadless areas and resource conditions are likely to be gradual and to extend beyond the planning period.

Inventoried roadless area characteristics are changed by development such as roads, timber management, recreation facilities, reservoirs, etc. The development of roads and the management of vegetation has affected roadless areas in the past. Since the mapping of roadless areas in 1999 and the 2001 Roadless Area Conservation Rule, fewer developments have changed the roadless characteristics of inventoried roadless areas. Alternatives C, B modified, A, and D, in that order, retain the most roadless character over the next 15 years.

3.17 Wild and Scenic Rivers

3.17.1 Introduction

Congress passed the National Wild and Scenic Rivers System Act in 1968 (Pub. L. 90-542; 16 U.S.C. 1271 et seq.) for the purpose of preserving rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations. The act is recognized for safeguarding the special character of these rivers while also allowing for their appropriate use and development. The act promotes river management across political boundaries and public participation in developing goals for river protection.

The Flathead National Forest has one designated wild and scenic river, the Flathead River, which has three forks—the South Fork, Middle Fork, and North Fork—that were designated by Congress in 1976 for a total of 219 miles. The Flathead National Forest cooperatively manages the North Fork and portions of the Middle Fork of the Flathead with Glacier National Park; Flathead National Forest is the lead management agency.

For wild and scenic rivers, the designated management boundaries generally average 0.25 mile on either bank in the lower 48 states. The purpose of this 0.25-mile management corridor is to protect river-related values. For management purposes, river segments are classified as *wild*, *scenic*, or *recreational*.

- **Wild River Areas**—Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.
- **Scenic River Areas**—Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.
- **Recreational River Areas**—Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

Regulatory framework

Laws and executive orders

Wild and Scenic Rivers Act of October 2, 1968 (Pub. L. 90-542, 82 Stat. 906, as amended): This act establishes the National Wild and Scenic Rivers System with three classes of river systems: wild, scenic, and recreational. The purpose of the act is to protect the river "for the benefit and enjoyment of present and future generations."

Key indicator

- Miles of designated and eligible wild and scenic rivers

Methodology and analysis process

Information sources and analysis

The information source is the Flathead National Forest GIS. See appendix 5 for detailed information on the sources used.

Analysis area

The geographic scope of the analysis is the lands administered by the Forest. All lands within the Flathead National Forest boundary form the geographic scope for cumulative effects, and the temporal scope is the anticipated life of the plan (15 years)

Notable changes between draft and final EIS

In response to comments requesting that additional rivers be included as eligible, in 2017 the Forest's planning team reviewed the rivers identified in comments. The results of the review are documented in appendix 5. An additional eligible wild and scenic river was added between draft and final. Twin Creek, also known as upper Twin Creek, was determined to have outstandingly remarkable values for scenery and geology. The preliminary classifications are *wild* from Nanny Creek to the confluence with North Creek and *recreational* from North Creek to the confluence with the South Fork of the Flathead River, for a total of 6 miles.

The plan direction for management area 2b (eligible wild and scenic rivers) was clarified to state that the direction is only for NFS lands. About 6 miles of this segment is on the Swan River State Forest, which is non-NFS land; the plan direction does not apply to these 6 miles.

3.17.2 Affected environment (existing condition)

Designated Rivers

North Fork of the Flathead River

The North Fork of the Flathead River is cooperatively managed with Glacier National Park. Glacier National Park manages the east side of the river as recommended wilderness and has specific permitted uses and regulations. The headwaters of the North Fork of the Flathead originate in Canada.

The upper North Fork segment is mostly classified as a *scenic river* and is about 37 miles long. The outstandingly remarkable values for this segment are fish, geology, water quality, wildlife, botanical resources, recreation, scenery, history, and ethnography. A large portion of river users on this stretch of the river are non-outfitted. Commercial outfitting use is capped at 670 service days.

The lower North Fork segment is classified as *recreational river* and is about 21 miles long. The outstandingly remarkable values for this segment are fish, geology, water quality, wildlife, recreation, history, and ethnography. Motorized use is allowed from Big Creek River Access to Blankenship (confluence of Middle Fork). This section of the North Fork provides more whitewater opportunities with 3 class III rapids below Great Northern Flats. Commercial outfitting use is 387 priority service days and unlimited temporary use.

Middle Fork of the Flathead River

The upper Middle Fork segment of the Middle Fork is classified as a *wild river* with about 33 miles within the Great Bear Wilderness and 14 miles in the Bob Marshall Wilderness. The outstandingly remarkable values for this segment are fish, geology, water quality, wildlife, botanical resources, recreation, scenery, and history. Commercial outfitting use is capped at 456 priority service days.

The lower Middle Fork segment is classified as a recreational river and is about 49 miles long, and it is cooperatively managed with Glacier National Park. The outstandingly remarkable values for this segment are fish, geology, water quality, wildlife, recreation, scenery, and history. The Glacier

National Park side is mostly recommended wilderness and is managed as designated wilderness. This section of the river has the highest recreational use and has a high volume of outfitter use, with 36,125 priority service days and unlimited temporary service days.

South Fork of the Flathead River

The upper South Fork segment has a 41-mile segment within the Bob Marshall Wilderness that is classified as *wild river*. The segment from Meadow Creek Gorge to the footbridge at the Spotted Bear Ranger Station is an 11-mile section classified as *wild river* and is the only wild section outside of wilderness in the Forest's wild and scenic river system. The wild section is managed similar to wilderness.

The lower South Fork segment extends downstream 9 miles from the footbridge at Spotted Bear Ranger Station; this section of river is classified as a *recreational river*. Motorboats are allowed but are limited to 10 horse power or less. This river segment offers a slower-paced float, with just a few class I and II rapids.

Eligible rivers

Refer to appendix 5 for detailed information on the process of determining eligible wild and scenic rivers. There are 24 eligible wild and scenic rivers on the Forest, totaling 284 miles. These eligible rivers stay constant for all alternatives.

Table 146. Eligible wild and scenic rivers

River or Creek	Segment	Preliminary Classification	Outstandingly Remarkable Values	Length (miles)	Acres[a]
Aeneas	Headwaters to Hungry Horse Reservoir	Scenic	History, prehistory, recreation, scenery	5	1,770
Big Salmon	Lena Lake to South Fork of Flathead River, includes Big Salmon Lake.	Wild	Recreation, geology, fish, prehistory	19	4,727
Clack	Headwaters to Middle Fork of Flathead River	Wild	Geology, scenery	8	2,021
Danaher	Headwaters to Youngs Creek.	Wild	Scenery, recreation, fish, wildlife, history, prehistory, botany, natural area	23	6,042
Elk	Headwaters to Forest boundary	Scenic	Fish	10	2,636
Gateway	Headwaters to Strawberry Creek	Wild	Scenery, geology, history	5	1,745
Glacier	Headwaters to outlet of Glacier Slough	Wild segment: within Mission Mountains Wilderness; Scenic segment: wilderness boundary to outlet of Glacier Slough	Geology, wildlife, scenery	6	1,774

River or Creek	Segment	Preliminary Classification	Outstandingly Remarkable Values	Length (miles)	Acres[a]
Graves	Headwaters to Hungry Horse Reservoir	Wild segment: within Jewel Basin hiking area; Scenic segment: from boundary of Jewel Basin to Hungry Horse Reservoir	Prehistory	10	2,467
Le Beau	Headwaters to Le Beau Research Natural Area boundary	Wild	Scenery, geology, natural area	4	1,325
Lion	Headwaters to Lion Creek Trailhead	Scenic	Wildlife	11	3,315
Little Salmon	Headwaters to South Fork of Flathead River	Wild	Scenery, fish, prehistory	19	5,513
Logan	From NFS Road 539 to Tally Lake	Recreational	Scenery, recreation	4	1,274
Schafer	Headwaters to Middle Fork of Flathead River	Wild	Prehistory, history	11	2,947
Spotted Bear	Headwaters to South Fork of Flathead River	Wild segment: headwaters to end of Blue Lake; Recreational segment: Blue Lake to SF of Flathead	Recreation, wildlife, geology	35	10,261
Strawberry	Headwaters to Middle Fork of Flathead River	Wild	Fish	14	3,869
Swan, lower	Swan River State Forest to Swan Lake[b]	Recreational	Wildlife	11	1,432
Swan, upper	Crystal Lake to Confluence with Lindbergh Lake	Wild	Recreation	2	837
Twin (also known as Upper Twin)	Nanny Creek to the Confluence with the South Fork of the Flathead	Wild segment: From Nanny Creek to confluence with North Creek; Recreational segment: North Creek to confluence with South Fork of Flathead	Geology, scenery	6	1,766
Whale	Headwaters to USFS boundary	Scenic segment: Headwaters to confluence to Shorty Creek; Recreational segment: Shorty Creek to USFS boundary	Wildlife, fish	21	6,263
White	Entire segment	Wild	Geology, fish, history, prehistory, scenery	24	6,964

River or Creek	Segment	Preliminary Classification	Outstandingly Remarkable Values	Length (miles)	Acres[a]
Nokio	Nokio Creek along NFS Road #114 to confluence with Yakinikak Creek.	Scenic	Prehistory	3	672
Yakinikak	Yakinikak Creek to confluence with Thoma Creek (stream becomes Trail Creek).	Scenic	Prehistory	8	2,319
Trail (North Fork)	Trail Creek to USFS boundary	Scenic	Fish, prehistory, geology, wildlife	2	1,475
Youngs	Headwaters to South Fork of the Flathead	Wild	Fish, recreation, prehistory, history, scenery	23	6,462
Total	--	--	--	284	--

a. There are 47,680 acres of management area 2b within management area 1a, 10,395 acres in management area 1b, and 1,325 acres in management area 4a.

b. Plan direction for management area 2b is only for NFS lands. About 6 miles of this segment is on the Swan River State Forest, which is non-NFS land; the plan direction does not apply to these 6 miles.

3.17.3 Environmental consequences

Effects common to alternatives A, B modified, C, and D

Under all alternatives, eligible rivers would be managed according to Forest Service policy and management area 2b direction and would be managed to protect their free-flowing condition, and outstandingly remarkable values. Therefore, the management of eligible segments under Forest Service policy would be the same for alternatives A, B modified, C, and D.

Consequences to designated or eligible wild and scenic rivers from forest plan components associated with other resource programs or management activities

Effects of management area prescription

The management area direction for eligible wild and scenic rivers protects the free-flowing conditions and outstandingly remarkable values for which the river was determined as eligible. All alternatives have the same miles of eligible rivers.

Effects from fire and fuels management

Both natural and unplanned ignitions and prescribed fires are allowed to be used as tools to maintain ecological conditions within river corridors as long as the outstandingly remarkable values for which the scenic or recreational river was identified are protected and maintained.

Effects from vegetative management

Rivers with a preliminary classification as wild are not suitable for timber production, and timber harvest is not allowed. There would be no effects from timber harvest on those segments. On rivers with a preliminary classification as recreational or scenic, timber production is not suitable but timber harvest is allowed for multiple-use purposes, for salvage logging, and to achieve desired vegetation conditions. Any timber harvest would protect the identified outstandingly remarkable values.

Effects from recreation and access

Impacts from recreational use and management within eligible river segments are anticipated to be low. Although river corridors may be used for camping, canoeing, hiking, and other activities, the impacts are expected to remain at existing levels. In order to provide an essentially primitive character, eligible segments classified as wild generally would not have developed recreation sites. Dispersed camping and day-use sites may occur in these river corridors. In segments classified as scenic or recreational, developed recreation sites would be allowed when such sites would protect and maintain the outstandingly remarkable values for which the river was deemed eligible. Trail maintenance work could be expected to have little if any impact in the river corridors.

Effects of mineral development

Anticipated effects from minerals management would be low under all alternatives. Eligible rivers with potentially classified as scenic or recreational are not withdrawn from mineral entry and are suitable for mineral exploration and development as long as the outstandingly remarkable values for which the river was deemed eligible are maintained and protected. Designated and eligible segments classified as wild would not be available for minerals development.

The potential for leasable minerals is low across most of the Forest, and currently there are no permits or operating plans for exploration within the corridors. Although the potential for locatable minerals does exist, there are no current permits or operating plans for mineral exploration within the corridors. Mineral materials are present and could potentially be used for construction purposes, but generally proposals for development of mineral materials do not occur, and allowing such development would be at the discretion of the Forest Service.

Cumulative effects

Cumulative effects are the potential impacts to wild and scenic rivers from the alternatives when combined with past, present, and reasonably foreseeable actions. The lands within the Flathead National Forest boundary, and the named rivers and streams contained therein, form the geographic scope for evaluating cumulative effects. The temporal bound is the life of the forest plan, which is estimated to be 15 years.

In order to integrate the contribution of past actions to the cumulative effects of the proposed action and alternatives, existing conditions are used as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior actions that have affected wild and scenic rivers and might contribute to cumulative effects. Water-related activities such as fishing, rafting, kayaking, and similar uses are expanding as the population in the nearby urban areas increases and access points are developed.

Water-related activities such as fishing, rafting, canoeing, and kayaking, have been steadily increasing and occur mostly at dispersed sites and some developed recreation sites such as the Moccasin boat launch site.

Management activities generally take place outside of eligible wild and scenic rivers unless an action is needed to help protect or preserve the identified outstandingly remarkable value. For example, if invasive weeds were discovered in an eligible river corridor, there might be a need to take some action (hand pulling, herbicide application) to eradicate or prevent further spread.

3.18 National Scenic Trails

3.18.1 Introduction

Regulatory framework

Laws and executive orders

Wilderness Act of September 3, 1964 (16 U.S.C. 1131-1136): This act provides the statutory definition of wilderness and management requirements for these congressionally designated areas. This act established a National Wilderness Preservation System to be administered in such a manner as to leave these areas unimpaired for future use and enjoyment as wilderness.

National Trails System Act of 1968: Established a national trails system.

National Forest Management Act (NFMA) of 1976, as amended (16 U.S.C. 1600): Provides that management direction for wilderness be incorporated into forest plans and sets minimum standards for the content of the plans.

Executive Order 13195 of January 18, 2001: Trails for America in the 21st Century

Omnibus Public Land Management Act of 2009 (Pub. L. 111–11): Authorized the Pacific Northwest Scenic Trail as an addition to the National Scenic Trail system.

Code of Federal Regulations

- **36 CFR § 293:** Wilderness–Primitive Areas
- **36 CFR § 261.18**: Prohibitions in National Forest Wilderness

Other policy

- The Continental Divide National Scenic Trail Comprehensive Plan

Indicators, methodology, and analysis process

Effects to national scenic trails are indicated by an evaluation of the difference in management activity by looking at the assigned management areas by alternative as well as the recreation opportunity spectrum class allocation by alternative.

- Management areas the national scenic trails goes through
- Recreation opportunity spectrum settings the national scenic trails goes through

Information sources

The Forest Service's GIS and the Continental Divide National Scenic Trail Comprehensive Plan were used in the analysis.

Analysis area

The geographic scope of the analysis is the lands administered by the Forest. All NFS lands within the Flathead National Forest boundary form the geographic scope for cumulative effects. The temporal scope of the analysis is the anticipated life of the plan (15 years).

Notable changes between draft and final EIS

A new desired condition, FW-DC-NST-02, states that "the Pacific Northwest National Scenic Trail segment on the Forest provides a nonmotorized long-distance trail." The analysis was updated to incorporate this desired condition.

3.18.2 Affected environment (existing condition)

Continental Divide National Scenic Trail

The Continental Divide National Scenic Trail, also known as the Continental Divide Trail, is a national scenic trail that runs 3,100 miles between Mexico and Canada. It follows the Continental Divide of the Americas along the Rocky Mountains and traverses five U.S. states: Montana, Idaho, Wyoming, Colorado, and New Mexico. The trail is a combination of dedicated trails and roads.

About 19 miles of the Continental Divide National Scenic Trail are on the Flathead National Forest, and these include Badger Creek Trail # 147, Strawberry Creek Trail # 161, Bowl Creek Trail # 324, and Sun River Pass Trail # 116. This section of the Continental Divide Trail on the Flathead National Forest is within designated wilderness (Bob Marshall Wilderness); there is about 1 mile of the trail which leaves the Flathead National Forest, goes into the Helena-Lewis and Clark National Forest, and crosses back into the Flathead National Forest and then back into the Helena-Lewis and Clark National Forest. The trail has a mapped 1-mile-wide corridor that is affected by all plan direction related to this trail. Refer to figure B-17.

Pacific Northwest National Scenic Trail

The Pacific Northwest National Scenic Trail begins near the Continental Divide in Glacier National Park and continues more than 1,200 miles through Montana, Idaho, and Washington before reaching its western terminus at the Pacific Ocean near Cape Alava. There are about 28 miles of the Pacific Northwest National Scenic Trail on the Flathead National Forest. The trail has a mile-wide corridor that is affected by all plan direction related to this trail. Going east to west, starting in Glacier National Park on Polebridge Ranger Station Road (see figure B-16), the trail sections include:

- Polebridge Ranger Station Road 107F
- Glacier Road 6055 (county road)
- Polebridge Loop Road 60054 (county road)
- North Fork Road 486 (county road)
- Hay Creek Road 376 (NFS road)
- Hay Creek Trail #3
- Ralph Thayer Memorial Trail (part of the Whitefish Divide Trail) #26 (connects to Blue Sky Trail #72 on the Kootenai National Forest)

Currently, an advisory board and interdisciplinary team for the Pacific Northwest Scenic Trail is developing a comprehensive plan for its entire length. An environmental analysis and decision for the trail (signed by the chief of the Forest Service) will be completed outside of this plan revision effort. The comprehensive plan is expected to provide additional programmatic direction for the trail. Depending on the outcome of the comprehensive plan and subsequent decision(s), the forest plan may be amended to include additional plan components for the trail.

On the Flathead National Forest portion of the trail, wheeled motorized use is allowed on 11.5 miles of the trail where the trail currently overlays segments of three roads: NFS road 376 (Hay Creek Road), NFS road 115 (Red Meadow Road), and NFS road 589 (Shorty Creek Road). Mechanized transport, hiking, and stock use are allowed on the entire 28 miles of the trail that are within the Forest. Motorized over-snow vehicle use is suitable on 12 miles and 2,710 acres within the trail corridor.

3.18.3 Environmental consequences

Continental Divide Scenic Trail

Effects common to all alternatives

None of the alternatives would affect the section of the Continental Divide Trail on the Flathead National Forest that is located within the Bob Marshall Wilderness. This wilderness provides a primitive recreation opportunity setting for all alternatives. There would be no change in current direction with any alternative. Although inside of the Bob Marshall Wilderness (management area 1a), the trail is also partially within an eligible wild and scenic river management area (Strawberry Creek) that has a potential classification of wild, which is managed as wilderness. There would be no change in current direction with any alternative.

Pacific Northwest National Scenic Trail

Alternative A

The majority of this trail is within backcountry (management areas 5a, 5b, 5c, and 5d) at 12 miles; general forest medium- and high-intensity vegetation management (management area 6b and 6c) at 8 miles; and general forest low-intensity vegetation management (management area 6a) at 7 miles. About 1 mile of the trail goes through designated and eligible wild and scenic rivers (management areas 2a and 2b). When comparing the management areas in the 1986 forest plan and the new management areas, the backcountry management areas 5a, 5b, 5c, and 5d are considered as a group (refer to table 3 in volume 1 of this final EIS).

The primary summer recreation opportunity spectrum setting is semiprimitive nonmotorized at 66 percent of the trail followed by roaded natural at 34 percent. This alternative provides a nonmotorized setting on 66 percent and a motorized setting on 34 percent.

The primary winter desired recreation opportunity spectrum setting of the trail corridor is semiprimitive motorized at 73 percent, which provides a motorized setting, followed by semiprimitive nonmotorized at 26 percent, which provides a nonmotorized setting.

Alternative B modified

The majority of this trail is within general forest medium-intensity vegetation management (management area 6b) at 11 miles; general forest low-intensity vegetation management (management area 6a) at 7 miles; backcountry motorized over-snow vehicle use (management area 5c) at 5 miles, and backcountry nonmotorized year-round primitive (management area 5a) at 4 miles. About 1 mile of the trail goes through designated and eligible wild and scenic river management areas (2a and 2b).

The primary summer desired recreation opportunity spectrum setting of the trail corridor is roaded natural at 58 percent, followed by semiprimitive nonmotorized at 25 percent and primitive at 17 percent. Alternative B modified provides a motorized setting on 58 percent of the area and a

nonmotorized setting on 42 percent. Compared to alternative A, this alternative provides less summer nonmotorized setting and a higher summer motorized setting. This alternative provides less nonmotorized setting than alternative C but more than alternative D. Conversely, it provides a higher motorized setting than alternatives A and C but less than alternative D.

The primary winter desired recreation opportunity spectrum setting of the trail is semiprimitive motorized at 53 percent, followed by semiprimitive nonmotorized at 27 percent, primitive at 18 percent, and roaded natural at 3 percent. This alternative provides a motorized setting on 56 percent and a nonmotorized setting on 45 percent. Compared to alternative A, alternative B modified provides a higher amount of nonmotorized setting than alternative A and a lower amount of motorized setting than alternative A. This alternative provides less nonmotorized setting than alternative C but more than alternatives A and D. Conversely, it provides a higher amount of motorized setting than alternative C but less than alternatives A and D.

FW-DC-NST-02 states that the Pacific Northwest National Scenic Trail segment on the Forest provides a nonmotorized long-distance trail. The most likely scenario to move towards this desired condition would be moving the location of the trail off the three NFS roads (Hay Creek Road 376, Red Meadow Road 115, and Shorty Creek Road 589) and constructing a new segment of trail. However, the Forest could restrict motorized use on these three roads to move towards this desired condition. The final comprehensive trail plan, the accompanying programmatic environmental analysis and decision, and forest plan direction are expected to provide overall management direction for the trail.

Alternative C

The majority of this trail is within backcountry motorized over-snow vehicle use (management 5c) at 9 miles; recommended wilderness (management area 1b) at 7 miles; general forest low-intensity vegetation management (management area 6a) at 6 miles; and general forest medium-intensity vegetation management (management area 6b) at 3 miles. About 1 mile of the trail goes through designated and eligible wild and scenic rivers (management areas 2a and 2b) for less than 1 mile.

The primary desired summer recreation opportunity spectrum setting in the corridor is semiprimitive nonmotorized at 41 percent, followed by primitive at 32 percent, roaded natural at 17 percent, and semiprimitive motorized at 10 percent. This alternative provides a nonmotorized setting on 73 percent of the area and a motorized setting on 35 percent of the area. Compared to alternative A, this alternative provides a higher amount of nonmotorized setting and a lower amount of motorized setting than A. This alternative provides a lower amount of motorized setting than alternatives A, B modified, and D. Conversely, it provides a higher amount of nonmotorized setting than alternatives A, B modified, and D.

The two primary winter recreation opportunity spectrum settings are semiprimitive motorized at 33 percent and semiprimitive motorized at 33 percent, followed by primitive at 32 percent and roaded natural at 3 percent. This alternative provides a motorized setting on 36 percent of the trail and a nonmotorized setting on 65 percent. Compared to alternative A, this alternative provides a higher nonmotorized setting and a lower motorized setting. This alternative provides a higher amount of nonmotorized setting than alternatives A, B modified, and D. Conversely, it provides a lower motorized setting than alternatives A, B modified, and C.

FW-DC-NST-02 states that the Pacific Northwest National Scenic Trail segment on the Forest provides a nonmotorized long-distance trail. The most likely scenario to move towards this desired condition would be moving the location of the trail off the three NFS roads (Hay Creek Road 376,

Red Meadow Road 115, and Shorty Creek Road 589) and constructing a new segment of trail. However, the Forest could restrict motorized use on these three roads to move towards this desired condition. The final comprehensive trail plan, the accompanying programmatic environmental analysis and decision, and forest plan direction are expected to provide overall management direction for the trail.

Alternative D

The majority of this trail is within general forest medium-intensity vegetation management (management area 6b) at 8 miles; backcountry motorized over-snow vehicle use (management area 5c) at 8 miles; general forest low-intensity vegetation management (management area 6a) at 7 miles; general forest high-intensity vegetation management (management area 6c) at 3 miles; and backcountry nonmotorized year-round primitive (management area 5a) at 1 mile. About 1 mile goes through designated and eligible wild and scenic river (management areas 2a and 2b).

The primary summer desired recreation opportunity spectrum setting in the trail corridor is roaded natural at 59 percent followed by semiprimitive nonmotorized at 23 percent and semiprimitive motorized at 18 percent. This alternative provides a motorized setting on 77 percent of the area and a nonmotorized setting on 23 percent. Compared to alternative A, alternative D provides a higher amount of motorized setting than alternative A and a lower amount of nonmotorized setting than alternative A. This alternative provides a higher amount of motorized setting than alternatives A, B modified, and C. Conversely, it provides a lower amount of nonmotorized setting than alternatives A, B modified, and C. The primary winter recreation opportunity spectrum setting is semiprimitive motorized at 65 percent, followed by semiprimitive nonmotorized at 33 percent and roaded natural at 3 percent. This alternative provides a motorized setting on 68 percent of the trail corridor and a nonmotorized setting on 33 percent. Compared to alternative A, this alternative provides a higher amount of nonmotorized setting than alternative A and a lower amount of motorized setting. This alternative provides a higher amount of motorized setting than alternatives B modified and C and less than alternative A. Conversely, this alternative provides a higher amount of nonmotorized setting than alternative A and less than alternatives B modified and C.

FW-DC-NST-02 states that the Pacific Northwest National Scenic Trail segment on the Forest provides a nonmotorized long-distance trail. The most likely scenario to move towards this desired condition would be moving the location of the trail off the three NFS roads (Hay Creek Road 376, Red Meadow Road 115, and Shorty Creek Road 589) and constructing a new segment of trail. However, the Forest could restrict motorized use on these three roads to move towards this desired condition. The final comprehensive trail plan, the accompanying programmatic environmental analysis and decision as well, and forest plan direction are expected to provide overall management direction for the trail.

Cumulative effects

Cumulative effects are the potential impacts to the two national scenic trails from the alternatives when combined with past, present, and reasonably foreseeable actions. The lands within the Flathead National Forest boundary, as well as the Continental Divide Trail System and the Pacific Northwest Scenic Trail System, form the cumulative effects area. The temporal bound is the life of the forest plan, which is estimated to be 15 years.

In order to integrate the contribution of past actions with the cumulative effects of the alternatives, existing conditions are used as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior actions that have affected the Continental Divide Trail System and the Pacific Northwest Scenic Trail System and might contribute to cumulative

effects. Recreational activities such as hiking, camping, mountain biking, and similar uses are expanding as the population in the nearby urban areas increases.

Management activities that would affect the Continental Divide Trail on the Flathead National Forest (which is within designated wilderness) are generally those that allow natural processes such as fire, insect, and disease to occur. Recreational use might increase on the trail, with long-distance users having more contact with other visitors.

Management activities that would affect the Pacific Northwest National Scenic Trail could be vegetation management, road reconstruction, fire suppression, and increased recreational use.

3.19 Special Areas

3.19.1 Introduction

Special areas are a category of administratively designated areas, defined as an area or feature managed to maintain its unique special character or purpose (36 CFR § 219.19), including those that are botanical, geological, or recreational in nature. The Forest has one existing designated special area and an additional thirteen special areas recommended for designation in the forest plan.

Regulatory framework

2012 planning rule (36 CFR § 219.7): States that in developing a proposed plan revision, the responsible official shall identify existing designated areas and determine whether to recommend any additional areas for designation. Forest plans must include components for appropriate management of existing or proposed designated areas.

Forest Service Manual 2372, Administratively designated areas: Contains purpose, policy, and guidance for administrative designation of special areas.

Methodology and analysis process

Flathead National Forest resource specialists have identified the areas on the Forest that possess the characteristics that make them suitable for establishment as special areas. The areas acknowledge and highlight the special natural features of the Forest as well as provide the opportunity for public appreciation, education, and enjoyment. Input from members of the public was also considered in the selection of the special areas recommended for designation.

Documentation of conditions within the special areas comes from reports and records for individual areas (where available) and from local and regional Forest Service resource specialist knowledge.

Incomplete and unavailable information

Recent surveys and other sources of information on vegetation conditions within some of the special areas are limited.

Analysis area

The geographic scope of the analysis is the lands administered by the Forest. All lands within the Flathead National Forest boundary form the geographic scope for cumulative effects, and the temporal scope is the anticipated life of the plan (15 years).

3.19.2 Affected environment (existing condition)

Table 147 below lists the special areas on the Forest, both the existing designated special area (listed first) followed by the areas recommended for designation (the ten fens are listed in alphabetical order, followed by the other three recommended special areas). All are identified on the basis of their special botanical features, as described in the table and in the descriptions that follow the table. The acres within the fen special areas include a 300-foot riparian management zone adjacent to the fen. Refer to figures B-27 to B-28 for maps displaying the locations of the special areas (management area 3b).

Table 147. Designated special area and recommendations for special area designation on the Forest

Name	Geographic Area	Special character and features	Acres
Condon Creek Botanical Area (designated special area)	Swan Valley	Concentration of pond habitats occupied by water howellia, a federally threatened plant species. Associated upland mixed conifer forest featuring several groves of mature ponderosa pine as well as western larch and Douglas-fir.	226
Bent Flat Fen	South Fork	A unique, extremely rich fen with well-developed patterning, extensive marl deposits, and a large number of rare plants that are restricted to calcareous habitats. The Trail Creek Fire in August of 2015 burned the forests surrounding and immediately adjacent to the fen.	44
Gregg Creek Fen	Salish Mountains	Features peatland and wet forest and shrub communities within an undisturbed portion of the Gregg Creek watershed. Rare plants are present.	33
Lost Creek Fens	Swan Valley	Lost Creek Fens are two distinctly different types of fens separated by a patch of moist coniferous forest. The northern fen is at the toe of a slope. An upwelling spring supplies water to a thick accumulation of peat that gently slopes to the south. The southern fen has two shallow potholes filled with peat and alluvium. The water table fluctuates seasonally; drawdown in the fall hastens peat decomposition and minimizes peat accumulation. A number of rare plant species are present at both sites.	36
Meadow Lake Fen	Swan Valley	One of the few places on the Forest that has a floating organic mat. Rare plants are present. Loons and bog lemmings have also been observed at this lake.	62
Porcupine Fens	Swan Valley	Features two fens that are part of a larger complex of fens. Porcupine Fen is at the toe of a slope from which several springs emerge. This constant supply of mineral-rich water has favored the accumulation of organic matter. The site supports a diverse flora. The site is largely ringed by wet to moist spruce forests, except on a portion of the west margin where a harvested area upslope of the fen extends down nearly to the fen. The site is an excellent example of a flow-through fen. A number of rare plants occur.	145
Sanko Creek Fen North	Salish Mountains	Features two wetland areas. One is a small pond, up to 3 to 4 meters deep, that is surrounded by a floating to anchored organic mat and a wet meadow. The other wetland is a north-south-oriented fen. The fen is surrounded by moist spruce forest. The fen has a series of broad, gently sloping terraces with interspersed water tracks and upwelling pools of water. Western larch is common on adjacent uplands. Rare plant species have been observed at the site.	49
Sanko Creek Fen South	Salish Mountains	Oriented east-west along the base of a slope. A number of seeps and springs emerge from the toe of this slope and maintain wet conditions in the peatland. One rare plant species has been observed here, as well as a possible bog lemming.	23

Name	Geographic Area	Special character and features	Acres
Trail Creek Fen	Hungry Horse	A relatively large, highly calcareous peatland. The site contains three abandoned beaver dams and ponds and a well-developed peatland on the upper easternmost portion of the wetland. Several rare plants occupy this relatively large, well-developed peatland.	98
Trout Lake Fen	Hungry Horse	Trout Lake is an excellent example of an organic mat (floating and anchored) surrounding a deep pond. A sedge meadow lies southwest of the pond. Several species of sphagnum moss form a nearly continuous carpet adjacent to the pond. Rare plant species are known to be in the peat mat. The site is easily accessible by motor vehicle and supports a handicapped-accessible fishing dock. Most of the organic mat, however, is undisturbed by human use.	34
Windfall Creek Fen	Swan Valley	Occupies a basin formed by glacial scouring. Rare plant species have been observed here.	31
Glacier Slough	Swan Valley	One of the largest wetlands in the Swan Valley, with a diversity of wetland- and riparian-associated plant and animal species and adjacent forests of mixed conifer species.	1,690
Johnson Terrace	Salish Mountains	Includes a mossy forb meadow on shallow residual soils over a Precambrian argillite bedrock dip slope that is inundated with water in the spring and dries out during summer. Many diminutive plants are restricted to this type of ephemeral spring habitat. In addition to botanical features, this area contains geologic/topographic features that harbor a diversity of rare plant communities unique to the Forest.	331
Fatty Creek Cedars	Swan Valley	Moist, riparian-associated western redcedar forest type supporting stands dominated by very large, old cedar trees and associated unique assemblages of understory plants. This area provides aesthetic values associated with "ancient" cedar groves. Groves such as this are relatively rare on the Forest due to the limited area with suitable site conditions for their development, past fire disturbance, and removal through previous logging or development activities.	261
Total Acres			3,063

Condon Creek Botanical Area

The existing designated special area, Condon Creek Botanical Area, is located on the Swan Lake Ranger District, lying in the central portion of the Swan Valley. Retreating glaciers left large blocks of ice embedded in till, resulting in numerous ponds and wetlands throughout the Swan Valley. The site's topography is rolling with alternating swales and small ridges, and the site contains fifteen ponds. Condon Creek, forming the northern boundary of the botanical area, flows west into the Swan River.

The primary purpose of the Condon Creek Botanical Area is to protect a concentration of pond habitats occupied by water howellia, a federally listed threatened plant species (see section 3.5.1). Nine ponds support populations of water howellia within the botanical area. Adjacent uplands support forests of lodgepole pine, western larch, Douglas-fir, and ponderosa pine. Research and

education on water howellia and its habitat, and the associated upland forested areas, is another purpose for this botanical area.

Special areas recommended for designation

Thirteen special areas are recommended for designation in the forest plan. Ten of these areas contain fens, and these were selected because they are considered to be important representatives of this type of wetland on the Forest. The remaining three contain other botanical or geological features considered of special interest in the Forest ecosystem.

Fens are peat-forming wetlands and receive nutrients and water from underground sources. They are characterized by their water chemistry that, in contrast to bogs, is usually less acidic and has higher nutrient and mineral levels. They therefore support a much more diverse plant and animal community than bogs. They are often covered by grasses, sedges, rushes, and wildflowers, with unique assemblages of species connected to the water regime and nutrient conditions of each fen.

Fens, like bogs and other wetlands, provide important benefits in a watershed, including preventing or reducing the risk of floods, improving water quality, and providing habitat for often rare plant and animal communities unique to the Forest. Up to 10,000 years are required to form a fen naturally. Extensive losses in wetland acres have occurred across the United States since the mid-1700s, primarily through draining and converting them to other uses (Dahl, 1990). Beginning in the 1970s, the rate of wetland losses slowed substantially as a result of changes in national and state wetland policies and heightened awareness of the important benefits that aquatic systems, including wetlands, bring to society.

Glacier Slough Special Area contains one of the larger wetland complexes in the Swan Valley. It is located in the Glacier Creek drainage which flows into the upper reaches of the Swan River. It contains a complex diversity of plants associated with riparian and wetland habitats, which in turn supports a diverse array of wildlife species. The portion of Glacier Creek that lies within this special area is a proposed wild and scenic river (see section 3.17).

Johnson Terrace Special Area is a geologic feature on the side of Johnson Mountain in the Salish Mountains. Like many rock terraces, its shallow soils support many springtime ephemeral plants that are rarely seen in such a large assembly anywhere else on the Forest. One rare plant species, *Idahoa scapigera*, occurs on the terraces. Later in the season when spring runoff has ended, the terraces become grassy meadows. Elk sign is common in the area, indicating it is an important area for wildlife. Johnson Terrace is one of the largest terrace complexes on the Forest and has been the subject of botanical interest for many years.

Fatty Creek Cedars Special Area is comprised of a western redcedar (*Thuja plicata*) grove. Western redcedar is a widespread and common species in the forests of the Pacific Northwest. The Flathead National Forest is at the far eastern edge of the species range. As such, the presence of western redcedar is relatively restricted on the Forest; it occupies only the warmest sites, with relatively deep soils that maintain consistent, moist conditions, or sites that are seasonally wet areas. These tend to be located in the lower-elevation riparian zones and poorly drained depressions. Due to topographic, weather, and soil conditions, the Swan Valley contains some of the most extensive areas of western redcedar-dominated sites on the Flathead National Forest.

Western redcedar is most commonly associated with a wide array of tree species, including Douglas-fir, western larch, western white pine, grand fir, and ponderosa pine. Western redcedar is very tolerant of shade and can survive in the understory forest canopy layers for many decades. It is capable of living for several centuries, with some individuals achieving ages of 1,000 years or more.

It is relatively intolerant of fire, though larger diameter trees may withstand low- or even moderate-severity fires. The location of western redcedar in most moist or wet areas that are less likely to burn increases their probability of survival over time.

Western redcedar typically grows in relatively pure stands only where fire has been excluded for a long time (Barrett, 1988). On this eastern edge of the species' range, western redcedar sites on the Flathead National Forest tend to be drier and less productive than sites farther west. Fires also tend to be more frequent in the Flathead landscape, with shorter fire-free intervals and fires that are strongly driven by weather and topography. Even the wettest zones of the Forest will eventually experience a stand-replacement, high-severity fire, though perhaps at intervals of several hundred years. In addition, the high economic value of large, old cedar trees and their relative accessibility led to past harvesting of many cedar stands on both NFS and private lands. As a result of all these factors, groves of very large, old cedar trees, and their associated assemblage of understory shrub and herb species, are relatively rare on the Forest. Fatty Creek Cedars Special Area encompasses an old cedar grove and is proposed for special area designation to recognize and increase awareness of its unique ecological characteristics, to provide greater protection, and to foster educational opportunities.

3.19.3 Environmental consequences

General effects and management direction

Alternative A—No action

This alternative contains only one special area, which is the currently established Condon Creek Botanical Area. It is designated as management area 3a in the 1986 plan. Plan direction specifies that it should be managed in accordance with direction set in the conservation strategy for *Howellia aquatilis* (water howellia) (USDA, 1997) . There are no additional special areas under this alternative.

Although there are no proposed additional special areas in the existing plan, standards and guidelines associated with riparian habitats and wetlands in the existing plan would continue to provide protection of the plant communities and ecological values associated with the fens, Glacier Slough, and most of the Fatty Creek Cedars area, which are proposed for designation as special areas in alternatives B modified, C, and D.

Alternatives B modified, C, and D

Alternatives B modified, C, and D include the proposed designation of 13 new special areas, in addition to the existing Condon Creek Special Area, as displayed in table 147. Existing and proposed special areas are designated management area 3b in all action alternatives. As under the existing plan, the Condon Creek Special Area would be managed in accordance with direction set in the conservation strategy for water howellia (USDA, 1997) because the water howellia is the primary feature for which it was designated.

Forest plan components under these three alternatives specify that all special areas would be managed in a substantially natural condition so that the ecosystems would primarily reflect the influence of natural processes. Plant and wildlife habitat values for which the special area was identified would be maintained. Invasive plant species would be controlled. Educational and research opportunities would be provided featuring the ecological and plant communities associated with the special areas.

Specific direction for special areas would provide protection from human disturbances that would adversely affect their qualities. Vegetation management or other activities near special areas would be evaluated for potential impacts to the plant species, plant communities, and other associated qualities. The fens and the Glacier Slough and Johnson Terrace Special Areas would be unsuitable for new trail construction and associated structures, although existing trails that access these areas might be maintained.

Desired conditions in the forest plan related to providing for a healthy, functioning ecosystem within riparian management zones would apply to the fens and the Glacier Slough and Fatty Creek Cedars Special Areas because these areas contain riparian management zones. The fen and wetland special area boundaries all include a 300-foot buffer adjacent to the wetland. Guidelines and standards related to riparian management zones restrict management activities and disturbance in these areas (see the Riparian Management Zone section in chapter 2 of the forest plan and section 3.2.10 of the final EIS).

Values and qualities associated with the existing and proposed special areas are protected equally by the forest plan components under all action alternatives, preserving the values associated with these areas. Potential for adverse effects to special areas is low, with no notable difference among the action alternatives.

Consequences to special areas from forest plan components associated with other resource programs or management activities

Effects from access and recreation

Access and recreational uses would be restricted within special areas, protecting the qualities associated with the areas. Summer wheeled motorized travel is only allowed on designated routes. Motorized over-snow vehicle use could occur in some special areas, as identified on the over-snow vehicle use map. The special areas are designated as not suitable for construction of new wheeled motorized trails and areas or associated structures. Impacts from recreational activities are expected to be low in the special areas.

Effects from fire and fuels management

Desired conditions within special areas are to maintain an ecosystem that primarily reflects the influence of natural processes. These natural processes may include fire within some areas. Most wildfires would require suppression measures for the purposes of protect values both within and outside the special areas. Prescribed fire is allowed within special areas for the purposes of maintaining natural processes and desired vegetation conditions. Impacts from fire and fuels management are expected to be low.

Effects from vegetation management

Special areas are unsuitable for timber production and for the commercial removal of special forest products. Vegetation management, including harvest, may occur only to maintain the values and qualities associated with the special area. Impacts from vegetation management activities are expected to be very low.

Effects from invasive species management

Invasive species control may occur in some special areas, dependent on ground conditions and control methods. For example, fens would not be treated chemically due to their hydrology, but areas like Fatty Creek Cedars or Johnson Terrace could be chemically treated when spring runoff is over

and the site is suitable for treatment with herbicide chemicals in accordance with state regulations. Manual treatments would be a priority method in these special areas. Biological controls would also be considered if appropriate. Control of invasive species is expected to have a positive impact on the native plant species and plant communities associated with these special areas.

Cumulative effects

Management activities generally have taken place and will continue to take place mostly outside of the existing and proposed special areas. It is unlikely they would have an effect on the special areas due to the distance of management activities from the areas and various plan components that protect soils, water, and other resource values forestwide.

Control of invasive weeds is an action that may have occurred in the past within special areas and is the most likely management activity to occur within special areas in the future. This would likely have a positive effect on the special areas by controlling invasive weeds or preventing their spread. There may be other vegetation treatments, such as removal of woody fuels, occurring in the future within and adjacent to some special areas, particularly the fen special areas that lie in the wildland-urban interface. These fuel reduction actions may be desirable to reduce the severity of potential future fires, protecting the values associated both with and adjacent to the special areas. These activities are not expected to result in detrimental effects to the values associated with the special areas.

3.20 Research Natural Areas, Coram Experimental Forest, and Miller Creek Demonstration Forest

3.20.1 Introduction

The Forest contains six established research natural areas plus the Coram Experimental Forest and the Miller Creek Demonstration Forest. All are administratively designated areas, which are defined as an area identified and managed to maintain its unique special character or purpose (36 CFR § 219.19). The existing conditions and effects by alternative for all three of these designated area categories are discussed in this section.

Regulatory framework

Regulation, policy, and guidance

2012 planning rule (36 CFR § 219.7): States that in developing a proposed plan revision, the responsible official shall identify existing designated areas and determine whether to recommend any additional areas for designation. Forest plans must include components for appropriate management of existing or proposed designated areas.

Forest Service Manual 4063: Directs management of research natural areas as part of a national network of ecological areas allocated in perpetuity for research and education and/or to maintain biological diversity on NFS lands. Research natural areas are co-managed by the appropriate national forest and USFS research station

Forest Service Manual 4063.03: Forest plans shall include analysis of, and recommendations for, the establishment of any proposed research natural areas.

Region 1 Natural Areas Assessment 1996 (Chadde, Kimball, & Evenden, 1996): Provides an assessment of plant community types needed to fulfill the national spectrum of types to be placed in research natural area status in the USDA Forest Service Northern Region.

Establishment records for each research natural area: These records provide information on the natural features, plant communities, and species present in each research natural area, as well as management guidance.

Key indicator

The differences between alternatives will be evaluated by considering effects of forest plan direction and how well it supports and protects the values associated with these areas.

Methodology and analysis process

Flathead National Forest resource specialists and research scientists from the Rocky Mountain Research Station have identified the lands on the Forest that possess characteristics that make them suitable for research natural area establishment. Information and management guidance for each research natural area is provided within the establishment records. A guidebook on research natural areas also provides a synopsis of the natural features protected in each research natural area and information about use of the areas for research (Evenden, Moeur, Shelly, Kimball, & Wellner, 2001).

The Coram Experimental Forest was established and is managed by the Rocky Mountain Research Station. The Miller Creek Demonstration Forest was jointly identified by Forest resource specialists

and research scientists as suitable for special designation as a demonstration forest. Field surveys, research information, or other available documentation of conditions within the Coram Experimental Forest and the Miller Creek Demonstration Forest, as well as local resource specialist knowledge, were used to evaluate existing conditions and potential effects by alternative.

Incomplete and unavailable information

Recent surveys and other sources of information on vegetation conditions within some of the research natural areas are limited.

Analysis area

The geographic scope of the analysis is the lands administered by the Forest. All lands within the Flathead National Forest boundary form the geographic scope for cumulative effects, and the temporal scope is the anticipated life of the plan (15 years).

3.20.2 Affected environment (existing condition)

Research natural areas

The National Forest Management Act of 1976 directs the Forest Service to establish research natural areas typifying important forest, shrubland, grassland, alpine, and aquatic ecosystems. In addition to their value as reference areas for research and monitoring, research natural areas help maintain biological diversity by conserving assemblages of common and rare species, plant communities relatively undisturbed by human actions, and unique landscape features. The 1983 Northern Region Guide (USDA, 1983) included a matrix of habitat types, community types, and aquatic features targeted for inclusion in the Northern Region's research natural area system. Major revision of this 1983 regional guide for research natural areas was completed in 1996 (Chadde et al., 1996), giving new targeted plant communities and other features for inclusion in research natural areas. Many research natural areas have been formally established over the past 30 years, including six on the Forest. No new research natural areas are proposed in the forest plan. Target assignments from the 1996 assessment not yet filled on the Flathead are listed in appendix C of the forest plan, along with information on future opportunities to fill these assignments.

The six established research natural areas on the Forest are permanently designated for the purpose of conserving biodiversity, conducting nonmanipulative research and monitoring, and fostering education. They serve as high-quality representative areas of the major forms of vegetative variability found in the Forest, and they present reference areas for the study of natural ecological processes, including disturbances and climate change. Table 148 lists the six existing research natural areas on the Forest, with a brief description of each following the table. Refer to figures B-27 to B-28 for maps displaying the locations of the research natural areas.

Table 148. Established research natural areas on the Forest, with their establishment dates and acres

Research natural area name	Establishment Date	Acres[a]	Acres[b]
Coram	1988	876	839
East Shore	1991	654	646
Le Beau	1997	5,397	5,709
Little Bitterroot	1991	202	200
Swan River	1997	692	682
Tuchuck	1991	2,050	2,062
	Total Acres =	9,871	10,138

a. Acres are from Flathead National Forest GIS data sets.

b. These are the official acres from the research natural areas' establishment records.

Coram Research Natural Area

Coram Research Natural Area, located in the southeast corner of the Coram Experimental Forest, is situated about 3 miles east of the town of Hungry Horse on the Hungry Horse-Glacier View Ranger District. It is part of and is located within the boundaries of the Coram Experimental Forest. The research natural area was recognized in 1937 as a natural area, but official establishment as a research natural area did not occur until 1988. Since 1937, it has been used extensively for research and educational purposes. Late-successional western larch and interior Douglas-fir stands characterize the area, and it is used as a reference site for comparison to managed areas. Baseline monitoring plots were established in the research natural area in 1985, with additional plots added in 1993. Remeasurement of plots has occurred in 1990 and 2000.

East Shore Research Natural Area

East Shore Research Natural Area is located in the Crane Mountain area on the Swan Lake Ranger District. It lies approximately 3 miles south of the town of Bigfork, on the slopes above the east shore of Flathead Lake, and it borders private land to the southwest. The research natural area primarily features transition vegetation types ranging from aquatic and moist sites to dry sites within the Douglas-fir, grand fir, and western redcedar habitat type series. It was established primarily to preserve in an undisturbed (by humans) condition the terrestrial and aquatic features of the research natural area.

Le Beau Research Natural Area

Le Beau Research Natural Area lies within Le Beau Creek in the Stillwater River drainage, approximately 18 miles northwest of Whitefish. Most of the research natural area (5,397 acres) occurs on the Tally Lake Ranger District of the Flathead National Forest, with about 400 acres occurring on the adjacent Fortine Ranger District of the Kootenai National Forest. The area possesses a high diversity of montane and subalpine vegetation features (both terrestrial and wetland) and geologic landforms created by continental glaciation. Western redcedar, western hemlock, grand fir, western larch, and herbaceous plant communities occur on glacier-formed rocklands, lakes, ponds, and wetlands. The portion of Le Beau Creek that lies within the Le Beau Research Natural Area is proposed in the forest plan as an eligible wild and scenic river (see section 3.17).

Little Bitterroot Research Natural Area

Little Bitterroot Research Natural Area is located on the far southwestern edge of the Flathead National Forest administrative boundary, in the Swan Lake Ranger District. It lies southwest of Marion, about 2 miles south of U.S. Highway 2 along the Little Bitterroot River, which flows north into Little Bitterroot Lake. The Little Bitterroot Research Natural Area lands were administered by the Bureau of Land Management until 1966, when they came under the administration of the Forest. The area is completely surrounded by non-NFS lands. This research natural area is characterized by a narrow, steep-walled canyon, with two narrow lakes at the base of the cliffs. Below the lakes are shrub-dominated riparian areas. Nearly all of the forested area of the research natural area is within the dry Douglas-fir/pine grass habitat type and includes examples of all four habitat type phases defined by Pfister et al. (1977).

Swan River Research Natural Area

Swan River Research Natural Area is located along the Swan River south of Swan Lake in the Porcupine Creek area of the Swan Lake Ranger District. The research natural area features upland forests dominated by old western larch. Mature western redcedar, grand fir, western white pine, and Douglas-fir are also present. Wetland communities dominated by western redcedar, spruce, black cottonwood, and various shrub and herbaceous species occupy riparian sites such as wet meadows, fens, river edges, and beaver ponds. This research natural area is also within the Swan River Island inventoried roadless area.

Tuchuck Research Natural Area

Tuchuck Research Natural Area lies in Tuchuck Creek, a tributary of Trail Creek that flows into the North Fork of the Flathead River. The research natural area lies approximately 4 miles south of the U.S./Canadian border on the Hungry Horse-Glacier View Ranger District. Upper elevation and alpine plant communities dominate. Extensive stands of whitebark pine occur, as well as alpine larch and subalpine fir. The entire area burned in 1929 and, as a result, upper slopes are open and dominated by shrubs and herbaceous species and are only slowly advancing into a forest type. Several wet meadows and talus slopes are also present. The area has some of the healthiest whitebark pine stands on the Forest, with lower levels of mortality than observed in most other whitebark pine stands across the Forest. The Tuchuck Research Natural Area lies within a recommended wilderness area (management area 1b) in alternatives B modified and C.

Coram Experimental Forest

The Forest contains the Coram Experimental Forest, an approximately 7,500 acre area located on the Hungry Horse Ranger District, established in 1933. The Coram Research Natural Area is included within the boundaries of the Coram Experimental Forest. Research activities, facilities and management of the Coram Experimental Forest is the responsibility of the Rocky Mountain Research Station. The Flathead National Forest is responsible for all non-research based general management activities that occur on the Coram Experimental Forest. Clarification of responsibilities, the operating plan and fire management plan are outlined in a letter of agreement between the Rocky Mountain Research Station and the Flathead National Forest (USDA, 2016c).

The original purpose of the Coram Experimental Forest was to study the ecology and silviculture of western larch as it occurs in a mix with other commonly associated species. Western larch research was centered at Coram Experimental Forest to provide a scientific basis to regenerate and grow this ecologically important and economically valuable species. Long-term studies of soils, forest productivity, stand structure and growth, wildlife habitat, and other ecological components following timber harvest activities have been conducted. Climate and hydrological stations record variability in long-term weather and stream flow. Coram Experimental Forest also offers extensive educational opportunities, including the award-winning Walk with Larch trails that illustrate the long-term effects of silvicultural choices. At the Hungry Horse Ranger District compound, the International Larix Arboretum, also established and managed by the Rocky Mountain Research Station, contains specimens of larch species from around the world. In addition, part of the Coram Experimental Forest is designated as a research natural area (see table 148 and discussion under research natural areas above).

Miller Creek Demonstration Forest

The approximately 4,900-acre Miller Creek Demonstration Forest is located on the Tally Lake Ranger District and was set aside in 1989 by the forest supervisor. Research in this area began in 1966 to study the effect of prescribed fire and silvicultural treatments on regeneration and other

conditions within the mixed conifer forests typical of the area. The Miller Creek Demonstration Forest was established to encourage continuing research and to recognize the value of the area for long-term educational and demonstration purposes. A memorandum of understanding between the Rocky Mountain Research Station (formerly the Intermountain Research Station) and the Flathead National Forest clarifies the roles of the two agencies regarding activities within the Miller Creek Demonstration Forest (USDA, 1989). The Forest is responsible for implementing current forest plan direction in the area. The research station director is responsible for any new or continuing research activities.

3.20.3 Environmental consequences

Alternative A—No action

The existing forest plan contains management direction for the six established research natural areas and the Coram Experimental Forest. Five of the six research natural areas are designated management area 3a in the 1986 forest plan, as amended (amendment 22). Coram Research Natural Area is not a separate management area but is included within the Coram Experimental Forest, which is designated management area 14. All research natural areas are directed to be managed to perpetuate natural ecosystems and encourage scientific research with minimum human interference. Each research natural area is managed in accordance with its establishment record and management plan, if available.

The Coram Experimental Forest is designated management area 14 in the existing 1986 forest plan and is managed by the Rocky Mountain Research Station, coordinating with the Forest through the 2016 letter of agreement mentioned above. Management emphasizes studies and research to provide ecological and silvicultural information needed to manage western larch-mixed conifer forests.

Miller Creek Demonstration Forest is not specifically identified as a management area within the 1986 forest plan, and there is no specific forest plan direction in the current plan related to the Miller Creek Demonstration Forest. The majority (88 percent) of the area is designated as management area 15, forestlands where timber management with roads is economical and feasible. The remaining area is designated management area 12 (8 percent) and management area 17 (4 percent), which are riparian buffer areas along the perennial streams. The main difference between management area 12 and management area 17 is that timber production is considered unsuitable in management area 12 and suitable in management area 17. The Forest is responsible for management of the area, as guided by the existing forest plan management areas, with the Rocky Mountain Research Station having responsibilities for new or continuing research. The memorandum of understanding prepared for the Miller Creek Demonstration Forest when it was administratively designated in 1989 clarifies the roles of the Forest and the Research Station.

Alternatives B modified, C, and D

Under alternatives B modified, C, and D, all six established research natural areas, the Coram Experimental Forest, and the Miller Creek Demonstration Forest would be retained as currently mapped. Research natural areas are designated as management area 4a, and the Coram Experimental Forest and Miller Creek Demonstration Forest are designated as management area 4b under these alternatives. Management direction for the research natural areas and the Coram Experimental Forest is the same as in the existing plan, as described under alternative A, and there is no notable difference in potential effects, which is the protection of the values associated with the research natural areas and Coram Experimental Forest and the continuation of the ecological and educational/research purposes of these areas.

In contrast to the existing plan, the Miller Creek Demonstration Forest is designated as a management area (management area 4b) under alternatives B modified, C, and D, with forest plan components in the revised plan providing guidance and direction for its management. This direction includes recognition of the area as a demonstration and study area for researchers, educators, forest managers, and the public. It is expected that vegetation management activities would have a dominant role in affecting the condition of the forest, and the Miller Creek Demonstration Forest is considered suitable for timber production. Wheeled motorized travel on designated roads and trails is allowable, as is motorized over-snow vehicle use throughout the area. Riparian habitat conservation areas are identified as occurring along the streams within the Miller Creek Demonstration Forest and would be managed and protected in accordance with the direction in the forest plan. These three alternatives have a beneficial effect on the Miller Creek Demonstration Forest by bringing greater recognition of the role this area plays in education and research and retaining opportunities for management of the forests in this area.

Consequences to research natural areas, Coram Experimental Forest, and Miller Creek Demonstration Forest from forest plan components associated with other resource programs or management activities

Effects from access and recreation

Nonmotorized travel and recreational use is allowed within research natural areas and Coram Experimental Forest, with limited motorized travel to meet administrative, research, and educational objectives. This use is expected to cause minimal to no impact to the values associated with the research natural areas and the Coram Experimental Forest.

Summer motorized travel is allowed on designated routes within the research natural areas, Coram Experimental Forest, and Miller Creek Demonstration Forest. Motorized over-snow vehicle use is suitable on specific routes and areas as identified on the motorized over-snow vehicle use maps for the Forest. These uses are not expected to impact the values associated with these areas under any of the alternatives.

Effects from vegetation management

Research natural areas and the Coram Experimental Forest are unsuitable for timber production in all alternatives. Vegetation management activities may occur as guided and restricted by regulation and policy. These measures are expected to protect all qualities associated with these areas and to achieve desired conditions.

Within research natural areas, the research station director, with the concurrence of the forest supervisor, may authorize management practices that are necessary for invasive weed control or to preserve the vegetation for which the research natural area was created (Forest Service Manual 4063.3). As stated in the manual, limited use of vegetation management may occur within research natural areas, in situations where the vegetative type would be lost or degraded without management. The criterion is that management practices must provide a closer approximation of the naturally occurring vegetation and the natural processes governing the vegetation than would be possible without management. These practices may include prescribed burning.

Vegetation management, including timber harvest, may occur within the Coram Experimental Forest if needed for study or research purposes. Timber harvesting for other purposes (i.e., fuel reduction, salvage) may also occur but must be coordinated and agreed upon with the Rocky Mountain Research Station.

The Miller Creek Demonstration Forest is suitable for timber production under all alternatives and is expected to have active and regularly scheduled timber harvest in the future under all alternatives. Forest plan components guiding vegetation management would be applied to achieve desired vegetation conditions.

Effects from fire and fire management

Desired conditions for research natural areas in the forest plan state that these lands are generally natural appearing, with natural processes (including fire) functioning naturally with limited human influences. One of the purposes of research natural areas is to serve as baseline areas for the study of these processes and their effects on ecosystems. Management of unplanned ignitions (wildfire) in or near research natural areas would be guided by these forest plan components as well as by the direction provided in each individual research natural area's establishment record, the Forest Service manual and other regulatory documents, and consultation with Rocky Mountain Research Station scientists. If the values associated with the research natural area are at risk of degradation or loss due to fire, fire management strategies would likely include measures aimed at protecting those values, if possible. On the other hand, fire as a natural process may be desired and allowed to occur within a research natural area to perpetuate the natural functioning of the ecosystem. In either case, the effects from fire and fire management strategies are expected to have a positive effect on the condition and perpetuation of the ecological and recreational values associated with the research natural areas.

Cumulative effects

The existing vegetation conditions within the designated areas reflect the contributions of past management actions and ecological processes. Management activities are very limited within research natural areas, restricted to management activities needed to maintain the features for which the research natural area was established. Management activities will generally continue to take place outside of the existing and proposed research natural areas, and it is unlikely that these activities would have an effect on the research natural areas. Control of invasive weeds is an action that may have occurred in the past within research natural areas, and it is the most likely management activity to occur within research natural areas in the future, in coordination with the Rocky Mountain Research Station. This would have a positive effect through the control of invasive weeds or prevention of their spread and would not result in any change to research natural area designations.

Vegetation treatments and other activities are likely to continue in the future within the Coram Experimental Forest, as guided by the Rocky Mountain Research Station and plan direction. They are not likely to result in any change to the Coram Experimental Forest designation.

Management activities are likely to occur within the Miller Creek Demonstration Forest in the future, as guided by plan direction. These activities are not likely to result in any change to the designation of the area as Miller Creek Demonstration Forest.

Production of Natural Resources

This section includes the following resources:

- forest products: timber
- other forest products, including huckleberries
- mineral resources
- livestock grazing

3.21 Forest Products—Timber

Introduction

The Forest contains valuable timber resources. They are important for products that are in demand by the American public, including lumber, house logs, pulpwood, posts and poles, and firewood. Because of the value of the timber resource, commercial timber harvest is used to move vegetation towards its desired conditions, improve watershed condition, improve wildlife habitat, and reduce wildfire risk through reduced fuel loads. Timber harvest also provides jobs and income in the logging and manufacturing of wood products.

Regulatory framework

Federal law

Organic Administration Act of 1897: Forests are established “to improve and protect the Forest within the boundaries, or for the purpose of securing favorable conditions of water flows, and to furnish a continuous supply of timber for the use and necessities of citizens of the United States.”

Multiple-Use Sustained-Yield Act of 1960: “It is the policy of the Congress that the national forests are established and shall be administered for outdoor recreation, range, timber, watershed and wildlife, and fish purposes. . . . The Secretary of Agriculture is authorized and directed to develop and administer the renewable surface resources of the national forests for multiple use and sustained yield of the several products and services obtained therefrom. . . . ‘Sustained yield of the several products and services’ means the achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resources of the national forests without impairment of the productivity of the land.”

Forest and Rangeland Renewable Resources Planning Act of 1974, as amended by the National Forest Management Act of 1976: These acts set forth the requirements for land and resource management plans for national forests.

Other regulation, policy, and guidance

2012 planning rule (36 CFR § 219**):** The procedures of the 2012 planning rule require the identification of areas suitable for timber production and of the amount of timber that can be removed annually on a sustained-yield basis. In addition, the procedures require an analysis of the supply and demand situation for resource commodities.

Forest Service Handbook 1909.12 chap. 60: This handbook describes the procedures for identification of lands as not suitable and suitable for timber production and methods for

determining the sustained-yield limit, the projected wood sale quantity, and the projected timber sale quantity.

Key indicators

Key indicators that will be used to measure effects of alternatives are

- acres suitable for timber production
- projected wood sale quantity
- projected timber sale quantity
- sustained-yield limit

Methodology and analysis process

Timber suitability was determined using various resource data and GIS to apply criteria and identify lands suitable for timber production. Timber production is defined as the growing, tending, harvesting, and regenerating of trees to produce logs or other products for industrial or consumer use. Lands determined to be suitable for timber production are areas identified as capable of producing a regular, periodic output of timber, maintained in perpetuity, without impairment of the productivity of the land or inconsistency with other land management direction. Criteria for suitability are defined in the 2012 planning rule procedures at 36 CFR § 219.11 and Forest Service Handbook 1909.12, chapter 60. Data was developed using the latest data sources and requirements to match the criteria defined by resource specialists.

Timber demand was based on a capacity and capability analysis completed by the University of Montana's Bureau of Business and Economic Research (Sorenson, McIver, Keegan, & Morgan, 2012).

Timber harvest was modeled using Spectrum, a software modeling system designed to assist decisionmakers in exploring and evaluating multiple resource management choices and objectives. Models constructed with Spectrum apply management actions to landscapes through a time horizon and display resulting outcomes. Management actions are selected to achieve desired goals while complying with all identified management objectives. One of the goals for all the action alternatives was the objective of moving vegetation towards the desired condition. Some alternatives were also run with a goal to maximize timber output. The Spectrum model was used to determine the sustained-yield limit and the projected timber sale quantity and acres treated by decade for each alternative. Historic data, along with the projected timber sale quantity, was used in determining the projected wood sale quantity for each alternative.

Information sources

Data used in determining timber suitability, projected wood sale quantity, and projected timber sale quantity is described in appendix 2.

Incomplete and unavailable information

There is no incomplete or unavailable information for this analysis. However, it should be noted that this analysis was completed at the strategic level, using Forest-level data sources. Site-specific data at the project scale is expected to result in some changes to timber suitability.

The Spectrum model is a simulation and a predictor of projected timber sale quantity and acres treated. It is used to display tradeoffs between alternatives and to predict sustainable timber harvest

levels over time. The actual timber harvest level is dependent on many variables, including budget, spatial limitations on the ground, and demand for products.

Analysis area

The analysis area for timber suitability is comprised of the NFS lands administered by the Flathead National Forest. The analysis area for timber demand consists of nine counties comprising the timber processing area. The analysis area for the projected timber sale quantity is the lands suitable for timber production and lands that are not suitable for timber production but where timber harvest is allowed. The analysis area for the projected wood sale quantity is the lands suitable for timber production and lands that are not suitable for timber production but where timber harvest or firewood collection may occur. The temporal scope of the analysis is the anticipated life of the plan (15 to 20 years).

Notable changes between draft and final EIS

The analysis of the natural range of variation for early successional forest openings was refined, resulting in some changes to the standard in the plan that establishes maximum opening sizes for harvest units (FW-STD-TIMB-07). Though the new analysis is similar to that for the draft plan, it was altered slightly to provide a more pertinent comparison to harvest openings as defined for this standard. Refer to Trechsel (2017a) for a detailed discussion of this analysis.

Timber suitability was updated between the draft and final EIS to reflect changes needed to incorporate riparian management zones for alternatives B modified, C, and D and updates to the riparian habitat conservation areas for alternative A. Some minor changes were also made to timber suitability in alternatives B modified, C, and D for the allocation of an additional recommended wild and scenic river and mapping corrections. The changes resulted in a five percent or less reduction in lands suitable for timber production for all alternatives. These acres then became not suitable for timber production, but timber harvest would be allowed on these lands for other purposes. Because of the small size of this change in conjunction with the interaction of other constraints, the Spectrum model was not rerun for the alternatives. See Frament (2017) for more information about this change to timber suitability.

3.21.1 Affected environment (existing condition)

Timber suitability

Lands suitable for timber production were used in deriving the allowable sale quantity for the current plan. The 1986 forest plan determined 670,670 acres were suitable for timber production. Timber suitability was determined through the use of resource data and computer models and followed the handbook and planning regulations that were in place at the time.

There have been many changes to timber suitability as the forest plan has been amended and implemented over the past three decades. These changes include reductions in lands suitable for timber production in riparian areas and inventoried roadless areas. There have also been changes in data and land status, resulting in updated figures for timber suitability. As part of the forest plan revision, timber suitability was recalculated to reflect these changes in management and data. Table 149 displays timber suitability at the time the 1986 forest plan was adopted compared to timber suitability under the no-action alternative (1986 forest plan as amended and implemented).

Table 149 Timber suitability for the 1986 forest plan

Suitability category	1986 forest plan, as written	No-action alternative (1986 forest plan, as amended)
Total NFS lands	2,362,082	2,392,804
Non-forested lands[1]	−1,006,594	−117,200
Withdrawn lands[2]	−519,741	−1,371,717
Irreversible resource damage is likely or adequate restocking not assured[3]	0	−166,508
Lands tentatively suitable for timber production	835,747	737,379
Lands where management area prescriptions preclude timber production, where management requirements cannot be met, or where meeting timber production objectives would not be cost-efficient[4]	−165,077	−202,761
Lands suitable for timber production	670,670	534,629

1. Handbook direction at the time the 1986 forest plan was developed classified lands that were not productive (producing < 20 cubic feet/acre/year) as "non-forested." The 2012 planning rule procedure does not consider low-productive lands as non-forested. Because of this change in definition and updated data, the total forested NFS lands have increased from the 1986 forest plan.

2. The change in the amount of withdrawn lands is mostly due to a change in the order of subtraction plus the addition of inventoried roadless area (460,791 acres) that is not suitable for timber production under the 2001 Roadless Area Conservation Rule.

3. The difference between irreversible damage and adequate restocking is mostly due to better data than was available for the 1986 forest plan.

4. The difference includes identification of riparian habitat conservation areas as not suitable for timber production

Under the no-action alternative (alternative A), 437,663 acres are suitable for timber harvest that are not suitable for timber production. A large portion of this acreage is comprised of inventoried roadless areas (approximately 320,773 acres) that are allocated to management areas where timber harvest is allowed to meet desired conditions. In these areas, timber harvest may be used as a tool under the following specific set of circumstances: the cutting, sale, or removal of generally small-diameter timber is needed to improve threatened and endangered, proposed, or sensitive species habitat or to maintain or restore the characteristics of ecosystem composition and structure that would be expected to occur under natural disturbance regimes. Refer to figure 1-09 (appendix 1) for a map showing lands suitable for timber production under alternative A.

Timber demand

Timber demand was analyzed as part of the 1986 forest plan. At that time, timber from the Flathead National Forest was historically processed primarily in Flathead County, with smaller percentages utilized by mills in Missoula and Lake Counties. In 1976, the production capacity of the sawmills within those three counties that produced at least 10 million board feet per year was determined to be 687 million board feet. This was updated in 1981 and estimated at 650 million board feet. The percent of this amount of timber supplied by the Flathead National Forest varies by county and by year. In 1976, about 65 percent of the timber received in Flathead County was from NFS lands. That same year, only 18 percent of sawtimber in Missoula and Lake Counties was of national forest origin (USDA, 1986, p. III-31).

Timber demand was updated in 2012 using a capacity and capability analysis for the Forest. This analysis was conducted by the University of Montana's Bureau of Business and Economic Research and summarized in a report prepared for the Flathead National Forest (Sorenson et al., 2012). The term "capacity" refers to the volume of timber (excluding pulpwood) that existing mills could

utilize annually. The term "capability" refers to the volume of trees of a certain size class that existing mills could efficiently process annually. The following information on timber demand is excerpted from this report.

Flathead National Forest non-reserved timberland is located in three Montana counties: Flathead, Lake, and Missoula. Non-reserved timberland is land that has not been withdrawn from timber utilization by statute or administrative regulation. It is available for harvest and capable of growing at least 20 cubic feet of wood per acre per year. The total harvest from all lands in these three counties was 43.9 million cubic feet (or approximately 215 million board feet) in 2009. Fifteen percent (6.6 million cubic feet or approximately 32 million board feet) of the timber harvest in this three-county area originated from the Flathead National Forest. Most (80 percent) of the timber harvested from these counties consisted of green (live) trees. Sawmills and veneer/plywood plants received about 71 percent of the timber harvested from these counties. House logs, posts and small poles, and other mills received less than two percent of the timber harvest volume. Pulp and paper mills utilized 28 percent of the 2009 harvest from the three-county region.

The 2011 harvest in the three-county area was estimated to be approximately 51.4 million cubic feet (approximately 245 million board feet). Given the mill closures that have occurred in the region since 2009, the pulpwood component was close to the historical average of 5 percent of the total harvest in 2011. The Flathead National Forest harvest in the three-county area was estimated to be approximately 10 percent of the total harvest by all ownerships, or approximately 25 million board feet.

In addition to the three counties with Flathead National Forest non-reserved timberland, another six counties process the majority of the remaining timber coming off of the Forest. The Flathead National Forest timber processing area was determined by the Bureau of Business and Economic Research to be the nine-county area including Flathead, Jefferson, Lake, Lewis and Clark, Lincoln, Mineral, Missoula, Ravalli, and Sanders Counties in Montana.

The capacity to process timber in the Flathead National Forest timber processing area during 2011 was 495 million board feet, with mills utilizing approximately 254 million board feet or about 50 percent of capacity (see table 150). Nearly 89 percent (236 million board feet) of the volume processed in the timber-processing area was composed of trees with diameter at breast height (d.b.h.) ≥ 10 inches. Just over 7 percent (15.8 million board feet) of the volume processed came from trees 7.0-9.9 inches d.b.h., and approximately 4 percent (2.2 million board feet) of processed volume came from trees < 7 inches d.b.h.

Table 150. Annual volume of timber processed by tree size class (excluding pulpwood) for the Flathead National Forest timber-processing area, 2011.

Tree d.b.h.	Volume Used (mmcf timber)	Tree d.b.h.	Volume Used (mmbf Scribner)
< 7 in.	2,196	< 7 in.	2,196
7-9.9 in.	4,106	7-9.9 in.	15,768
10+ in.	49,946	10+ in.	236,154
Total	**56,248**	**Total**	**254,118**

About 59 percent (371 million board feet) of the 494 million board feet of existing capacity in the Flathead National Forest timber-processing area is not capable of efficiently utilizing trees < 10

inches d.b.h., and nearly 60 percent of the capacity capable of utilizing trees < 10 inches d.b.h. is in the 7-9.9 inches d.b.h. class (see table 151).

Table 151. Annual total capacity and capability* to process trees by size class (excluding pulpwood) for the Forest timber processing area, 2011.

Tree d.b.h.	Capability (mmcf timber)	Tree d.b.h.	Capability (mmbf Scribner)
< 7 in.	18,251	< 7 in.	18,251
7-9.9 in.	27,175	7-9.9 in.	104,351
10+ in.	66,468	10+ in.	371,003
Total Capacity	**111,893**	**Total Capacity**	**493,606**

* Note: Capability in the < 7 and 7-9.9 inch classes is the maximum volume capable of being used efficiently; capability in the 10+ inch class is the portion of total capacity *not* capable of efficiently using trees with d.b.h. < 10 inches

A substantial amount of the capacity capable of utilizing smaller diameter trees is being used to process larger trees or is going unused. About 12 percent of capacity in the < 7 inches d.b.h. category is currently utilized to process trees < 7 inches d.b.h., and slightly more than 15 percent of capacity in the 7-9.9 inches d.b.h. category is being used to process trees 7-9.9 inches d.b.h. More than 7.6 mmcf of capacity capable of using trees 7-9.9 inches d.b.h. is used annually to process trees ≥ 10 inches d.b.h. Recent (2007-2011) poor market conditions for lumber have reduced mill demand for smaller-diameter logs used to make studs. When markets are poor, it becomes more difficult to profitably produce lumber from small and low-quality logs. The price of stud-grade lumber, which is predominantly made from small logs, fell by a much higher percentage during the recent recession than many other dimensions and board and shop lumber grades (RLY, 2010). This reduced the profitability of sawing lower grades of lumber from small and lower-quality logs. As lumber markets recover, increased capacity utilization can be expected across all the size classes.

Timber supply

Before the Flathead National Forest was established, timber was harvested on the Forest to meet the needs of the people living in the area. Like many other national forests, timber harvest on the Forest greatly increased in the 1960s to meet the demands of a rapidly growing economy.

Figure 70 displays the total volume of timber cut and sold on the Flathead National Forest during the life of the current plan, from 1986 to 2012. The amount cut is based on the amount sold by the Forest Service. The amount and timing of harvest from the volume under contract with the Forest Service is in response to market conditions and demand for timber products. The salvage of timber from insect and disease or fire events also affects the amount harvested, as salvage needs to occur within a few years of when the trees are killed. The largest volume harvested during this time was in 1988, when nearly 122 million board feet of timber was harvested on the Forest. The largest volume sold occurred two years earlier (1986), when more than 87 million board feet of timber was sold. However, the decade of the 1990s saw a sharp decline in the volume harvested and sold, with the lowest volumes occurring at the beginning of the century. In 2001, only 6 million board feet of timber was harvested on the Flathead National Forest, and the lowest sold volume (4.5 million board feet) occurred in 2000. In 2012, 28 million board feet of timber was harvested on the Flathead National Forest and 20.3 million board feet was sold.

The 1986 forest plan is an average annual allowable timber harvest of 54 million board feet. The allowable sale quantity is the maximum level of harvest consistent with the 1986 forest plan's standards and guidelines. The annual timber volume offered per year averaged 29.4 million board

feet, or 5.7 million cubic feet, over the five-year period of 2011 through 2015. This volume includes both sawtimber and non-sawtimber products such as firewood. The actual amount of timber offered is influenced by a variety of factors, including site-specific environmental analyses, public involvement on project proposals, choice of harvest methods, and effects of administrative appeals and litigation (T. A. Morgan & Baldridge, 2015).[8] In addition, actual levels are limited by the budget the Forest receives for that purpose and the workforce capacity needed to prepare sales and the associated environmental analyses. Forest Service funding and workforce capacity to support the timber sale program is not expected to increase in the immediate future.

Actual timber volume offered is also influenced by factors outside the authority of the Forest Service. For example, forest conditions on adjacent non-national forest lands can limit harvesting opportunities on Forest Service lands in order to provide for wildlife habitat needs. Other regulatory agencies, such as the USFWS, may also provide direction that limits harvest levels to protect threatened and endangered species, meeting their responsibility under the Endangered Species Act. Trends in timber supply are also influenced by forest and ecosystem conditions, such as the presence of insect epidemics or fire events.

As described in the Flathead's assessment (USDA, 2014a), the Forest has salvage harvested some of the areas with fire-killed trees. Approximately 164,000 acres of national forest lands outside wilderness areas burned from 1990 through 2013. The Forest salvage harvested 16,963, or approximately 10 percent of these acres. Opportunities for salvage harvest have been minimal, with harvest needing to occur within a few years of the fire to remove trees before they deteriorate and lose economic value. These burned areas are often not salvage harvested because of other resource needs or concerns.

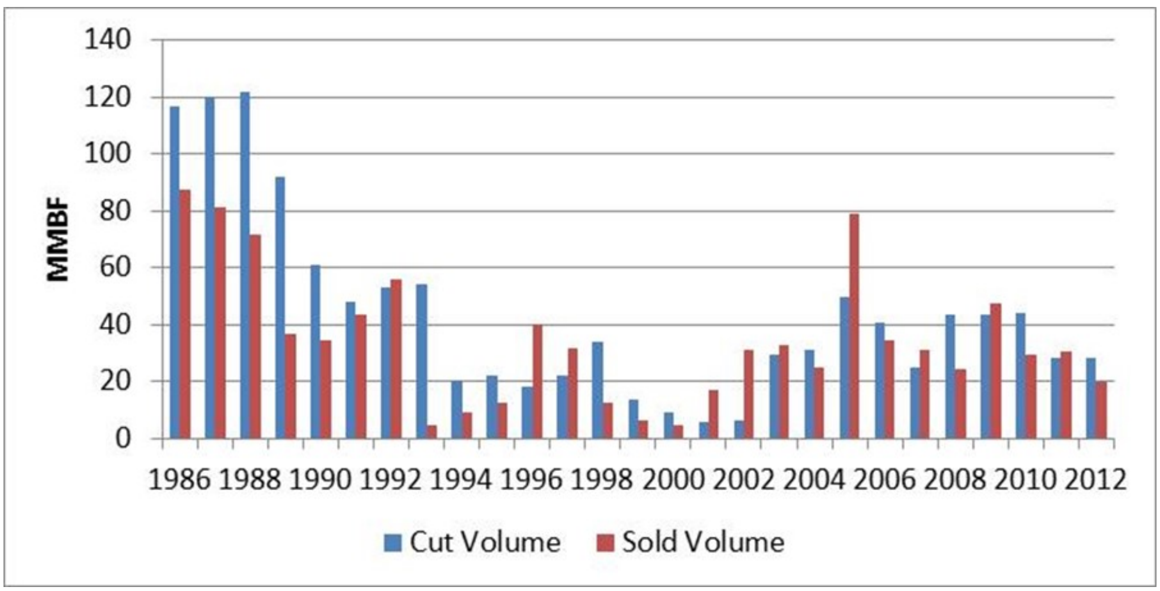

Figure 70. Cut and sold volumes for the Forest, 1986-2012

[8] Litigation has a real impact on the amount of timber that can be sold. A recent study by Morgan and Baldridge (2015) concludes that "the relatively high frequency of litigation in Region One and the protracted duration (often one to two years) of litigated cases contributes to agency workload, cost, and uncertainty, as well as uncertainty and related economic impacts for loggers, mills, and communities near the forests. Even if agency personnel were not spending effort working on these cases each day cases were open, the duration of most litigated cases was over multiple planning and budget cycles, making resource management and financial decisions very difficult for the FS, mills, loggers, and forest-dependent communities in the Region." Sales that are litigated are delayed in coming to sale and often require additional analysis as circumstances change over time.

3.21.2 Environmental consequences

Alternative A—No action

Timber suitability

Under the no-action alternative, timber suitability was updated to reflect plan amendments, current data, and current regulation (see earlier discussion on timber suitability for the 1986 forest plan). Lands that may be suitable for timber production are consistent for all alternatives and total 737,000 acres (see table 152). These are lands that are physically capable and have not been administratively withdrawn (such as wilderness and inventoried roadless areas) from timber production.

From the lands that may be suitable for timber production, 202,800 acres were found to have other resource concerns that would preclude timber production as an objective. This includes habitat conservation areas and management areas where timber production would not be consistent with desired conditions.

On lands not suitable for timber production but where timber harvest is allowed, timber harvest contributes to achieving desired conditions while providing economic and social services and benefits to people (FW-DC-TIMB-06). Timber harvest on these lands occurs for purposes such as salvage, fuels management, insect and disease mitigation, protection or enhancement of wildlife habitat, research or administrative studies, or recreation and scenic-resource management. Timber harvest on these lands would have to be consistent with other management direction. Lands where timber harvest may be allowed is defined by management area and desired conditions. Any timber harvest from these lands is not scheduled and would not occur on a rotation basis. Alternative A has approximately 437,700 acres (18 percent of the Forest) where timber harvest is allowed on land not suitable for timber production.

Projected timber sale quantity and projected wood sale quantity

In order to compare outputs under alternative A to those of the action alternatives, the allowable sale quantity for the 1986 forest plan was updated to reflect a projected timber sale quantity and projected wood sale quantity following current handbook requirements. These projected sale quantities were formulated by considering the lands suitable for timber production and lands suitable for timber harvest, vegetation desired condition, other multiple-use objectives, and the management requirements set forth in the National Forest Management Act. Based on 2012 planning rule direction (36 CFR § 219.1(g)) and Forest Service handbook requirements (Forest Service Handbook 1909.12, 64.32), the projected timber sale quantity and projected wood sale quantity reflect currently foreseeable budget levels. In order to understand sustainable volumes under potentially higher budgets, sale quantities were also estimated without a budget constraint for comparison purposes.

Timber harvest levels were calculated using the Spectrum model (see appendix 2). The model was run with a mix of objective functions based on the theme of each alternative. To reflect direction under the 1986 forest plan, alternative A was run with the objective of maximizing timber production.

The projected timber sale quantity for alternative A is 28.2 million board feet/year for the first decade. Without a budget constraint, the sale quantity is 52.4 million board feet/year for the first decade. Modeling indicates that, although a much higher timber harvest level might be possible without a budget constraint, the Forest would require an additional 3.5 million dollars annually in the first decade to achieve this.

Sustained-yield limit

Under alternative A, the long-term sustained-yield limit for the 1986 forest plan is replaced with a sustained-yield limit. The sustained-yield limit is based on the productivity of the land and does not vary by alternative. See discussion below for the action alternatives on the calculation of the sustained-yield limit.

Alternatives B modified, C, and D

Timber suitability

Lands suitable for timber production were determined following direction under the 2012 planning rule (36 CFR § 219.11(a)) and handbook direction (Forest Service Handbook 1909.12, 61). Lands that may be suitable for timber production are consistent for all alternatives and total 737,000 acres (see table 152). These are lands that are physically capable and have not been administratively withdrawn (such as wilderness and inventoried roadless areas) from timber production.

Based on management areas and desired conditions, timber suitability then varies by alternative. Lands in management areas 6b and 6c, a portion of management area 7, and the Miller Demonstration Forest (management area 4b) are suitable for timber production. All other management areas preclude timber production as an objective. Timber harvest may be allowed in other management areas (2a and 2b in scenic or recreation segments, 3a, 3b, 4a, 4b [Coram Experimental Forest], 5a, 5b, 5c, 5d, 6a, and part of 7), but only to meet other resource objectives. These acres are not suitable for timber production. Table 152 displays timber suitability for each alternative.

Table 152. Timber suitability by alternative

Land Classification Category	Alternative A	Alternative B modified	Alternative C	Alternative D
A. Total NFS lands in the plan area	2,392,800	2,392,800	2,392,800	2,392,800
B. Lands not suited for timber production due to legal or technical reasons	1,655,400	1,655,400	1,655,400	1,655,400
C. Lands that may be suited for timber production (A – B)	737,400	737,400	737,400	737,400
D. Total lands suited for timber production because timber production is compatible with the desired conditions and objectives established by the plan	534,600	465,200	308,200	482,600
E. Lands not suited for timber production because timber production is not compatible with the desired conditions and objectives established by the plan (C – D)	202,800	272,200	429,200	254,800
F. Total lands not suited for timber production (B + E)	1,858,200	1,927,600	2,084,600	1,910,200

Alternative A has the most acres suitable for timber production. Acres suitable for timber production are slightly higher in this alternative than the acres in the action alternatives. This is because the management area allocation for the 1986 forest plan has slightly lower acres of management areas where timber production is not consistent with desired condition. Also, alternative A has riparian habitat conservation areas consistent with INFISH, which encompass fewer acres than the riparian management zones that are applied to the action alternatives under the revised plan. See the subsections related to riparian areas in section 3.2 for a discussion of management of riparian areas.

Of the action alternatives, alternatives B modified and D have nearly the same (and the most) acres suitable for timber production, whereas alternative C has the least. This is primarily because alternatives B modified and D have the lowest number and alternative C the greatest number of acres allocated to management areas unsuitable for timber production (such as management area 5 backcountry designations). Refer to figures 1-09 through 1-12 for maps displaying lands suitable for timber production in each alternative. The intensity of management of lands suitable for timber production varies by management area (see description of timber management in the forest plan for each management area). Management areas 4b and 6c emphasize a higher intensity of management, whereas management area 6b is more moderate. The intensity of timber management in management area 7 varies, depending on the site. Alternative C has the highest proportion of lands suitable for medium-intensity timber production, with 63 percent of lands suitable for timber production allowing a moderate level of intensity of management and 37 percent allowing for more intense management. Alternatives B modified and D have similar proportions of intensity in management, with 54 and 50 percent, respectively, of lands suitable for timber production allowing for a moderate level of intensity of management and 46 and 50 percent, respectively, allowing for more intense management. Because the existing plan does not explicitly identify a “medium-” or “high-” intensity management approach for the management areas, percentages have not been determined for alternative A.

As the plan is implemented on the ground, timber suitability may change based on site-specific analysis. Broad-scale information is used in determining lands suitable for timber production in the forest plan. As a result, changes may occur at the project-scale level using site-specific data. For example, certain landtypes were excluded from lands suitable for timber production due to sensitivity to harvest operations (such as poorly drained, saturated soils and steep, rocky thin soils). The specific presence and location of landtypes can only be positively confirmed on the ground, which would occur at the project-level of analysis. Trechsel (2015) outlines the process used to determine lands suitable for timber production and the specific features (such as landtypes) that factored into the determination. Changes to timber suitability will be monitored during implementation of the plan.

Timber harvest is allowed on lands not suitable for timber production (see FW-DC-TIMB-06 and suitability by management area) for such purposes as salvage, fuels management, insect and disease mitigation, protection or enhancement of wildlife habitat, research or administrative studies, or recreation and scenic-resource management. Timber harvest on these lands would have to be consistent with other management direction. Timber harvest on these lands is not scheduled or managed on a rotation basis, but it does contribute towards projected sale quantities described below.

Acres where timber harvest is allowed on land not suitable for timber production are estimated as follows: alternative A = 437,700 acres (18 percent of the Forest); alternative B modified = 447,200 acres (19 percent of the Forest); alternative C = 403,700 acres (17 percent of the Forest); and alternative D = 522,600 acres (22 percent of the Forest). Under alternatives B modified and D, approximately one half of these acres are comprised of inventoried roadless areas. For alternative C, the largest percentage of these acres are those allocated to management area 6a (general forest low-intensity vegetation management).

Projected sale quantities

The projected sale quantities for each alternative were formulated by considering lands suitable for timber production and lands where timber harvest is allowed, vegetation desired condition, other multiple-use objectives, and the management requirements set forth in the National Forest

Management Act. Timber harvest levels for the alternatives were calculated using the Spectrum model (see appendix 2). The model was run with a mix of objective functions based on the theme of each alternative. Alternative A was run with an objective to maximize timber production, whereas alternatives B modified and C had objectives to move towards vegetation desired condition as quickly as possible while meeting other resource objectives. Alternative D had the objective function of maximizing timber and then moving towards vegetation desired condition.

The projected wood sale quantity is the estimated output of timber and all other wood products (such as fuelwood or biomass) expected to be sold during the plan period for any purpose (except salvage harvest or sanitation harvest) on all lands in the plan area. The projected timber sale quantity is the portion of the projected wood sale quantity that meets applicable utilization standards. Table 153 displays the projected sale quantities for each alternative. Outputs are shown by both million cubic feet and million board feet per year for the projected timber sale quantity. Outputs are shown only in million cubic feet for the projected wood sale quantity, as material not meeting utilization standards is not measured in board feet.

As shown in table 153, the projected wood sale quantities for the first two decades under alternatives A, B modified, and D are higher than the average wood products volume sold over the last five years (2011 through 2015) of 5.7 million cubic feet per year (see section 3.21.1 for the past and current supply of timber sold from the Flathead National Forest). Alternative C is the only alternative that would produce less than the current timber sale levels.

Table 153. Average annual projected timber sale quantities by alternative for decades 1 and 2 with a reasonably foreseeable budget

Category and Decade	Alternative A (mmcf)	Alternative A (mmbf)	Alternative B modified (mmcf)	Alternative B modified (mmbf)	Alternative C (mmcf)	Alternative C (mmbf)	Alternative D (mmcf)	Alternative D (mmbf)
Timber Products[a] A1. Lands suitable for timber production (decade 1)	5.3	25.6	5.3	26.3	3	13.8	5.8	28.6
Timber Products[a] A1. Lands suitable for timber production (decade 2)	5.9	28.4	4.9	24.2	3.7	17.6	5.7	27.6
Timber Products[a] A2. Lands not suitable for timber production (decade 1)	0.5	2.6	0.2	1.0	0.9	4.2	0.1	0.6
Timber Products[a] A2. Lands not suitable for timber production (decade 2)	0	0	0.6	3.2	0.9	4.4	0.2	1
Projected Timber Sale Quantity (A1 + A2) (decade 1)	5.8	28.2	5.5	27.3	3.9	18	5.9	29.2
Projected Timber Sale Quantity (A1 + A2) (decade 2)	5.9	28.4	5.5	27.4	4.6	22	5.9	28.6
Other Wood Products[b] B. All lands (decade 1)	0.8	n/ac	0.8	n/ac	0.6	n/ac	0.9	n/ac
Other Wood Products[b] B. All lands (decade 2)	0.8	n/ac	0.8	n/ac	0.6	n/ac	0.9	n/ac

Category and Decade	Alternative A (mmcf)	Alternative A (mmbf)	Alternative B modified (mmcf)	Alternative B modified (mmbf)	Alternative C (mmcf)	Alternative C (mmbf)	Alternative D (mmcf)	Alternative D (mmbf)
Projected Wood Sale Quantity—Timber Products[a] and Other Wood Products[b] (A1 + A2 + B) (decade 1)	6.6	n/ac	6.3	n/ac	4.5	n/ac	6.8	n/ac
Projected Wood Sale Quantity—Timber Products[a] and Other Wood Products[b] (A1 + A2 + B) (decade 2)	6.7	n/ac	6.3	n/ac	5.2	n/ac	6.8	n/ac

a. Timber products = volumes other than salvage or sanitation volumes that meet timber product utilization standards.

b. Other wood products = fuelwood, biomass, and other volumes that do not meet timber product utilization standards (small diameter, 3-7 inches d.b.h.).

c. n/a = not applicable

Source: Spectrum model analysis

To determine the highest sustainable harvest levels possible, the alternatives were also run without a budget limitation (see appendix 2). Table 154 displays projected sale quantities by alternative that may be possible if there is no requirement to be within reasonable budget limitations. These numbers are not the projected timber sale quantities found in the objectives of the forest plan because they do not meet the requirement to be within reasonably foreseeable budgets. They are shown here to display what might be feasible if budgets were increased above what is reasonably foreseeable.

Table 154. Average annual projected timber sale quantities by alternative, decades 1 and 2 with no budget limitation

Category and Decade	Alternative A (mmcf)	Alternative A (mmbf)	Alternative B modified (mmcf)	Alternative B modified (mmbf)	Alternative C (mmcf)	Alternative C (mmbf)	Alternative D (mmcf)	Alternative D (mmbf)
Timber Products[a] A1. Lands suitable for timber production (decade 1)	10	48.5	6.5	32.4	3.5	16.3	10.7	52.4
Timber Products[a] A1. Lands suitable for timber production (decade 2)	12.3	60	7.5	36.9	3.5	11.5	11.6	56.5
Timber Products[a] A2. Lands not suitable for timber production (decade 1)	0.8	3.9	1.1	5.6	0.4	1.7	2.3	11.1
Timber Products[a] A2. Lands not suitable for timber production (decade 2)	0.03	0.1	0.4	2.0	0.4	6.6	1.4	6.6
Projected Timber Sale Quantity (A1 + A2) (decade 1)	**10.8**	**52.4**	**7.6**	**38.0**	**3.9**	**18**	**13**	**63.5**

Category and Decade	Alternative A (mmcf)	Alternative A (mmbf)	Alternative B modified (mmcf)	Alternative B modified (mmbf)	Alternative C (mmcf)	Alternative C (mmbf)	Alternative D (mmcf)	Alternative D (mmbf)
Projected Timber Sale Quantity (A1 + A2) (decade 2)	**12.33**	**60.1**	**7.9**	**38.9**	**3.9**	**18.1**	**13**	**63.1**
Other Wood Products[b] B. All lands (decade 1)	1.5	n/a[c]	1	n/a[c]	0.6	n/a[c]	1.6	n/a[c]
Other Wood Products[b] B. All lands (decade 2)	1.5	n/a[c]	1	n/a[c]	0.6	n/a[c]	1.6	n/a[c]
Projected Wood Sale Quantity—Timber Products[a] **and Other Wood Products**[b] **(A1 + A2 + B) (decade 1)**	**12.3**	**n/a**[c]	**8.6**	**n/a**[c]	**4.5**	**n/a**[c]	**14.6**	**n/a**[c]
Projected Wood Sale Quantity—Timber Products[a] **and Other Wood Products**[b] **(A1 + A2 + B) (decade 2)**	**13.83**	**n/a**[c]	**8.9**	**n/a**[c]	**4.5**	**n/a**[c]	**14.6**	**n/a**[c]

a. Timber products = Volumes other than salvage or sanitation volumes that meet timber product utilization standards.

b. Other wood products = Fuelwood, biomass, and other volumes that do not meet timber product utilization standards (small diameter, 3-7 inches d.b.h.).

c. n/a = not applicable

Source: Spectrum model analysis

Budget levels would have to greatly increase to achieve the timber sale quantities shown in table 154. Annual budgets would need to increase by more than 3.5 million dollars per year under alternative A, by more than 1.5 million dollars under alternative B modified, and by more than 5 million dollars under alternative D to achieve these sale levels. Because of low timber harvest levels, alternative C does not require the entire current budget level; rather, it is 2.2 million dollars below current levels. With no budget limitation, under alternative C there is no increase in the budget (over the alternative C run with a constrained budget) for the first several decades. Budget levels and activities would eventually increase in response to trending towards desired conditions.

The effects on timber production are directly related to the amount of acres classified as suitable for timber production and lands where timber harvest is allowed. The amount of timber production is also directly related to the objective the model was run under based on the theme of the alternative. Because of this, alternative D has the highest and alternative C the lowest timber sale quantities.

Table 155 and table 156 display the acres harvested in decades 1 and 2 to achieve the corresponding volumes shown in table 153 and table 154. Acres harvested are a mix of silvicultural prescriptions, including even-aged regeneration (clearcut, seedtree, shelterwood) and non-regeneration harvest (group selection or commercial thin). Under reasonably foreseeable budget levels, alternative B modified has the most even-aged regeneration harvest acres in achieving the timber sale quantities and alternative C the least. At the reasonably foreseeable budget level, alternative C has the most non-regeneration harvest acres to move vegetation towards the desired condition. At the reasonably foreseeable budget level, alternatives A and D harvest fewer acres than alternative B modified but in a more efficient manner to maximize volume. At the unlimited budget level, alternative D harvests the most acres.

Table 155. Average annual acres treated, by treatment type and by alternative for decades 1 and 2 with a reasonably foreseeable budget

Type and Decade of Harvest	Alternative A	Alternative B modified	Alternative C	Alternative D
Even-aged Regeneration (decade 1)	1,199	2,138	77	1,833
Even-aged Regeneration (decade 2)	1,081	2,045	411	908
Nonregeneration (decade 1)	500	1,000	2,500	0
Nonregeneration (decade 2)	500	1,000	2,827	1,500
Total (decade 1)	**1,699**	**3,138**	**2,577**	**1,833**
Total (decade 2)	**1,581**	**3,045**	**3,238**	**2,408**

Table 156. Average annual acres treated by treatment type by alternative for decades 1 and 2 with an unlimited budget

Type and Decade of Harvest	Alternative A	Alternative B modified	Alternative C	Alternative D
Even-aged Regeneration (decade 1)	2,459	2,883	49	3,201
Even-aged Regeneration (decade 2)	2,694	2,397	2	2,771
Nonregeneration (decade 1)	1,500	1,002	2,500	1,500
Nonregeneration (decade 2)	1,500	1,000	2,500	1,500
Total (decade 1)	**3,959**	**3,885**	**2,549**	**4,701**
Total (decade 2)	**4,194**	**3,397**	**2,502**	**4,271**

Sustained-yield limit

A sustained-yield limit was calculated to determine the amount of timber "which can be removed from [a] forest annually in perpetuity on a sustained-yield basis" (National Forest Management Act, sec. 11, 16 U.S.C. 1611; 36 CFR § 219.11(d)(6)). Based on Forest Service handbook direction (Forest Service Handbook 1909.12, 64.3), the sustained-yield limit is the volume that could be produced in perpetuity on lands that may be suitable for timber production. The calculation of the sustained-yield limit is not limited by land management plan desired conditions, other plan components, or the Forest's fiscal capability and organizational capacity. The sustained-yield limit is not a target; it is a limitation on harvest. Because it is based on lands that may be suitable for timber production, the sustained-yield limit does not vary by alternative. The sustained-yield limit was calculated using the Spectrum model and was determined to be 25.4 million cubic feet, or 116.9 million board feet.

Consequences to timber from forest plan components associated with other resource programs or management activities

Effects from fire and fuels

Fire and fuels management generally has a positive effect on timber management. The objectives for fuel reduction are consistent with commercial timber harvest. Timber harvest is often the tool for reducing fire risk through a reduction in fuel loading. Timber harvest also moves vegetation towards desired conditions that are more resilient and less fire-prone. Alternative B modified has the most management activities for fire and the most positive impact on timber harvest.

Effects from aquatic species and habitat, riparian area management, and watershed management

Measures to protect aquatic habitat, riparian areas, watersheds, and wildlife limit the amount of timber that may be harvested. Protection measures for watersheds, aquatic habitat, and wildlife limit the amount of openings and the type of harvest. All of these factors reduce the amount of timber harvest. The reduction in timber harvest is the same for all alternatives.

Protection measures for riparian areas affect lands suitable for timber production, which decreases the amount of timber that may be harvested. Based on plan component FW-SUIT-RMZ-01, riparian management zones are not suitable for timber production under all action alternatives. Timber harvest is allowed for other purposes. Under alternative A, riparian habitat conservation areas are not suitable for timber production. See the glossary for definitions of riparian habitat conservation areas and riparian management zones. Also see the subsections in section 3.2 related to riparian areas for additional information on the affected environment of riparian areas and environmental consequences associated with timber harvest.

Alternatives B modified and D have similar amounts of acres not suitable for timber production solely because they are within a riparian management zone, at 103,500 and 105,900 acres, respectively. Because it has more acres allocated to management areas not suitable for timber production, alternative C has fewer acres not suitable for timber production solely because of riparian management zones, at 66,900 acres. Alternative A has the fewest acres not suitable for timber production from riparian management, at 56,100 acres. For the action alternatives, the percent effect of riparian management zones on timber suitability is similar, with an 18 percent reduction in lands suitable for timber production because of riparian management. The percent reduction for alternative A is lower, with approximately 10 percent reduction in lands suitable for timber production. These acres allow timber harvest, but they are not suitable for timber production.

This decrease in lands suitable for timber production reduces the amount of timber that may be harvested under all alternatives. For more information on riparian management and timber suitability, see Frament (2017).

Effects from wildlife

Management direction for white-tailed deer winter habitat, grizzly bear habitat, and lynx habitat affects the amount of timber volume available under all alternatives. Timber volume is reduced because timber harvest scheduling would be affected by (1) limits to decreases in security habitat and limits to increases in open motorized route density and total motorized route density, (2) limits on openings in white-tailed deer winter habitat, and (3) limits on regeneration harvest per decade in lynx habitat (except in portions of the wildland-urban interface where exemptions to standards are allowed). The Spectrum model contained constraints on the percentage of area harvested per decade estimated to meet management requirements for each of these species at a programmatic level. The sensitivity analysis shows the effect on the model from these constraints. See appendix 2 for a description of the Spectrum model and the sensitivity analysis results. Also see section 3.3.10 for a more detailed description of effects on vegetation ecosystems from wildlife management.

As stated above, management direction for wildlife limits timber harvest under all alternatives. However, under alternatives B modified and D there would be more flexibility to conduct timber harvest within grizzly bear habitat in the NCDE than exists under alternative A (see FW-STD-IFS-03). Alternative C adds additional recommended wilderness (which overlaps with lynx habitat and grizzly bear habitat in the primary conservation area) but otherwise retains the flexibility found in alternatives B modified and D. Alternative A would continue management under amendment 19, with some additional future road reclamation and security core requirements that could reduce timber harvest outputs.

Effects from inventoried roadless areas

Inventoried roadless areas are not suitable for timber production. Based on the management area allocation and other timber suitability factors (administrative withdrawal and physically capability), timber harvest may be allowed in some inventoried roadless areas. The amount of inventoried roadless areas where timber harvest may be allowed varies by alternative. Table 157 and table 158 display acres where timber harvest may be allowed within inventoried roadless areas for each alternative, with a reasonably foreseeable budget and no budget limitations, respectively. The tables also show the acres of inventoried roadless areas that are allocated to harvest sometime over the modeling horizon (250 years) and the amount of timber harvest from these areas in the first decade.

Table 157. Acres where timber harvest may be allowed, percent scheduled for harvest, and first decade harvest within inventoried roadless areas, with a reasonably foreseeable budget

Alternative	Acres of Timber Harvest That May Be Allowed in Inventoried Roadless Areas	Percent Allocated to Harvest (over 250 years)	Timber Harvest from Inventoried Roadless Areas, Decade 1 (mmbf/year)
A	233,200	2%	0
B modified	186,500	4%	1.5
C	6,700	3%	0
D	271,100	3%	0

Table 158. Acres where timber harvest may be allowed, percent scheduled for harvest, and first decade harvest within inventoried roadless areas, with an unlimited budget

Alternative	Acres Timber Harvest May be Allowed in Inventoried Roadless Areas	Percent Allocated to Harvest (over 250 years)	Timber Harvest from Inventoried Roadless Areas, Decade 1 (mmbf/year)
A	233,200	21%	4.6
B modified	186,500	7%	0.9
C	6,700	2%	0
D	271,100	5%	3.1

Timber harvest within inventoried roadless areas is limited, requires additional analysis, and receives a great deal of public and agency scrutiny. Because of limited access and the additional analysis and public/agency involvement, unit costs for timber harvest are much higher within an inventoried roadless area. No alternative manages all inventoried roadless area acres for timber harvest, with fewer acres managed under constrained budgets. Alternative C has the fewest acres of inventoried roadless area where timber harvest may be allowed, with no timber volume generated from these lands in decade 1. Alternative D has the most acres of inventoried roadless area where timber harvest may be allowed, with a larger percentage of those lands managed for timber harvest under the unconstrained budget run. However, management opportunities are expected to continue to be limited within inventoried roadless areas, and harvest within these areas may not be feasible.

Effects from recommended wilderness management

Alternative C has the greatest acres of recommended wilderness and represents the maximum amount of area that could potentially be designated as recommended wilderness (management area 1b). Comparing the recommended wilderness areas in alternative C to the lands suitable for timber production in alternatives B modified and D indicates that recommended wilderness designation has little to no impact on potential timber outputs from the suitable land base. This is because there are no acres under alternative B modified and only 5,200 acres under alternative D within the suitable timber base that would occur within areas that qualify as recommended wilderness under alternative C, which is representative of the greatest acreage of recommended wilderness. The 5,200 acres in alternative D represents about 1 percent of all the suitable acres within alternative D and consist of small patches and narrow strips of land widely scattered across the Forest.

Under alternative A, the current forest plan, an estimated 15,000 acres of lands suitable for timber production lie within the recommended wilderness areas of alternative C; however, these lands consist of relatively small patches widely scattered across the Forest. This represents approximately 3 percent of the 526,973 acres suitable for timber production under alternative A (see table 149). Most (approximately 10,000 acres) are in locations that are not realistically suitable for timber production under the current management environment. If these unrealistic acres are removed, alternative A is similar to alternative D as far as potential effect to timber outputs, with less than 1 percent of the suitable lands potentially affected by recommended wilderness designation.

Effects from natural disturbance

Insects, disease, and wildfire can affect the production of timber by killing and damaging trees. The Spectrum model included a predicted amount of wildfire on the Forest based on current fire suppression success and fire starts. See appendix 2 for more information on the Spectrum model.

Under all alternatives, there exists potential for salvage/sanitation cuts to harvest dead and damaged timber and to attempt to slow or impede infestations from spreading. The degree to which these harvests are undertaken will largely depend upon the risks associated with wildfire potential, infestation spread into healthy stands, public safety, the presence of high-value resources, and the resource emphasis of the infected or adjoining area. These would all be determined at the site-specific project level of analysis and decision.

Under alternative C, which has more acres in recommended wilderness compared to alternatives A, B modified, and D, natural ecosystem processes, including fire and insect activity, would dominate and harvest activities would be prohibited in recommended wilderness. However, as discussed earlier under effects from inventoried roadless areas and recommended wilderness, most of the recommended wilderness is within inventoried roadless areas, so access and harvest opportunities are already limited, whether these areas are designed as recommended wilderness or as backcountry management areas. Thus, there are relatively minor differences between alternatives regarding the amount of salvage harvest that would be technically achievable and would potentially influence the intensity or impacts of disturbances such as fire or insect outbreaks. There could be a somewhat greater potential for a limited amount of salvage harvest under alternatives A, B modified, and D, for example, in areas accessible to helicopter logging methods. This is because these alternatives have fewer acres of recommended wilderness (where salvage is not allowed); those acres are replaced by backcountry management areas (management area 5a, 5b, 5c, or 5d) that allow salvage harvesting.

As described in section 3.21.1, the Forest only salvage harvested approximately 10 percent of the acres of lands that burned outside of wilderness from 1990 to 2013. The amount of salvage harvest is not expected to increase under any of the alternatives.

Catastrophic events, such as large wildfires and epidemic insect outbreaks, were not included in the modeling because of uncertainty in the extent or timing of such an occurrence. If a catastrophic event does occur in the future, analysis would need to be conducted to determine whether the event would warrant a forest plan amendment due to the changed conditions.

Cumulative effects

Many factors influence and affect timber harvest. The demand for timber products, supply from sources other than the Forest, laws, and regulations all affect the amount of timber that may be harvested from the Flathead. Budgets and court decisions also impact timber supply potential. Following is a brief description of some items that are changing or may change in the future, adding to the effects on timber harvest from the alternatives.

Demand and future timber products

The demand for timber products is a driver in the amount of wood fiber supplied from the Flathead National Forest. Diversification of wood product manufacturing has historically allowed Montana mills to be more resilient in changing markets (MTDNRC, 2010). This diversification leads to new products and new processing techniques and affects the demand for wood fiber. If markets improve and the demand for wood products increases, there would be a desire for more wood fiber from the Forest. Alternatively, if demand decreases and mills close, there might be less desire for wood fiber from the Forest. A decrease in demand might reduce the amount of timber sold from the Forest under all alternatives.

Alternative sources of wood fiber

The supply of wood fiber from private and state lands and adjacent national forests impacts the demand on the Forest. If wood fiber supplies decrease from private and State lands and adjacent national forests, there will be an increasing demand for wood fiber from the Forest. If supplies increase from private and State lands and adjacent national forests, there might be a decrease in demand for wood fiber from the Forest. A decrease in demand might reduce the amount of timber sold from the Forest under all alternatives.

Subdividing corporate timberlands

Montana, like many states across the West, is experiencing a massive divestiture of commercial timberlands for development and subdivisions (MTDNRC, 2010). Corporate timberland has become more valuable for recreational or residential real estate than for timber production. This development results in increased fragmentation of forested landscapes and decreased timber harvest on private lands. The increased fragmentation limits the amount of harvest that may occur on adjacent national forest lands, whereas the decreased supply from private lands increases the demand for timber harvest from the Forest. The limit on timber harvest from fragmentation of adjacent lands would limit the amount of timber sold from the Forest under all alternatives.

3.22 Other Forest Products, Including Huckleberries

3.22.1 Introduction

Special forest products are mainly plant and fungi materials that are gathered from national forest lands for personal use, for commercial resale, or for sale as a craft product. They can generally be categorized under five general areas: residential comfort and use, food, herbs and medicinal, decorative, and specialty items. Huckleberries (*Vaccinium membranaceum*) have been identified as a key ecosystem component for the Forest and will receive special focus in this analysis of special forest products.

Regulatory framework

36 CFR § 223.1: Trees, portions of trees, and other forest products on NFS lands may be sold for the purpose of achieving the policies set forth in the Multiple-Use Sustained-Yield Act of 1960, as amended, and the Forest and Rangeland Renewable Resources Planning Act of 1974, as amended.

36 CFR § 223.239-240, Sale and Disposal of NFS Timber, Special Forest Products, and Forest Botanical Products: Section 223.239 provides regulations of free use without a permit for members of tribes with treaty or other reserved rights related to special forest products. Section 223.240 provides regulations regarding harvest of special forest products by tribes with treaty or other reserved rights.

36 CFR § 261.6: Lists activities regarding timber and other products that are prohibited.

Forest Service Manual 2670, Threatened, Endangered, and Sensitive Plants and Animals: This chapter directs national forests to avoid or minimize impacts to species whose viability has been identified as a concern.

Methodology and analysis process

The analysis included a review of rules and regulations for special forest and botanical products and effects. Differences between alternatives were evaluated based on the variation in management area allocations among alternatives as they influence availability or other aspects of special forest products.

Information sources

Research and information on plant physiology and location across the Forest is limited for many of the plants and other material gathered as products. Best available information and research for huckleberries and other botanical products was used to inform the description of existing conditions and potential effects.

Analysis area

The analysis area is the national forest lands within the Forest. The analysis area for cumulative effects includes lands in other ownerships adjacent to or within the administrative boundary of the Flathead National Forest. The temporal scope of the analysis is the anticipated life of the plan (15 years).

3.22.2 Affected environment (existing condition)

General information

Special forest and botanical products include, but are not limited to, mosses, fungi (including mushrooms), roots, bulbs, berries, seeds, wildflowers, forbs, sedges, grasses, nuts, ferns, boughs, bark, cones, burls, transplants, Christmas trees, firewood, posts and poles, mine props, and rails. Some of the most popular special forest and botanical products on the Forest are huckleberries, firewood, post and poles, Christmas trees, mushrooms, and boughs.

Special forest products may be collected forestwide unless an area has been closed for a specific reason. Existing uses are often tied to historical knowledge and patterns of use. Special forest products are available through commercial harvest and sale, with some available through free use. Historically, the Forest has granted commercial and free use of special forest and botanical products to individuals and tribes with treaty and other reserved rights.

The supply of special forest products is dependent on ecological conditions and existing distributions of potential growing sites. Forest management or natural disturbances can influence the supply of certain products. For example, fire can increase the availability of firewood and mushrooms but may decrease the availability of huckleberries in the short term. Thinning of young sapling stands and conifer regeneration after fire or timber harvest can increase production of Christmas trees for a period of time.

Special forest and botanical products have importance to the tribes as traditional and cultural uses. Based on current handbook direction (Forest Service Handbook 2409.18 sec. 87.13), the Forest considers “treaty rights, customary and traditional uses (including subsistence and other historical uses of plant material by tribes), the federal trust responsibility to tribes, and competitive market demands in determining which products would be excluded from or allowed for sale to commercial harvesters. When there is a shortage of any particular special forest product for tribal use, commercial permits will be issued only to the extent that the tribal use can be accommodated.” The Forest consults and coordinates with tribal governments prior to issuing any permits, contracts, or other authorized instrument when there is a possible impact to tribal treaty and other rights and interests in the permitted or contracted area (Forest Service Handbook 2409.18 sec. 87.18). The Forest honors the unique legal relationship, including the trust relationship, between the Federal government and Indian tribal governments.

In addition, the Forest Service has the responsibility to honor Indian tribes’ reserved rights (Forest Service Handbook 2409.18 sec. 87.2). The gathering of forest products by the Confederated Salish and Kootenai Tribes is a reserved right on the Forest. The Salish and Kootenai may remove special forest and botanical products without charge or permit (36 CFR § 223.239(e)). The Flathead Indian Reservation, which is home to the Confederated Salish and Kootenai Tribes, shares a border with the Forest on its southwestern boundary.

Huckleberries

Huckleberries are a specific special forest product identified as a key ecosystem component for the Forest. This is because of their fruit, which is highly sought after by both humans and wildlife. Large quantities of the berries are collected in the wild and sold both locally and nationally, either fresh or in products such as jams, wines, sauces, and creams. Huckleberries are an important food for species such as black and grizzly bears (refer to section 3.7) as well as many bird species. Huckleberries were, and remain so in some areas, an important food source for Native Americans, who both ate them fresh and dried them for consumption through the winter months.

Huckleberries grow as a shrub, commonly reaching two to three feet in height, and produce berries that look similar to blueberries, although they are usually smaller, stronger flavored, and more tart. They grow slowly, requiring many years before fruiting is at full production, and berry production varies widely between individual plants, even plants on the same site. Huckleberries occur in open areas, such as early successional forests, as well as an understory shrub in forests from the mid- to late successional stages (Dahlgren, 1984; James R. Habeck, 1968; Martin, 1979). Although they are shade tolerant, a decline in huckleberry production may occur with increasing closure of the forest canopy (Dahlgren, 1984; Don Minore, 1972).

Huckleberries grow within a wide range of coniferous forest types on the Forest, from river valley bottoms up to subalpine ridges, and on all aspects. However they are most abundant and have the best berry production on gently sloping or northerly aspects at mid elevations (i.e., 4,000 to 6,000 feet), where relatively cool, moist conditions prevail. Berry production also tends to be better in more semi-open or open forest conditions, as compared to dense, closed-canopy forests (D. Minore, 1984). However, on the drier south and westerly slopes, berry production may be better in more densely forested areas because of the moisture stress and exposure to sun scalding and wind desiccation that may occur in more open conditions (Arno, Simmerman, & Keane, 1985).

As with all other vegetation in the northern Rocky Mountains, huckleberries have evolved with fire as a major disturbance process. They are well adapted to persist and regenerate in the mixed- and high-severity fire regimes of the Forest. Fire is advantageous to huckleberry production and plant vigor insofar as it reduces the density of overstory tree canopies and reduces competing vegetation (M. Miller, 1978; D. Minore, 1984). Huckleberries will generally survive low to moderately severe fires, attaining pre-fire coverage or greater within three to seven years (A. F. Bradley, Noste, & Fischer, 1992; Coates & Haeussler, 1986). Although the above-ground plant parts may be consumed by fire, rhizomes as deep as 6 inches underground will resprout after fire. Stand-replacing (high-severity) wildfires may result in moderate to high mortality or greatly reduced sprouting, with recovery to pre-fire levels taking 15 or more years (Arno et al., 1985; Coates & Haeussler, 1986; Laursen, 1984; Martin, 1979; M. Miller, 1978; Stark, 1989). Huckleberry showed good vegetative response in lightly burned areas of western larch/Douglas-fir forests in western Montana. The same result was seen in moderate-severity fires that top-kill the majority of shrubs and consumed up to half of the litter (Steele & Stark, 1977). In moist Douglas-fir habitat types, where ponderosa pine and lodgepole pine are seral components, low-severity burning in the early spring stimulates huckleberry, increasing shoot density (Davis, Clayton, & Fischer, 1980; Steiger, 1980). Because of these responses of huckleberries to fire, the pattern, intensity, and frequency of fire across the landscape will heavily influence the pattern of huckleberry abundance and berry production in both the short and long term.

Currently, the sole source of huckleberries is from wild plants. People gather the berries by hand by picking from the bushes; some gatherers use rakes. The commercial cultivation of huckleberries via cuttings has been unsuccessful, presumably due to a lack of key fungal associations (mycorrhizae) that occur in native forests between huckleberries and surrounding plant species. Propagation by seed has been successful but has not been widely used commercially.

Mushrooms

The most common edible mushroom harvested on the Flathead is the morel (a fungus of the genus *Morchella*). Fire prompts morels to fruit, and they are particularly abundant the first year after fire and where the ground has been totally blackened. Though this relationship with fire is well known, the density and distribution of morels within a fire's boundaries can vary widely, and the specific environmental factors that cause this fruiting are still largely unknown.

Personal or commercial picking of mushrooms on the Forest is limited in intensity and extent, largely because of the lack of access, the difficult terrain, and the limited amount (both temporally and spatially) of area where abundant morels occur (e.g., post-fire conditions).

3.22.3 Environmental consequences

General effects common to all alternatives

Commercial use of special forest products is not allowed in designated wilderness, recommended wilderness, portions of designated and eligible wild and scenic rivers, special areas, research natural areas, and the Coram Experimental Forest. Special forest and botanical products may be collected for personal (noncommercial) use forestwide except in research natural areas.

Effects by alternative

Table 159 and table 160 display the acres by alternative where commercial and personal use of special forest products is and is not allowed. The acres under the existing plan (alternative A) are the acres of existing management areas considered equivalent in management direction to the management areas in the action alternatives.

Table 159. Approximate acres of management areas where commercial use of special forest products is and is not allowed, by alternative

Management Area	Alternative A	Alternative B modified	Alternative C	Alternative D
Not allowed management areas (1a,1b, 2a,[a] 2b,[b] 3b, 4a, 4b[c])	1,198,100	1,316,500	1,622,900	1,151,800
Allowed management areas (3a, 4b,[c] 5a, 5b, 5c, 6a, 6b, 6c, 7)	1,194,700	1,076,300	769,900	1,241,000
Total acres	2,392,800	2,392,800	2,392,800	2,392,800

a. Designated rivers: Not allowed in wild or scenic sections; allowed in recreation sections.

b. Eligible rivers: Not allowed in wild section, allowed in scenic and recreation sections.

c. Not allowed in Coram Experimental Forest; allowed in Miller Demonstration Forest.

Table 160. Approximate acres of management areas where personal use of special forest products is and is not allowed, by alternative

Management Area	Alternatives A, B modified, C, D
Not allowed management areas (4a)	9,900
Allowed management areas (1a, 1b, 2a, 2b, 3a, 3b, 4b, 5a, 5b, 5c, 6a, 6b, 6c, 7)	2,382,900
Total Acres	2,392,800

As indicated in table 159, the amount of acres where commercial use of special forest products may be allowed differs between alternatives, with alternative D having the most acres and alternative C the least. Alternatives A and B modified are intermediate between C and D, although closer in acres to alternative D. As indicated in table 160, the amount of acres available for personal use of forest products is the same between all alternatives.

Although roads or trails are not necessary for the removal of special forest products, they generally make it easier to access forest lands and areas where special products may be gathered (such as for

berry picking). Therefore, areas that tend to have greater road or trail access, particularly wheeled motorized access, may be expected to provide greater opportunities to gather special forest products. Conversely, the potential for over-harvesting special forest products may increase with greater access.

In general, the areas on the Forest that are expected to have the most road access are those that are suitable for timber production because these areas are more likely to have roads for vegetation management purposes. Table 161 displays the acres suitable for timber production by alternative.

Table 161. Acres suitable for timber production by alternative

Alternative A	Alternative B modified	Alternative C	Alternative D
534,600	465,200	308,200	482,600

Restrictions on the use of wheeled motorized vehicles on roads and trails would occur under all alternatives. Alternative A retains the 1986 management direction regarding forest plan amendment 19 (grizzly bear habitat direction). This would result in a decrease in the current amount of wheeled motorized use, with an estimated 518 miles of road reclaimed and 57 miles of motorized trails that would no longer allow motorized wheeled use unless site-specifically amended. Thus, although alternative A has the most area suitable for timber production and potentially more road access, over time a larger amount of those roads would become unavailable for motorized wheeled access. Alternatives B modified and alternative D would result in no change from current conditions for wheeled motorized use and would have little to no effect on the area potentially accessible by motorized wheeled vehicles for the gathering of special forest products. Alternative C would decrease the amount of suitable wheeled motorized use compared to the current amount by an estimated 75 miles of motorized trail routes across the Forest, resulting in greater motorized restrictions than alternatives B modified and alternative D but less than alternative A. In all alternatives, although motorized use on roads and trails may be restricted, walking and mountain biking are usually allowed. Refer to section 3.10.3 for a more detailed discussion of changes in wheeled motorized road and trail access by alternative.

Huckleberries

Management activities, such as logging, that impact ground vegetation and soils can affect huckleberry cover and productivity. The rhizomes and roots of huckleberry plants are sensitive to disturbance. Initial decreases in huckleberry plants often occur after mechanical logging and slash treatment or after broadcast burning of slash (Arno et al., 1985; Coates & Haeussler, 1986; Martin, 1979; Oswald & Brown, 1993). These effects are generally temporary, but recovery to pretreatment conditions may take several years.

Opening the stand through harvest increases the amount of sun, which has the potential to improve conditions for huckleberry growth and berry production over the long term compared to preharvest conditions. On steeper south- or west-facing aspects where plants are subject to moisture stress, recovery after harvest may take longer than on more moist sites, continuing until the forest grows sufficiently to provide shade to understory plants (Arno et al., 1985).

Alternatives vary in the acres suitable for timber production and in the acres expected to be treated with timber harvest over the next decade. Table 162 displays the acres by alternative of lands suitable for timber production and the expected annual average acres of timber harvest over the next decade. Refer to section 3.21.1 for additional details on determination of the suitable lands and to section 3.21.2 for timber harvest amounts.

Table 162. Acres suitable for timber production[a] and expected annual average timber harvest outputs[b] over the next decade by alternative.

Area	Alternative A Acres	Alternative B Modified Acres	Alternative C Acres	Alternative D Acres
Total acres suited for timber production	534,600	465,200	308,200	482,600
Average annual acres treated by timber harvest over the next decade	1,699	3,138	2,577	1,833

a. As defined by the 2012 planning rule and described in the section 3.21 of this EIS.

b. Source: Spectrum model.

The existing plan (alternative A) and alternative D have higher acres suitable for timber production, but the amount of expected timber harvest acres under these alternatives are the lowest among the alternatives, mainly because these alternatives as modeled would tend to harvest timber in a more efficient manner (refer to section 3.21 for more details). Alternatives A and D would thus likely have a lower potential than alternatives B modified or C for decreased huckleberry production due to fewer acres of ground potentially disturbed by logging. Alternative C would have the next lowest potential, and alternative B modified would likely have the highest potential for impact to huckleberries from logging-related ground disturbance.

Conversely, because of the potential for better huckleberry growth and production with increased sunlight, harvest treatments that open up dense forest stands where huckleberry is present have the potential to improve berry production. Commercial thin treatments can be particularly beneficial because they create a favorable semi-open forest condition. Alternative C as modeled is anticipated to treat the most forest with nonregeneration harvest (mostly commercial thinning), followed by alternative B modified, alternative D, and alternative A (refer to table 19 in section 3.3.1). Thus, though alternative C has a relatively higher level of total harvest acres compared to other alternatives, a higher proportion of these acres is anticipated to be commercial thins, with has the potential to improve berry production by creating a more semi-open forest condition. Alternative B modified is the next most beneficial to huckleberries by this activity, followed by alternatives D and A.

For all alternatives, it is important to note that the estimates of amounts and type of harvest are generated by the model; actual treatment prescriptions and area treated would be determined on a site-specific basis during project analysis. The actual proportion of regeneration compared to nonregeneration could be quite different than the model predicts. In addition, these potential effects to huckleberries are very general in nature, with both the existence and degree of effect entirely dependent on site- and treatment-specific factors. For example, harvest areas may or may not have huckleberries present or capable of growing on the site. Berry production varies widely both across sites and seasons, affected by weather, past wildfire events, and other factors out of human control. Ground disturbance from harvest varies by logging method, season of harvest, site preparation method, and other treatment factors.

Mushrooms

Concerns are sometimes raised about the possible detrimental ecological effects of mushroom picking on, for example, soil conditions, invertebrates, or mushroom productivity. There is little if any scientific evidence that there are any broad adverse ecological effects caused by the picking of mushrooms. On a small, localized scale, intensive gathering by large numbers of people over long periods of time may possibly disturb soils and understory plants, much as could occur at an

intensively used recreation site. However, evidence that such harvesting could detrimentally impact mushroom productivity is lacking. A long-term study (over a 27-year period) conducted in a mixed hardwood/fir/pine forest in Switzerland found no difference in species richness or abundance of species of edible fungi in harvested areas compared to non-harvested sites (Egli, Peter, Buser, Stahel, & Ayer, 2006). The authors did note that very widescale harvesting, in which the depletion of spores over large areas might occur, deserves additional study. A study on post-fire morel abundance in a Sierra Nevada mixed conifer forest found that burned forests in Yosemite National Park alone could produce an average crop of more than 1 million morels per year (A. J. Larson et al., 2016).

On the Flathead, the amount and intensity of mushroom picking is greatly limited by the lack of easy access, the difficult and steep terrain, the periodicity of abundant mushroom crops, and the relative remoteness of the Forest when compared to areas adjacent to large cities. It is anticipated that there would be no effect to mushroom productivity or other ecological factors associated with mushroom picking on the Forest due to the implementation of the forest plan.

Management direction for special forest products and huckleberries

There is no forest plan direction related directly to huckleberries in the 1986 plan nor to the gathering of special forest products.

Under all action alternatives, the forest plan provides direction to provide for sustainable levels of all forest products, including special forest products. Forest plan components provide for protection of tribal treaty rights related to harvestable plants, including access to the Forest for the effective exercise of gathering rights. All the action alternatives have forest plan components that provide for the sustainable harvest of huckleberries by people and encourage the use of non-destructive berry-harvesting methods. These serve to protect the current and future availability of huckleberries for both wildlife and human use.

All alternatives, including the no-action alternative, contain plan components that protect soil quality and sustain soil ecological functions during vegetation management activities. These components also serve to protect huckleberry plants, roots, and rhizomes from excessive damage.

Consequences to special forest products and huckleberries from forest plan components associated with other resource programs or management activities

Effects from fire and fire management

Fire may increase or decrease the potential availability of some special forest products, such as mushrooms and firewood. Potential wildfire over the next five decades has been modeled to assess changes to vegetation conditions (refer to sections 3.3 and 3.8). Future wildfire patterns and amounts have a relatively high degree of uncertainty; modeling portrays a range of possible wildfire acres that are the same for all alternatives. Therefore, all alternatives would have similar potential to provide for some special forest products linked to fire events, specifically firewood, mushrooms, and, in some areas, huckleberries.

The interrelationship of fire with huckleberry presence and production is discussed under the “Affected environment” section above. As mentioned, huckleberry is well adapted to persist under the natural fire regimes of the Flathead National Forest, and its abundance and distribution is strongly influenced by fire. Fire suppression or exclusion will also have an influence, depending upon the status of the huckleberry at a particular site. Fire exclusion and suppression may result in maintained or increased berry production (i.e., in an early successional forest where plants are

increasing in vigor) or in decreased production (i.e., in a forest that is increasing in density and canopy closure).

Fire will remain the primary disturbance factor on huckleberry abundance and production in the ecosystems of the Flathead National Forest. The amount, location, and intensity of future fire, both planned and unplanned ignitions, are uncertain but are expected to occur to similar degree under all the alternatives because climate and weather are the primary drivers. Therefore, the potential effect on huckleberry production is expected to be similar under all alternatives. This effect will be highly varied across the landscape, depending on fire location and severity. The species is well adapted to persist under native fire regimes and is expected to benefit in the long term from the diverse forest conditions created by fire.

Effects from vegetation management

Timber harvest and other vegetation management activities may increase or decrease the potential availability of some special forest products. Firewood may increase, either due to an increase in commercial firewood sales or as a byproduct of other commercial timber sales. All alternatives propose timber harvest to some amount, and thus all would have the opportunity to increase the potential availability of certain special forest products.

Timber harvest activities may have impacts on huckleberries, as described in subsection “Effects by alternative” on huckleberries (section 3.22.3).

Cumulative effects

Flathead County and surrounding counties have experienced high rates of population growth over the past couple decades (refer to the section on population demographics under section 3.27.2). With this increased growth rate comes increased pressure on national forest lands for a variety of social needs and desires, including the use of special forest products and huckleberry gathering. The sustainable use of some of these resources may become increasingly vulnerable, requiring permitting and limitation of use.

The expected change in climate in future decades could influence the availability of some special forest products. Insofar as it alters the growing conditions of a site, climate change could influence presence and productivity of huckleberries and other plants. Increased frequency or severity of fire could also cause changes or shifts on the landscape in terms of plant species composition or abundance. More firewood might be available with the increased size or frequency of fire, but an increase in fire might eliminate other special products (such as huckleberries), at least over the short term. Significant uncertainty exists regarding the possible effects of climate change on vegetation and thus on the availability and distribution of plants that are gathered as special forest products.

Past logging practices have impacted huckleberry production on the Forest, both by decreasing and by increasing berry production, depending on site, types of treatments, and time since harvest. Previously harvested areas are in various stages of recovery. More recently harvested areas may still be experiencing an initial decline in huckleberry production but are expected to trend upwards in response to the increased light available to huckleberry plants as the forest and vegetation recovers.

3.23 Mineral Resources

3.23.1 Introduction

As directed by the Organic Administration Act of 1897 and the Multiple-Use Sustained-Yield Act of 1960, the national forests are managed by the USDA Forest Service for continuous production of the renewable resources on NFS lands—timber, clean water, wildlife habitat, forage for livestock, and outdoor recreation. Although not renewable, minerals are resources of the national forests and are important to the nation's welfare.

Forest Service role in minerals management

In the Mining and Minerals Policy Act of 1970, Congress declared that it is the continuing policy of the Federal government, in the national interest, to foster and encourage private enterprise in (among other goals) the development of domestic mineral resources and the reclamation of mined land. This Federal policy applies to NFS lands.

The Forest Service recognizes the importance of NFS mineral resources to the well-being of the nation and encourages bona fide mineral exploration and development. But, it also recognizes its responsibility to protect the surface resources of the lands under its care. Thus, the Forest Service is faced with a double task: to make minerals from NFS lands available to the national economy and, at the same time, minimize the adverse impacts of mining activities on other resources.

Land management planning, as mandated by the National Forest Management Act of 1976, is a principal tool for ensuring that mineral resources are given proper consideration. Before plans are approved, specialists evaluate resource activities, including existing and potential mineral development. Planners and decisionmakers then formulate plans to minimize potential resource conflicts and maximize the various uses and values of NFS lands. Since mineral resources are often subsurface, relatively rare, and governed by certain preferential laws, the land management planning procedures provide for the availability of minerals and development of mineral operations where possible.

Minerals management of NFS lands requires interagency coordination and cooperation. Although the Forest Service is responsible for the management of surface resources of NFS lands, the Bureau of Land Management is primarily responsible for management of government-owned minerals. Since it is not possible to separate mineral operations from surface management, the agencies have developed cooperative procedures to accommodate their respective responsibilities.

There are three types of mineral and energy resources:

- **Locatable minerals**: Includes commodities such as gold, silver, copper, zinc, nickel, lead, platinum, etc., and some nonmetallic minerals such as asbestos, gypsum, and gemstones. Lands that are open to location under the Mining Law of 1872 guarantee U.S. citizens the right to prospect and explore lands reserved from the public domain and open to mineral entry. The right of access for exploration and development of locatable mineral is guaranteed.
- **Leasable minerals**: Includes commodities such as oil, gas, coal, geothermal, potassium, sodium phosphates, oil shale, sulfur, and solid leasable minerals on acquired lands. Currently, there are 341 suspended oil and gas leases covering approximately 641,500 acres on the Forest. No activity can take place on the leases until an EIS is completed. A leasing decision will not be a part of this forest plan revision.

- **Salable minerals**: Includes common varieties of sand, stone, gravel, cinders, clay, pumice, and pumicite. The Forest Service has the authority to dispose of these materials on public lands through a variety of methods. The disposal of these materials is discretionary.

Regulatory framework

Laws and executive orders

Surface management authority

Organic Administration Act of June 4, 1897 (30 Stat. 11, as amended; 16 U.S.C. § 473 et seq.): This act provides the Secretary of Agriculture the authority to regulate the occupancy and use of NFS lands. It provides for the continuing right to conduct mining activities under the general mining laws if the rules and regulations covering NFS lands are complied with. This act recognizes the rights of miners and prospectors to access NFS lands for all proper and lawful purposes, including prospecting, locating, and developing mineral resources.

Multiple-Use Sustained-Yield Act of June 12, 1960 (Pub. L. 86-517, 74 Stat. 215; 16 U.S.C. 528 et seq.): This act requires that NFS lands be administered in a manner that considers the values of the various resources when making management decisions and specifically provides that nothing in the act be construed to affect the use or administration of the mineral resources on NFS lands.

Wilderness Act of September 3, 1964 (Pub. L. 88-577, 78 Stat. 890; 16 U.S.C. § 1121, et seq.): This act provides that, subject to valid rights existing prior to January 1, 1984, wilderness areas are withdrawn from all forms of appropriation and disposition under the mining and mineral leasing laws. Subsequent acts designating additional NFS lands as wilderness may contain specific provisions concerning mineral activities. Patents issued under the mining laws for mining claims staked after passage of this act within wilderness areas shall reserve the surface rights to the United States. The act provides for reasonable access to valid mining claims and other valid occupancies inside wilderness areas. The act also requires the survey of wilderness areas by the U.S. Geological Survey on a planned, recurring basis consistent with the concept of wilderness preservation to determine the mineral values that may be present.

National Environmental Policy Act of 1969, January 1, 1970 (Pub. L.91-190, 83 Stat. 852; 42 U.S.C. § 4331 et seq.): This act requires federal agencies to use a systematic, interdisciplinary approach to ensure the integrated use of the natural and social sciences in planning and decisionmaking. It also requires an analysis of the probable environmental effects of proposed Federal actions. Generally, decisions on mineral and energy development are subject to this law.

Forest and Rangeland Renewable Resources Planning Act of August 17, 1974 (Pub. L. 93-378, 88 Stat. 476; 16 U.S.C. § 1600 et seq.): This act directs the assessment of all resources on NFS lands to determine the desired level of future production from Forest Service programs. Once approved, the policy statement and recommended program serve as a guide to future Forest Service planning and a basis for future budget proposals.

National Forest Management Act of October 22, 1976 (Pub. L. 94-588, 90 Stat. 2949; 16 U.S.C. § 1600 et seq.): This act requires the Forest Service to establish a comprehensive system of land and resource planning, including the development and maintenance of a comprehensive and detailed inventory of lands and resources. The act also specifies the use of a systematic interdisciplinary approach to achieve integrated consideration of the physical sciences into planning for the management and use of NFS lands and resources.

Minerals management authorities

U.S. Mining Laws Act of May 10, 1872 (17 Stat. 91, as amended, 30 U.S.C. § 22 et seq.): This act (often referred to as the General Mining Act of 1872) sets forth the principles of discovery, right of possession, assessment work, and patent for hard-rock minerals on lands reserved from the public domain. The law applies to lode, placer, mill-site claims, and tunnel sites. Except as otherwise provided, all valuable mineral deposits, and the lands in which they are found, are free and open to exploration, occupation, and purchase under regulations prescribed by law.

Weeks Law Act of March 1, 1911 (Pub. L. 61-435, 72 Stat. 1571, as amended, 16 U.S.C. § 480 et seq.): This act authorizes the Federal government to purchase lands for streamflow protection, and maintain the acquired lands as national forests.

Mineral Resources on Weeks Law Lands Act of March 4, 1917 (Pub. L. 64-390, 39 Stat. 1149, 16 U.S.C. § 520): This act authorizes the Secretary of Agriculture to issue permits and leases for prospecting, developing, and utilizing hard-rock minerals on lands acquired under the authority of the act. This authority was later transferred to the Secretary of the Interior.

Mineral Leasing Act of February 25, 1920 (Pub. L. 66-146, 41 Stat. 437 as amended, 30 U.S.C. § 181 et seq.): This act authorizes the Secretary of the Interior to issue leases for the disposal of certain minerals (coal, phosphate, sodium, potassium, oil, oil shale, gilsonite, and gas). The act applies to NFS lands reserved from the public domain, including lands received in exchange for timber or other public domain lands, and lands with minerals reserved under special authority.

Clarke-McNary Act of June 7, 1924 (Pub. L. 68-270, 43 Stat. 653 as amended, 16 U.S.C. § 505 et seq.): All lands to which title is accepted under section 7 of this act become national forest lands, subject to all laws applicable to the lands acquired under the Weeks Act of March 1, 1911.

Reorganization Plan No. 3 of 1946 (60 Stat. 1097; 5 U.S.C. Appendix): This transferred the functions of the Secretary of Agriculture with respect to permits and leases for hard-rock minerals on acquired Weeks Law land to the Secretary of the Interior. However, Secretary of Agriculture consent to the issuance of permits or leases is required.

Mineral Materials Act of July 31, 1947 (Pub. L. 80-291, 61 Stat. 681, as amended, 30 U.S.C. § 601 et seq.): This act provides for the disposal of mineral materials on the public lands through bidding, negotiated contracts, and free use.

Mineral Leasing Act for Acquired Lands of August 7, 1947 (Pub. L. 80-382, 61 Stat. 913, as amended, 30 U.S.C. § 351 et seq.): This act extends the provisions of the mineral leasing laws to federally owned mineral deposits on acquired NFS lands and requires the consent of the Secretary of Agriculture prior to leasing.

Multiple Use Mining Act of July 23, 1955 (Pub. L. 84-167, 69 Stat. 368, as amended, 30 U.S.C § 601 et seq.): This act requires the disposal of common varieties of sand, stone, gravel, pumice, pumicite, and cinders under the provisions of the Materials Act of July 31, 1947, and gives to the Secretary of Agriculture the authority to dispose of these materials. It also provides that rights under any mining claim located under the mining laws are subject to the right of the United States to manage and dispose of surface resources.

Geothermal Steam Act of December 24, 1970 (Pub. L. 91-581, 84 Stat. 1566, 30 U.S.C. § 1001-1025): This act provides the Secretary of the Interior the authority to lease NFS lands for geothermal steam development, subject to the consent and conditions the Secretary of Agriculture may prescribe.

Mining and Minerals Policy Act of December 31, 1970 (Pub. L. 91-631, 84 Stat.1876, 30 U.S.C. § 21a): This act states that the continuing policy of the federal government is to foster and encourage private enterprise in the development of economically sound and stable domestic mining and minerals industries and the orderly and economic development of domestic mineral resources.

Federal Coal Leasing Amendments Act of August 4, 1976 (90 Stat. 1083; 30 U.S.C. § 201 et seq.): This act amends the Mineral Lands Leasing Act of February 25, 1920 (para. 3) by specifying that coal leases on NFS lands may be issued only after the consent of the Secretary of Agriculture and adherence to conditions the Secretary may prescribe. The act also provides that no lease shall be issued unless the lands involved in the lease have been included in a comprehensive forest land and resource management plan and the sale is compatible with that plan. The act authorizes the issuance of a license to conduct exploration for coal.

Federal Land Policy and Management Act of October 21, 1976 (Pub. L. 94-579, 90 Stat. 2713; 43 U.S.C. § 1701 et seq., 7 U.S.C. § 1212a, 16 U.S.C. § 478a, 1338a): This act defines procedures for the withdrawal of lands from mineral entry. It reserves to the United States the rights to prospect for, mine, and remove the minerals in lands conveyed to others and requires the recordation of claims with the Bureau of Land Management.

Surface Mining Control and Reclamation Act of August 3, 1977 (Pub. L. 95-87, 91 Stat. 445, 30 U.S.C. § 1201-1328): This act provides for cooperation between the Secretary of the Interior and States in the regulation of surface coal mining. It also restricts or prohibits surface coal mining operations on NFS lands, subject to valid existing rights and compatibility determinations.

Energy Security Act of June 30, 1980 (Pub. L. 96-294, 94 Stat. 611, 42 U.S.C. § 8855): This act directs the Secretary of Agriculture to process applications for leases and permits to explore, drill, and develop resources on NFS lands, notwithstanding the current status of the Forest's land and resource management plan.

National Materials and Minerals Policy, Research and Development Act of October 2, 1980 (94 Stat. 2305; 30 U.S.C. §1601-1605): This act restates congressional intent to promote policies that provide for an adequate and stable supply of materials while considering long-term needs, a healthy environment, and natural resource conservation. The act also requires the Secretary of the Interior to improve the availability and analysis of mineral data in Federal land use decisionmaking.

Federal Onshore Oil and Gas Leasing Reform Act of 1987 (30 U.S.C. § 181 et seq.): This act expands the authority of the Secretary of Agriculture in the management of oil and gas resources on NFS lands. The Bureau of Land Management cannot issue leases for oil and gas on NFS lands over the objection of the Forest Service. The Forest Service must approve all surface-disturbing activities on NFS lands before operations commence.

Federal Cave Resources Protection Act of 1988 (102 Stat. 4546; 16 U.S.C. § 4301-4309): This act provides for the protection and preservation of caves on federal lands.

Omnibus Parks and Public Lands Management Act of 1996 (Pub. L. 104-333, 110 Stat. 4093; 16 U.S.C. § 497c): This act automatically withdraws from all forms of appropriation under the mining laws and from disposition under all laws pertaining to mineral and geothermal leasing all lands located within the boundaries of ski area permits.

Executive Order 13211, issued May 18, 2001: This executive order titled "Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use" requires Federal agencies

to prepare and submit a statement of energy effects to the Office of Management and Budget describing the effects of certain regulatory actions on energy supply distribution, or use.

Executive Order 13212, issued May 18, 2001: This executive order titled “Actions to Expedite Energy-Related Projects” requires Federal agencies to take actions, to the extent consistent with applicable law, to expedite projects that will increase the production, transmission, or conservation of energy.

Energy Policy Act of 2005 (Pub. L. 109-58): This act directs Federal agencies to undertake efforts to ensure energy efficiency and the production of secure, affordable, and reliable domestic energy.

128 Stat. 3828 (Pub. L. 113–291—Dec. 19, 2014) Sec. 3063: This statute establishes the North Fork Federal Lands Withdrawal Area, “to withdraw certain Federal land and interests in that land from location, entry, and patent under the mining laws and disposition under the mineral and geothermal leasing laws and to preserve existing uses” (see figure B-29). Nothing in this section prohibits the Secretary of the Interior from taking any action necessary to complete any requirement under the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.) or the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.) required for permitting surface-disturbing activity to occur on any lease issued before the date of enactment of this act.

Code of Federal Regulations

36 CFR § 228−Minerals: These regulations set forth rules and procedures governing use of the surface of NFS lands in conjunction with operations authorized by the general mining laws, oil and gas leasing, and mineral material disposal laws.

- Subpart A: Locatable Minerals
- Subpart B: Leasable Minerals (Reserved)
- Subpart C: Disposal of Mineral Materials
- Subpart D: Miscellaneous Minerals Provisions
- Subpart E: Oil and Gas Resources

36 CFR § 251−Land Uses.

43 CFR § 2300−Land Withdrawals.

Other regulation, policy, and guidance

Interagency agreements

The Forest Service has entered into interagency agreements with agencies within the U.S. Department of the Interior to cooperate and coordinate in the management of federally owned minerals within NFS lands. The principal agreements include

- a November 8, 1946, agreement with the Bureau of Land Management detailing procedures for mineral leases and permits administered under section 402 of the President’s Reorganization Plan No. 3 of 1946;
- a May 18, 1957, memorandum of understanding with the Bureau of Land Management describing work procedures for land applications, mining claims, and patents;
- a March 4, 1977, cooperative agreement with the U.S. Geological Survey concerning oil and gas operations;

- a May 20, 1980, memorandum of understanding with the Bureau of Land Management describing the coordination of activities under the Federal coal management program;
- a November 26, 1980, cooperative agreement with the U.S. Geological Survey for operations under solid mineral leases and permits;
- a December 3, 1981, memorandum of understanding with the U.S. Geological Survey and the Bureau of Land Management for the geothermal steam leasing program;
- a December 11, 1989 memorandum of understanding with the Montana Department of Environmental Quality (formerly the Montana Department of State Lands) to promote efficiency and effectiveness in administration and regulation of mineral resources;
- a July 31, 1990, memorandum of understanding with the Office of Surface Mining Reclamation and Enforcement describing the management of surface coal mining operations on NFS lands;
- a November 11, 1991, interagency agreement with the Bureau of Land Management describing the procedures by which the Forest Service can authorize the Bureau of Land Management to offer NFS lands for oil and gas leasing; and
- a November 19, 1991, interagency agreement with the Bureau of Land Management describing the procedures for coordinated administration of oil and gas operations on Federal leases within the NFS.

Key indicators

- Locatable minerals—acres available for mineral entry (not withdrawn)
- Leasable minerals—acres available for leasing proposals and proposed no surface occupancy stipulation acreages
- Salable minerals—acres available for disposal of mineral materials

Methodology and analysis process

The acres that are available for locatable mineral resource development are determined by subtracting the number of acres that are withdrawn from the total number of acres for the Flathead National Forest. The number of acres that are withdrawn from mineral entry is a matter of record. By law, the Bureau of Land Management keeps official records in the General Land Office.

The number of acres that are available for leasing proposals is determined by subtracting the number of acres that are legally unavailable from the total number of acres on the Flathead National Forest. Currently, there are 341 suspended oil and gas leases covering approximately 641,500 acres on the Forest. No activity can take place on the leases until an EIS is completed. A leasing decision will not be a part of this forest plan revision.

Lands which are legally unavailable for leasing are

- lands withdrawn from mineral leasing by an act of Congress or by an order of the Secretary of the Interior;
- lands recommended for wilderness allocation by the Secretary of Agriculture;
- lands designated by statute as wilderness study areas, unless oil and gas leasing is specifically allowed by the statute designating the study area; and

- lands within areas allocated for wilderness or further planning in Executive Communication 1504.

The number of acres that are available for the disposal of mineral materials is determined by subtracting from the total number of acres on the Flathead National Forest the number of acres where the Forest Service has exercised its discretion to refrain from authorizing the disposal of mineral materials.

Information sources

The Bureau of Land Management keeps official records on active and closed mining claims on public lands. Current records are kept in the LR2000 database. These records are the source for the documentation of mining claims on the Flathead National Forest. Published and unpublished mineral resource assessments and maps produced by the Forest Service, Bureau of Land Management, U.S. Geological Survey, and the Montana Bureau of Mines and Geology were reviewed to determine the occurrence potential for minerals, oil and gas, and geothermal resources.

Incomplete and unavailable information

There is no incomplete or unavailable information pertinent to energy and minerals.

Analysis area

The analysis area is the national forest lands within the Forest. The temporal scope of the analysis is the anticipated life of the plan (15 years).

3.23.2 Affected environment (existing condition)

A variety of mineral deposit types and mineral resources, including gold, silver, and copper, occur within the boundaries of the Forest. The Forest Service recognizes that minerals are fundamental to the nation's well-being and, as policy, encourages the exploration and development of the mineral resources it is authorized to manage. The Secretary of Agriculture has provided regulations (36 CFR § 228) to ensure surface resource protection while encouraging the orderly development of mineral resources on NFS lands. Refer to figure 1-67, which shows mineral potential on the Forest, and figure 1-68, which displays oil and gas potential.

With respect to national forest management, mineral resources are divided into three groups: locatable minerals, leasable minerals, and mineral materials. The authority of the Forest Service to influence and regulate the exploration, development, and production phases of mining operations varies with each group. As a result, the Forest Service manages mineral resource programs that are specific to each group.

Locatable minerals

If the land is open to mineral entry and the mining claim is properly filed with the Bureau of Land Management, the claimant has legal title to the minerals. The Bureau of Land Management's mining claim database, LR2000, lists active (current) and closed mining claims recorded on public lands. The status of mining claims can change on an annual basis, and new claims can be recorded at any time throughout the year. In general, the Flathead National Forest is rated as having a low to very low potential for locatable minerals.

Currently, there are no authorized locatable mineral activities, such as exploration or development operations for the locatable minerals within the boundaries of the planning area. Based on the results of a July 27, 2015, query of the Bureau of Land Management mining claim database, one active

mining claim (MMC 195448) is located within the planning area. The Mary Dee II lode claim is located on the Hungry Horse Ranger District. Refer to figure 1-67 for a map of locatable minerals potential on the Forest.

Currently, the 2.4-million-acre Flathead National Forest contains 1,075,559 acres of designated wilderness, which is all withdrawn from mineral entry. In 2015, Section 3063 of the Howard P. 'Buck' McKeon National Defense Authorization Act withdrew the North Fork of the Flathead from mineral entry. This resulted in approximately 420,000 acres being withdrawn from location, entry, and patent under the mining laws and disposition under all laws relating to mineral leasing and geothermal leasing. This does not affect minerals materials. Currently, approximately 62 percent of the Flathead National Forest is withdrawn from mineral entry as either designated wilderness or as a part of the North Fork of the Flathead withdrawal.

Leasable minerals

At this time, there is no leasable mineral exploration or mining activity on the Forest. However, as of April 15, 2013, there were 341 suspended oil and gas leases covering approximately 641,500 acres on the Flathead National Forest (see figure 1-79). The Bureau of Land Management suspended the oil and gas leases in 1985 after the Conner v. Burford district court decision [Conner v. Burford, 605 F. Supp.107 (D. Mont. 1985)]. The court found the environmental effects analysis supporting lease issuance on the Gallatin and Flathead National Forests to be inadequate. The court specified that no activity may take place on the leases until an EIS is completed.

In 1987, Congress passed the Federal Onshore Oil and Gas Leasing Reform Act. The act authorized the Secretary of Agriculture to develop procedures and regulations governing leasing of oil and gas resources on lands administered by the National Forest Service. Forest Service regulations implementing the Leasing Reform Act went into effect on April 20, 1990 (36 CFR Subpart E). Sections 102-104 of Subpart E speak directly to the leasing process, its various options and effects analysis, and the decisions to be made. The regulations also provide that the required effects analysis can be completed as part of the Forest's planning process or as a standalone analysis. The forest supervisor for the Flathead National Forest has decided that the analysis required to answer oil and gas lease decisions is well beyond the broad programmatic analysis and the decisions for the forest plan revision. Until a leasing decision is completed, no oil and gas exploration or development can take place on the Flathead National Forest. Most of the Forest has moderate to high potential for the occurrence of oil and gas (Long, 1997) (see fig. 1-54) but low potential for development of these resources due to the lack of NEPA analysis discussed above. There is low occurrence potential for geothermal resources (Sonderegger & Bergantino, 1981) or any other leasable mineral on the Forest.

Salable minerals

Salable minerals, also known as "common variety" minerals, are subject to the Mineral Materials Act of 1947, as amended. These minerals are disposed of by sale, issuance of free-use permits, or contracts for in-service needs. These minerals include petrified wood, common varieties of sand, rock, stone, cinders, gravel, pumice, clay, and other similar materials. Such common-variety mineral materials include deposits that, although they have economic value, tend to be relatively widely available and do not have a distinct and special value. These minerals are most commonly used as building stone, landscaping, and constructions materials.

The Forest uses mineral material, such as gravel, riprap, and crushed aggregate, for road maintenance, road construction, recreation sites, and trailheads. Other uses include Forest contract work, culvert replacement, and repair of damage caused by fire, floods, and landslides. The mineral material utilized by the Forest is primarily derived from Forest Service pits and quarries located in

the planning area. The type volume and source of locations for in-service use varies year by year and according to need. The Forest in-service pits, type of material, and quantities for fiscal years 2012 and 2013 are listed below in table 163 and table 164.

Table 163. Forest in-service mineral material use for fiscal year 2012

Pit Name	Type	Volume (cubic yards)
007 Quarry	riprap	321
007 Quarry	¾" crushed aggregate	370
007 Quarry	large rock	17
Airport Pit	crushed gravel	800
Airport Pit	¾" crushed aggregate	560
Piper Creek	crushed aggregate	410
Langford Pit	pit run material	500
Logan Pit	¾" crushed aggregate	20
Logan Pit	riprap	50
McGovern Pit	¾" crushed aggregate	10
Owl Pit	¾" crushed aggregate	40

Table 164. Forest in-service mineral material use for fiscal year 2013

Pit Name	Type	Volume (cubic yards)
Owl Creek	crushed aggregate	120
007	crushed aggregate	4,310
Piper Creek	crushed aggregate	3,316
Peters Quarry	riprap	100
Peters Quarry	crushed aggregate	30
Spotted Bear Airstrip	crushed gravel	150
Kraft	riprap	227
Star Logan	crushed aggregate	10
Star Logan	boulders	5
Porcupine	pit run	495

The Forest also disposes of minerals materials via free-use permits. These can be issued to any State, Federal, or territorial agency, unit, or subdivision, including municipalities, county road districts, nonprofit associations, or individuals (36 CFR § 228.57). The Glacier View Ranger District issued 36,000 cubic yards of crushed stone to Flathead County for maintenance and improvement of the North Fork Road in 2012. At this time, there are no planned sales or free-use allocations to the State, county or other agencies, although they may occur in the future.

The Forest also issues free-use permits to the public for the collection of up to four tons of loose rock suitable for landscaping use from Forest-administered lands along open roads. An individual may obtain a permit and collect rock, as long as it is not for commercial use, sale, or barter. Only hand tools can be used to collect the rock; no digging is permitted, and the collection of loose rock only is authorized. On average, about 75 permits are issued each year.

3.23.3 Environmental consequences

Expected future mining activity

Locatable mining activity has occurred on the Forest in the past, but in recent years there has been very little activity and nothing is currently authorized. It is likely that very little locatable mining activity will occur on the Forest over the next 15 years. The same can be said for leasable mineral activity. Oil and gas leasing cannot occur without a separate leasing analysis EIS, and this is not likely to be completed in the next 15 years. There is low to no potential for any other type of leasable mineral development on the Forest within the next 15 years. Salable mineral mining activity is expected to continue at current levels, and the mineral materials are predominantly being used by the Forest and local county governments to improve and maintain roads throughout the Forest.

None of the alternatives propose to make any site-specific changes to the existing availability of land for locatable minerals or leasable minerals on the Forest. No need for new withdrawals has been identified, and no additional areas are proposed for withdrawal. No changes to existing access are proposed.

Locatable minerals

Alternative A has approximately 1,471,000 acres formally withdrawn from mineral entry.

Alternatives B modified, C, and D do not propose any additional lands for withdrawal from mineral entry. There is no difference between the alternatives in regards to land available for locatable mineral development. A total of approximately 1,471,000 acres of NFS lands are withdrawn from mineral entry for all alternatives.

Leasable minerals

Alternative A has approximately 1,455,000 acres legally unavailable for mineral leasing.

Alternatives B modified, C, and D do not propose to make any additional lands legally unavailable for mineral leasing. Alternatives B modified and D do not include any stipulations as to surface use or occupancy. Alternative C proposes no surface occupancy stipulations on any future oil and gas leases within the primary conservation area or zone 1, and these would be included in any future oil and gas leasing analysis. Any other stipulations would be identified through the oil and gas leasing analysis.

Salable materials

The availability of salable mineral materials varies by alternative based on suitability by management area. For the action alternatives, management areas 1a, 1b, 3b, 4a, and the wild segments of 2a and 2b are not suitable for the removal of salable mineral materials. Table 165 displays the acres suitable for salable minerals by alternative. Alternative D has the most and alternative C has the least acres suitable for removal of salable minerals.

Table 165. Acres suitable for salable mineral disposal by alternatives

Area	Alternative A acres	Alternative B modified acres	Alternative C acres	Alternative D acres
Total NFS lands	2,392,800	2,392,800	2,392,800	2,392,800
Lands not suitable for mineral material disposal	1,180,500	1,272,100	1,582,900	1,097,800

Area	Alternative A acres	Alternative B modified acres	Alternative C acres	Alternative D acres
Total lands suitable for mineral material disposal	1,212,300	1,120,700	809,900	1,295,000

In addition to the direction on suitability for removal of mineral materials by management area, the forest plan contains a guideline that mining and extraction of sand and gravel at new sites should not occur within riparian management zones (FW-GDL-RMZ-06). This guideline would limit this activity in all riparian management zones (410,863 acres forestwide), and the effects would be the same for all action alternatives.

Consequences to minerals from forest plan components associated with other resource programs or management activities

Effects from access and recreation management

Access and recreation management direction under any of the four alternatives would not result in any change in the lands available for locatable minerals, leasable minerals, or salable minerals development.

Inventoried roadless area management regulations under alternatives A, B modified, C, and D would have the same effects on access. Road construction or reconstruction associated with mineral leases or salable mineral disposal may not occur in inventoried roadless areas.

Effects from vegetation management

Vegetation management direction under any of the four alternatives would not result in any change in the lands available for locatable minerals, leasable minerals, or salable minerals development.

Effects from fire and fuels management

Fire and fuels management direction under any of the four alternatives would not result in any change in the lands available for locatable minerals, leasable minerals, or salable minerals development.

Effects from wildlife management

Wildlife management direction under any of the four alternatives would not result in changes in valid existing rights for locatable minerals, leasable minerals, or salable minerals development.

Habitat security requirements and other mineral mitigation measures for grizzly bear can be expected to affect the cost of locatable, leasable and salable mineral exploration and development under all alternatives. Where roads, and the access they provide, are necessary, limitations on road construction and operating seasons can be expected to have the effect of prolonging exploration or development work. Areas most affected would be bear management units in the NCDE primary conservation area (see standards FW-STD-E&M-01, 02, and 04 through 08 and guidelines FW-GDL-E&M-01 through 06).

Currently, approximately 1.5 of the Forest's 2.4 million acres (about 63 percent) is withdrawn from mineral entry because it is designated wilderness (management area 1a) or is part of the North Fork of the Flathead withdrawal area (see figure B-29). These areas are in the grizzly bear primary conservation area. Under alternative B modified, the no surface occupancy stipulation would apply to new oil and gas leases across the remainder of the NCDE primary conservation area but would not

apply to valid existing rights. Under alternative C, the no surface occupancy stipulation would apply to new oil and gas leases across the remainder of the NCDE primary conservation area and zone 1 but would not apply to valid existing rights. Although the potential for oil and gas development on the Forest is very low, the no surface occupancy stipulation proposed in alternative C would make it more costly or infeasible to develop oil and gas resources for new leases. Under alternative B modified, additional areas of no surface occupancy would affect the potential cost of development for new leases in a much smaller area of the Forest than alternative C. With alternatives A and D, no new area would be affected by a no surface occupancy stipulation.

New locatable, leasable, and salable mineral exploration and development might also be affected in lynx analysis units on the Forest. Standard ALLS1 requires that habitat connectivity is maintained, and guideline HU G12 gives direction that winter access should be limited to designated routes or designated motorized over-snow vehicle routes, but this is also subject to valid existing rights (see appendix A for lynx management direction and figures 1-42 through 1-45 for motorized over-snow vehicle use suitability by alternative). Although the potential for leasable and locatable mineral development is low, implementation of these plan components could make minerals development more costly.

Effects from watershed, soil, riparian, and aquatic habitat management

Aquatic management direction under any of the four alternatives would not result in any change in the lands available for locatable minerals, leasable minerals, or salable mineral development.

Under alternative A, surface occupancy associated with salable and leasable minerals would not be allowed in riparian habitat conservation areas unless there are no other options for location, the riparian management objectives can be attained, and adverse effects to inland native fish can be avoided (INFISH Standard MM-4). Alternatives B modified, C, and D include guidelines to minimize adverse effects to inland native fish species from mineral operations in riparian management zones. Because of the low leasable mineral occurrence potential (other than oil and gas) on available lands, and the expected low demand for leases, there is likely to be little to no effect to leasable minerals. Potential oil and gas development would be impacted by making it more expensive and possibly infeasible. Since there are plentiful sources for salable minerals outside of these areas, there is likely to be little to no effect on salable minerals. There would be no impact to locatable minerals.

Effects from lands and special uses management

Lands and special uses management direction under any of the four alternatives would not result in any change in the lands available for locatable minerals, leasable minerals, or salable mineral development.

Cumulative effects

Cumulative effects evaluate the potential impacts to mineral resources from the action alternatives when combined with past, present, and reasonably foreseeable actions. All lands within the Flathead National Forest boundaries form the geographic scope for cumulative effects. The temporal bound would be the life of the forest plan, which is estimated to be 15 years.

In order to integrate the contribution of past actions to the cumulative effects of the action alternatives, existing conditions are used as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior actions that have affected access and might contribute to cumulative effects. Mineral resources across the Forest are likely to be

influenced by a variety of factors, and as described in the "Affected environment" section, there are a number of actions that may occur over the life of the plan.

Requests for approval of small lode and placer mining operations may occur, but it is not possible to predict how many may be submitted in any given year or how many might be approved, but there is low potential for locatable mineral development on most of the Forest. Since Congress has imposed a moratorium on the patenting of mining claims, there would be no change in the acres of patented lands unless Congress lifts the moratorium.

Given the low probable occurrence of leasable minerals other than oil and gas on open/available lands on the Flathead National Forest, the court decision in Conner vs. Burford suspending existing oil and gas leases, and the low probability of an EIS for oil and gas leasing being prepared in the next 15 years, there is little likelihood of mineral lease applications being made on the Forest.

Mineral material use can be expected to continue for in-service needs (e.g., road maintenance and watershed improvement activities) and as a salable commodity and would result in the further depletion of this non-renewable mineral resource from NFS lands.

Reclamation work is likely to occur on select abandoned mine sites as well as on mineral material sites that have reached the end of their useful life.

3.24 Livestock Grazing

3.24.1 Introduction

Livestock grazing on NFS land is a valuable resource to livestock owners. It has been a legitimate use of public lands since the inception of the NFS and has become an important part of the culture of the rural West. The objectives for Forest Service management of rangelands include managing range vegetation to provide ecosystem diversity and ecosystem and environmental quality while maintaining relationships with livestock owners, meeting the public's needs for rangeland uses, providing for livestock forage, maintaining wildlife food and habitat, and providing opportunities for economic diversity.

Rangeland management is an essential part of the Forest Service's multiple-use strategy to manage its lands. This strategy ensures that rangelands provide essential ecosystem services such as wildlife habitat and related recreation opportunities, watershed functions and livestock forage. The Forest Service has primarily managed rangelands for livestock forage (C. N. Kendall, 2013).

Forage is a provisionary service in that it is a tangible product from an ecosystem that humans use for nutrition, materials, or energy. Being a tangible product, forage is managed by the Forest Service to be sustainable by ensuring that it will be available for future generations while still providing the other rangeland's ecosystem services required by their multiple-use strategy. To accomplish this, the Forest Service divides rangelands into allotments and monitors each one to maintain the overall rangeland health. Additionally, the Forest Service manages forage in transitory ranges. Transitory range is defined as forested lands that are suitable for grazing for a limited time following a timber harvest, fire, or other landscape event (Spreitzer, 1985).

Grazing permits for each allotment are issued to eligible commercial livestock owners for the grazing of livestock. To determine the livestock numbers per allotment, which is often called the stocking rate, rangeland managers use animal unit months. An animal unit month is defined as the amount of dry forage required by one mature cow of approximately 1,000 pounds or its equivalent for one month. The forage allowance per day has been determined to be 26 pounds. In determining the animal unit months per allotment, the livestock used by permitted outfitters, guides, and other recreational visitors are not included.

Livestock grazing management is established through forest plans, the Forest Service grazing guidelines, and individual allotment management plans. These plans are developed to be comprehensive using sound science and incorporating public involvement. Plans are revised and updated to ensure that livestock grazing management decisions are based on existing and future ecological, social, cultural, and economic conditions.

Regulatory framework

Laws and executive orders

Federal acts and executive orders guide rangeland resource management and commercial livestock grazing on NFS lands. Other laws pertinent to rangeland management and livestock grazing on NFS lands can be found in Forest Service Manual 2200.

Federal law

Organic Administration Act of 1897: This act authorizes the President to modify or revoke any instrument creating a national forest; states that no national forest may be established except to improve and protect the Forest within its boundaries, for the purpose of securing favorable conditions of water

flows, and to furnish a continuous supply of timber for the use and necessities of citizens of the United States. Authorizes the Secretary of Agriculture to promulgate rules and regulations to regulate the use and occupancy of the national forests.

Bankhead-Jones Farm Tenant Act of 1937: This act directs the Secretary of Agriculture to develop a program of land conservation and use to correct maladjustments in land use and to assist in such things as control of soil erosion, reforestation, preservation of natural resources, and protection of fish and wildlife.

Granger-Thye Act of 1950: This act provides for the issuance of grazing permits for a term of up to 10 years. It also provides for the use of grazing receipts for range improvement work.

Wild Horse Protection Act of 1959: This act prohibits the use of a motor vehicle to hunt for the purpose of capturing or killing any wild horse, mare, colt, or burro running at large on the public lands. The act also prohibits the pollution of watering holes on public lands for the purposes of trapping, killing, wounding, or maiming any of these animals.

Multiple-Use Sustained-Yield Act of 1960: This act provides that national forests are established and administered for several purposes, including livestock grazing. This act also authorizes the Secretary of Agriculture to develop the surface renewable resources of national forests for multiple use and sustained yield of the services and products to be obtained from these lands, without impairment of the productivity of the land.

Wilderness Act of 1964: This act provides that livestock grazing, and the activities and facilities needed to support grazing, are allowed to continue in wilderness areas when such grazing was established before the wilderness was designated.

National Historic Preservation Act of 1966: This act secures protection of archaeological resources and sites on public and Native American lands.

National Environmental Policy Act of 1970: This act directs all Federal agencies to consider and report the potential environmental impacts of proposed Federal actions. The act also established the Council on Environmental Quality.

Clean Water Act of 1972: This act sets the basic structure for regulating discharges of pollutants to waters of the United States.

Endangered Species Act of 1973: This act protects animal and plant species that are currently in danger of extinction (endangered) and those that may become endangered in the foreseeable future (threatened). The act provides for the conservation of ecosystems upon which threatened and endangered species of fish, wildlife, and plants depend, both through Federal action and by encouraging the establishment of State programs.

Forest and Rangeland Renewable Resource Planning Act of 1974: This act directs the Secretary of Agriculture to develop a process for the revision of NFS lands resource management plans. This includes the identification of the suitability of lands for resource management.

Federal Land Policy and Management Act of 1976: This act states that public lands will be managed in a manner that will provide food and habitat for fish, wildlife, and domestic animals.

Public Rangelands Improvement Act of 1978: This act recognizes the need to correct unsatisfactory conditions on public rangelands by increasing funding for maintenance and management of these lands.

Rescissions Act of 1995: This act directs the Forest Service to complete site-specific National Environmental Policy Act analyses and decisions for grazing allotments on a regularly scheduled basis based on the permits requirements.

Executive orders

Secretary's Administrative Order of 1963: This executive order provides administration of NFS lands under Title III of the Bankhead-Jones Farm Tenant Act; establishment of national grasslands.

Regulation, policies, and guidance

The following regulations and policies have been developed to support implementation of the acts and executive orders previously presented:

Departmental Regulation, Number 9500-5, dated December 15, 1983; subject: Policy on Range.

National Grasslands Management—A Primer (1997): A document that identifies and interprets the laws and regulations applicable to the administration of the national grasslands.

36 CFR Chapter II, Forest Service, Department of Agriculture:

- 219 Planning
- 222 Range Management
- 241 Fish and Wildlife

Forest Service manuals and handbooks

- Forest Service Manual 2200—This manual summarizes laws and regulations governing rangeland management and forest planning.
- Forest Service Handbook 2209.13—Grazing Permit Administration Handbook
- Forest Service Manual 2600—This manual summarizes laws and regulations governing fish and wildlife
- Forest Service Handbook 2609.13—Wildlife and Fisheries Program Management Handbook

Other agreements and plans

The following agreements and plans also support the Forest Service's rangeland management program:

Memoranda of understanding for forage reserves. Forage reserves are allotments under a term grazing permit but may be used by other permittees that have been temporarily displaced due to wild or prescribed fire, drought, or other situations that have made forage unavailable.

Non-use for resource protection agreements. These agreements may be established to establish long-term non-use to allow rangelands to recover, provide forage on a temporary basis to allow resource recovery on other grazing units, provide temporary resolution of conflicts created by predation on livestock, or provide supplemental forage in times of drought to assist area livestock operators and lessen the resource impacts of grazing.

Allotment management plans: Developed through site-specific environmental analysis, an allotment management plan uses forest plan direction and current issues to determine desired conditions and a broad strategy for meeting desired conditions. These plans describe site-specific grazing strategies, stocking, structural and non-structural range improvement needs, and coordination with other resources.

Key indicators

Indicators for livestock grazing within the Flathead National Forest are listed below, and the key indicators are ambient air quality and visibility, as follows:

- an alternative would be considered to have potentially significant impacts if its implementation would result in a national ambient air quality standards non-compliance violation as determined by the montana department of environmental quality.
- an alternative would be considered to have potentially significant impacts to visibility if its implementation would result in changes to or degradation of visual quality, views, and the aesthetic landscape.

the montana department of environmental quality has a network of air quality monitoring sites across the state. monitoring sites that are within the administrative boundaries of the flathead national forest and will be referenced in this analysis are the following:

- kalispell: flathead electric
- whitefish: dead end

shows how these indicators are used in rangeland analysis:

- Permitted use; measured as the acres and percentage of NFS land in active grazing allotments
- Forage, via suitability for and utilization by cattle; measured as animal unit months of cattle grazing
- Forage, via suitability for and utilization by sheep; measured as animal unit months of sheep grazing

Table 166: Resource indicators and measures for assessing effects from livestock grazing

Resource Element	Resource Indicator	Measure
Use	Permitted Use	Acres and percentage of allotments
Forage	Suitability and utilization	Animal unit months and available forage

Methodology and analysis process

The alternatives include management standards and guidelines that describe actions that may or may not impact the management of grazing livestock within the Forest. For the purpose of this analysis, each alternative is evaluated using one or more of the key indicators to determine the overall impacts to livestock grazing within NFS land. Then, the impacts of each alternative are compared to the current conditions, also known as the existing baseline or no-action alternative, and then to the other alternatives.

The National Forest Management Act of 1976 requires the identification of the suitability of lands for resource management, including grazing. An analysis to determine lands capable of producing forage and suitable for grazing livestock was completed as part of the Flathead National Forest's forest plan revision. Although an area may be deemed capable and suitable for use by livestock in the forest plan, a project-level analysis evaluating the site-specific impacts of the grazing activity is required to authorize and dictate the management of livestock grazing in a specific allotment.

An analysis of acres by management area was used to quantify the impact. For example, if there are more acres available in a management area for livestock grazing under alternative B modified than the existing baseline or no-action alternative, then it is assumed that livestock grazing would benefit more under alternative B modified than under the no-action alternative.

For analysis purposes, when the degree of impact cannot be quantified, a qualitative assessment is prepared based on professional judgment and, when possible, in conjunction with available acreage data.

Assumptions

In all quantitative and qualitative analyses, the following assumptions are used to determine the degree of impacts on livestock grazing. These assumptions are based on previous assessments, professional judgment, and Forest Service range management directives.

- Livestock that use rangelands can remove plant material, trample soils, and alter water flow patterns. However, with proper management, these impacts are insignificant in comparison to the natural resilience of ecosystems (Holling, 1973). Therefore, for the purpose of this analysis, livestock grazing is not considered a surface-disturbing activity.
- Livestock grazing will be managed to meet specific standards and guidelines for rangeland health, including riparian standards and guidelines. In addition, range improvements will be used to meet standards and guidelines for rangeland health and to achieve rangeland management goals.
- Within the Flathead National Forest, the grazing system in each allotment will remain the same. Additionally, the animal unit months for each allotment is not expected to increase; it will remain at current levels.
- Impacts on livestock grazing are generally the result of activities that affect forage levels or the limiting of access to designated allotments such that livestock can no longer use rangelands.
- Mitigations for impacts to, or from, livestock for any resource will be addressed in a site-specific analysis.
- Grazing use is managed similarly under all alternatives.
- Grazing allotments will remain open as long as there continues to be demand. If a permittee is willing to vacate their allotment, the allotment could be closed and the permit could be terminated. The decision to close an allotment and terminate a permit may be based on the demand for permitted use and utilization of forage or the dedication of the land to another purpose.

Limitations

The livestock grazing analysis is limited to the active allotments within the Flathead National Forest. Livestock grazing outside existing allotments, including rangelands available to pack stock and transitory range, is included in the analysis; however, this is discussed as a qualitative assessment.

Information sources

Information sources include literature, records, documents and information from Forest Service range program assessments, and information from Forest Service range program managers.

Incomplete and unavailable information

The information sources used contained sufficient information to complete this analysis. Project-level analysis may require site-specific data to conduct an impact analysis.

Analysis area

The analysis area includes rangeland within active allotments on NFS lands on the Flathead National Forest (for an overview of grazing allotments within the Forest, see figure 1-69), specifically within the area designated as the grizzly bear primary conservation area and zone 1. For the purposes of the cumulative effects analysis, properties adjacent to the Forest are considered in respect to the associated

permit-holding ranch operations and potential impacts to open space. The temporal scope of the analysis is the anticipated life of the plan (15 years).

3.24.2 Affected environment (existing condition)

In 1986 there were 20 active allotments on the Flathead National Forest; however, over the past several years more than half have been vacated and closed. The decrease in allotments can be correlated to the decline in ranching in the Flathead Valley. With the decline in grazing, active allotments are administratively closed when they are no longer being used by the permittee. Permitted livestock numbers and seasons of use are often based on past actual and permitted use levels but are also based on the site conditions.

Commercial livestock are generally authorized through issuance of a term (i.e., 10-year) grazing permit. These permits include numerous requirements and conditions and describe the responsibilities of the permit holder. These terms and conditions are also incorporated into an allotment management plan. The allotment management plan establishes site-specific goals and objectives and provides management strategies to achieve them. These strategies may include levels of grazing use, seasons of use, rotations, and a schedule for implementing range-improvement projects such as fences and water developments. This plan also includes requirements for monitoring and inspections, payment of grazing fees, ownership of livestock and base property, livestock management, range improvement maintenance and construction, and other terms as appropriate. Once approved, the allotment management plan becomes a part of the permit.

As of 2014, the Flathead National Forest had seven active range allotments, which included two on the Tally Lake Ranger District and five on the Swan Lake Ranger District (table 167). All seven of the active grazing allotments are permitted for cattle grazing. There are no sheep allotments on the Flathead National Forest, nor are any sheep grazing permits anticipated to be issued in the future (C. N. Kendall, 2013). Each grazing allotment lies within one of the NCDE grizzly bear management zones (table 167). The seven active allotments consist of 72,540 acres and support 1,407 animal unit months (USDA, 2014d).

Table 167. 2014 Flathead National Forest range allotments and their respective locations within the NCDE grizzly bear management zones

Allotment name	Ranger District	Acres	Capable acres	Authorized animal unit months	Seasons of non-use 2006-2014	NCDE Grizzly Bear Management zone
Barber Creek	Swan Lake	7,864	5,635	206	4	Primary conservation area
Browns Meadow	Swan Lake	8,440	1,163	169	7[a]	Zone 1
Holland	Swan Lake	20,020	5,365	265	1	Primary conservation area
Island Meadows	Tally Lake	8,461	3,125	329	1	Zone 1
Kerr Mountain	Swan Lake	11,610	212	83	0	Zone 1
Lemonade Springs	Tally Lake	10,569	6,507	329	2	Zone 1
Piper Creek	Swan Lake	5,576	5,516	26	0	Primary conservation area

Allotment name	Ranger District	Acres	Capable acres	Authorized animal unit months	Seasons of non-use 2006-2014	NCDE Grizzly Bear Management zone
Swaney	Tally Lake	[18,254]	–	Vacant	3	Zone 1
Wild Bill	Swan Lake	[9,060]	–	Vacant	3	Zone 1
Total		72,540[c]	27,523	1,078[b]	–	–

a. This grazing permit was in non-use status for four consecutive years starting in 2011.

b. The permittee for Island Meadows and Lemonade Springs moves the cattle between these two allotments, so the acres not counted twice in the total.

c. Vacant allotment acres are not counted in the total. No grazing permit has been issued; awaiting NEPA decision to be closed.

Range management and the designated range allotments are administered by the District's resource assistants, with the forest range program manager providing program management and oversight. The resource assistants and the forest range program manager work with grazing permit holders to ensure that the range management goals and objectives of the allotment management plan are being met.

The current forest plan (USDA, 1986) contains specific desired conditions, objectives, standards, and guidelines that were developed for livestock grazing. The current plan also identifies approximately 485,000 non-wilderness acres that are considered potentially suitable for livestock grazing and a maximum transitory range that could support a maximum of 12,000 animal unit months (C. N. Kendall, 2013). Timber harvest areas create transitory range within an allotment that provides forage for livestock. As the forest grows back, the available range decreases. If adjustments are made to account for transitory range that is manageable and accessible, the Flathead National Forest could support roughly 4,120 animal unit months. The Forest currently permits 1,407 animal unit months (table 167).

The acres of capable rangeland identified in table 167 were determined through GIS analysis. Capable acres are those areas within an allotment with the capability to produce forage; they do not equal total allotment acres for several reasons. An allotment may only have a few acres of suitable grasslands within its borders, and the rest may be heavy forest or rock outcrops. Some allotments may contain small amounts of capable acres that were not identified in the GIS analysis, and grazing may occur in areas based on site-specific conditions.

In response to localized conditions, such as rehabilitation, drought, or predation, some allotments have sporadically been placed in non-use status, which results in actual grazing use being considerably lower than permitted use. In addition, certain circumstances may delay access to allotments (e.g., a prolonged winter), and as a result some grazing seasons are temporarily shortened; however, permitted animal unit months are not affected by these conditions or circumstances.

Livestock grazing tends to have the greatest impacts on the following areas (Kauffman & Krueger, 1984):

- low-gradient riparian and wetlands areas,
- fine-textured soils with a minimal amount of rocks, cobbles, or boulders,
- open canopy or low shrub vegetation types,
- areas with naturally available water (although there may be some avoidance of standing water areas),
- areas of concentration due to natural or human-created obstacles (e.g., narrow drainages), and
- alpine soils (the Forest does not have any allotments in areas with alpine soils).

The magnitude of impacts depends on the timing of use, the kind and class of livestock, the intensity, duration, and frequency of grazing, and the associated management practices, including the level of active permittee management and involvement.

Site-specific NEPA analysis for each allotment or set of allotments is completed during the allotment management planning process. The Flathead National Forest has revised allotment management plans as mandated by the 1995 Rescissions Act. Project-level allotment NEPA decisions were determined in consideration of the goals and objectives as well as the standards and guidelines of the 1986 forest plan, as amended.

In general, the grazing management program helps to ensure a reliable and consistent level of native rangeland forage for permitted commercial livestock production. This resource helps local ranches maintain an economical operation that, in turn, maintain open space adjacent to the Forest, which is integral to meeting desired resource conditions and maintaining the economic and social sustainability of local communities.

Resource indicator for permitted use

The Flathead National Forest has 72,540 acres within active grazing allotments (approximately 3 percent of the total acres managed by the Forest). Of the allotment acres, only 27,523 are capable acres (approximately 1 percent of the total acres managed by the Flathead National Forest). Capability is used to determine the suitability for grazing based on lands capable of producing forage. Of the seven active allotments within the Flathead National Forest, three active allotments are located within the primary conservation area, and the other four are located in zone 1 (table 167). As previously stated, there are no sheep grazing allotments within the Forest.

Resource indicator for suitability and utilization

Currently, 1,407 animal unit months are designated on all active grazing allotments of the Flathead National Forest (table 167). The majority of the animal unit months (910) are located within zone 1.

3.24.3 Environmental consequences

This section describes the effects of implementing the action alternatives on livestock grazing. The action alternatives are described in chapter 2. Effects are analyzed in relation to the no-action alternative (i.e., alternative A).

Acres available for livestock grazing and allotted animal unit months are the same under each alternative (the key indicators are ambient air quality and visibility, as follows:

- an alternative would be considered to have potentially significant impacts if its implementation would result in a national ambient air quality standards non-compliance violation as determined by the montana department of environmental quality.
- an alternative would be considered to have potentially significant impacts to visibility if its implementation would result in changes to or degradation of visual quality, views, and the aesthetic landscape.

the montana department of environmental quality has a network of air quality monitoring sites across the state. monitoring sites that are within the administrative boundaries of the flathead national forest and will be referenced in this analysis are the following:

- kalispell: flathead electric
- whitefish: dead end

lists these indicators for livestock grazing). Figure 1-69 provides a map of the grazing allotments. None of the action alternatives change the existing allotments, nor do they provide any specific direction regarding current allotments. The most significant environmental consequence on livestock grazing from any alternative is the effect it would have on the future availability of suitable livestock grazing acres and animal unit months. Within the grizzly bear primary conservation area, the action alternatives are the same. The action alternatives differ in grizzly bear management zone 1.

The standards and guidelines are designed to protect upland and riparian resources, manage noxious weeds, and manage grazing allotments in accordance with the draft NCDE Grizzly Bear Conservation Strategy (USFWS, 2013c) in all alternatives. Furthermore, there are resource mitigations and best management practices that are part of allotment plans that are designed to protect forest resources from potential disturbances from livestock grazing. These are site specific for each allotment and not part of this analysis. In conjunction with this analysis, a discussion of the social and economic impacts related to livestock grazing can be found in section 3.27.

Alternative A—No action

The existing forest plan, with permit- and/or contract-specific terms and conditions, is the current management being used by the Flathead National Forest to address livestock grazing. This direction represents the no-action alternative and is the baseline to which the action alternatives are compared. Thus, it is important to understand which actions would continue under the no-action alternative.

Management direction for alternative A—No action

Under the 1986 forest plan, the management of domestic livestock grazing allotments is consistent with management area direction and objectives. The plan considers the dependency of the ranching community on forage management and controls grazing to support tree regeneration and to maintain water quality and fisheries habitat when grazing occurs in riparian areas. Management direction related to noxious weeds is also provided (USDA, 1986).

Indirect effects of the no-action alternative

Under the no-action alternative, grazing management, as outlined in the “Affected environment” section, would continue. Additionally, allotment plans and associated protections for forest resources would also continue. Forage management would continue to provide the necessary animal unit months designated on grazing permits. The quantity and size of grazing allotments could change from the current condition. Additional grazing allotments could be added if they met the goals and guidelines of the existing management areas.

Impacts, known and unknown, to livestock grazing under the no-action alternative were considered in reference to the disturbance associated with continuing management and the proposed implementation of the draft Grizzly Bear Conservation Strategy. These impacts are summarized below.

Vegetation management

Under the no-action alternative, transitory range would increase in areas that experienced a timber harvest or other vegetation management action, thereby increasing the forage capacity of that allotment; however, these increases would be temporary and, as the forest overstory returns, the capable range would decrease in these areas. If additional grazing allotments are added it would increase the total grazed acreage.

Riparian and wetland management

Under the no-action alternative, livestock grazing within riparian areas would be controlled to maintain water quality and fisheries habitat. This is consistent with the draft Grizzly Bear Conservation Strategy in

that it maintains the desired species composition and ecological processes. Any additional measures to protect and mitigate impacts to riparian and wetland resources for individual grazing allotments would be addressed during site-specific evaluations prior to the issuance of the grazing permits.

Noxious and invasive species

Under the no-action alternative, management direction for noxious weeds and invasive species would continue as part of the process of issuing grazing permits and other vegetation management programs. Specific strategies would be evaluated for site-specific projects.

Management areas

Under the no-action alternative, management area direction related to livestock grazing must meet the goals established for each management area. Therefore, it is not anticipated that management area direction would impact livestock grazing because any grazing that would occur within a management area would be consistent with the management area direction.

Wildlife management

Under the no-action alternative, new grazing permits would be allowed if they met the management area objectives and if the ranching community needed to increase the number of allotments and animal unit months within grizzly bear habitat. Although there is no history of conflicts between grizzly bears and cattle on the Forest, increased cattle numbers could slightly increase the risk of conflicts in the future (see section 3.7.5 for more details).

Other resources

Impacts from the no-action alternative from other resources are similar to the other alternatives. Refer to the effects analysis sections for alternatives B modified, C, and D.

Action alternatives B modified, C, and D

For each resource area or activity described below, the environmental consequences to livestock grazing are compared by alternative, based on the key indicators of permitted use and forage determined by assessing suitability and utilization.

Effects of forestwide direction

Effects from vegetation management

Timber harvest and other vegetation management activities can provide transitory range that would be available for livestock and wildlife grazing. Transitional range forage capacity decreases over time as the forest overstory grows back and shades the grass understory. As the overstory returns, the transitional range is reduced to a level that does not provide enough grazing to be utilized. As timber is harvested, areas may open up to livestock that were not previously available, increasing capable acres. These newly accessible areas would be used as transitory range, as long as the acreage occurs within an existing allotment.

Timber harvest could also open up range that is inaccessible to livestock because of natural barriers. This could cause livestock control and management problems if the previously unharvested timber stands were used as natural barriers between allotments or other critical area. If this were to occur, additional range improvements would need to be installed to control livestock access.

To evaluate the impact of vegetation management activities on livestock grazing, the acres of land suitable for timber production is used to determine the acres that could be used as a transitory range. The

location of a timber harvest (or other vegetation management activity) would need to be within an existing allotment. In most cases, grazing allotments on the Forest overlap with the wildland-urban interface, where timber harvest is likely to continue to occur under all alternatives.

More acres would be suitable for timber production under the no-action alternative (alternative A) than under the action alternatives. Under alternative C, fewer acres would be suitable for timber production than under the other alternatives. This means that suitability and utilization for livestock grazing under the no-action alternative (alternative A) could result in the creation of more transitory range than the action alternatives. Alternative C has the lowest number of acres suitable for timber production and would have the lowest potential for the creation of transitory range, limiting potential suitability and utilization. The acres available for timber production are about the same under alternatives B modified and D, and therefore the potential for the creation of transitory range is the same.

Effects from roads and trails management

The primary impact to livestock grazing from roads and trails management is focused on the level of motorized access to and on an allotment. Generally, the greater ease and availability of motorized access into and throughout an allotment, the more efficient and cost effective it is to manage livestock and maintain structural improvements. Livestock are trailed or trucked to and from grazing allotments along roads, and permittees access cow camps using travelways.

Motorized recreational use on allotments can increase the difficulty of maintaining positive control of livestock (i.e., gates may be left open and livestock are inadvertently or purposely moved), which complicates allotment management and increases management costs. Structural range improvements generally receive less disturbance and vandalism when recreational vehicles are restricted to designated roads and trails; however, permit holders need more time to obtain prior authorization to travel off roads or on trails in their allotments. Motorized winter recreation has no effect on livestock because permitted grazing does not take place during the winter.

Evaluation of the impacts of road and trail management on livestock is based on a qualitative assessment that compares the action alternatives to the no-action alternative. Based on the qualitative assessment of the location of livestock allotments on the Forest, the impacts would similar under all action alternatives. Limitations on motorized access associated with alternative A could affect motorized access to and on the three active cattle-grazing allotments on about 33,460 acres of the primary conservation area, but the exact location of road restrictions and the magnitude of the effects is uncertain at the programmatic level.

Effects from fire management

Fires and fuel management can have very differing short-term and long-term effects on livestock grazing. Effects depend upon burning conditions and burn type because the results and timing of a wildfire are much less predictable than those from a controlled burn/prescribed fire.

Prescribed burning often results in an increase in forage production and availability and in a shrub community that is more compatible with a variety of wildlife species. A reduction in shrub density can accelerate the recycling of nutrients and make water more accessible across the landscape, such as in springs, seeps, and intermittent streams. This accessibility can have the effect of simplifying livestock management, improving livestock or wildlife distribution, and increasing available animal unit months. An effect often results from underburns in conifers or other types of burns that can increase forage production and accessibility. Thus, alternatives that use more prescribed fire would be expected to result in increases in the effects described above. Areas that are typically grazed may have use deferred for up to two growing seasons following a prescribed burn to allow for vegetative recovery. This “resting” requires that the permittee be flexible in management and involved in considerable advance planning and

coordination. If a prescribed fire does not take place on schedule, arrangements need to be made again in successive attempts, which can accrue additional costs to the ranchers and/or Forest Service.

A wildfire can have similar effects as prescribed fire but is likely to have unplanned adverse effects as well. Wildfire may result in the entirety of an allotment being burned, and livestock may have to be completely removed from an allotment or a permittee may be forced to move their livestock to other lands in their operation (e.g., private, State). Wildfire may remove trees and open forest understories to a flush of grass and forb production for many years. Similar to prescribed fire, this can have the effect of recycling nutrients and improving the quality and quantity of forage for livestock and wildlife. However, since the timing, location, and burn conditions are not controllable, wildfires are less likely to provide the same amount of positive effects as prescribed burns.

To evaluate the impact of fire management activities on livestock grazing, the projected acres of prescribed fire are used to identify the areas most likely to create more suitable forage. The location of prescribed fire treatments are not currently known, but they would need to be within an existing allotment for the fuel treatment to affect the amount of acres that could be considered suitable for livestock grazing.

Effects from wildlife management

Under all alternatives, there is a potential for grizzly bear-livestock conflicts to occur within grizzly bear habitat where livestock operations occur on Forest lands (see figure 1-69 for grazing allotments on the Forest). Many reported conflicts are associated with livestock operations, both with cattle and sheep (S. M. Wilson et al., 2005). There are no sheep allotments on the Flathead National Forest. There is no history of conflicts between grizzly bears and cattle on the Forest. Food storage orders are in place and would continue under all alternatives; these include requirements that reduce the risk of conflicts (e.g., the removal of boneyards, the quick removal of dead animals from grazing allotments). Food storage orders reduce the risk of cattle loss on existing allotments. Annual monitoring of livestock allotments is performed to check on conflicts and compliance with food storage orders. Additionally, the Forest Service coordinates and cooperates with State and other Federal agencies when bear-human conflict occurs.

Under alternatives B modified, C, and D, the Flathead National Forest would continue to allow cattle grazing in the seven active allotments, but there would be no increase in cattle allotments within the grizzly bear primary conservation area. There are three active cattle grazing allotments on about 33,460 acres in the primary conservation area. Although there is no history of conflicts between grizzly bears and cattle on the Forest, limits to cattle allotments could slightly reduce the risk of conflicts in the future (see section 3.7.5 for more details). Under alternative C, there would be the same limit on future cattle allotments in the primary conservation area as under alternatives B modified and D. In addition, alternative C has no increase in cattle allotments within zone 1. There are four active cattle grazing allotments on about 39,080 acres in zone 1. Rangeland management would continue to issue permits and manage allotments in accordance with the forest plan and allotment plans, so impacts on current grazing allotments would not occur.

Grazing livestock share habitat resources with other wildlife species besides grizzly bears. For example, grazing cattle use the same resources as big game species. Big game grazing and browsing is compatible with livestock grazing and browsing. There is a large dietary overlap (40 to 80 percent) between elk and cattle and a similar though smaller dietary overlap with deer (R. M. Hansen & Reid, 1975; Wallmo, Gill, Carpenter, & Reichert, 1973). Elk grazing patterns have been shown to be strongly influenced by livestock grazing because they seek areas of forage regrowth following grazing by livestock (Crane, Mosley, Brewer, Torstenson, & Tess, 2001). In certain cases, permit limitations may be placed on forage use by permitted livestock to ensure adequate forage for the wild ungulate populations, particularly on crucial winter range.

The evaluation of the effects that big game habitat management has on livestock grazing is based on a qualitative assessment that compares action alternatives to the no-action alternative. Based on the qualitative assessment, the effects would be similar under all the alternatives, including the no-action alternative. For all alternatives, including the no-action alternative, big game habitat management actions would not limit livestock forage. These impacts of big game habitat management would not affect permitted use, suitability, or utilization within the grazing allotments.

Effects from recreation management

Recreation management can alter livestock grazing in several ways. Achieving reasonably uniform livestock distribution across an allotment is one objective of livestock management because it allows the optimal use of available forage resources. Areas with campers, pet dogs, all-terrain vehicles, and other concentrated human activity are generally avoided by livestock. Concentrated or frequent recreational use along roads and near popular areas can cause livestock to avoid grazing or passing through an area and work directly against a permittee's attempts to distribute livestock evenly. People using camping or picnic sites on the Forest sometimes become concerned with livestock in and around their recreation sites. Cattle are occasionally shot by mistake or otherwise during hunting seasons or are struck and injured or killed by vehicles, resulting in a direct economic loss. Fences are a common solution but require installation and maintenance and can be costly. Fencing of roadways may result in a safer travelway for motorists and livestock but may also result in a loss of forage available to permitted livestock. Right-of-way fence can either disrupt planned grazing management or increase management flexibility by creating additional pastures. Higher levels of summer recreation could create increased levels of potential conflicts with livestock grazing. Alternatives that allow more areas of motorized access in grazing allotment areas may adversely impact livestock grazing the most. Winter recreation and motorized over-snow vehicle use would not impact livestock grazing because the permitted grazing season would not occur during the winter months.

The evaluation of the impact of recreation management activities on livestock grazing is based on a qualitative assessment that compares the action alternatives to the no-action alternative. Based on the qualitative assessment, effects are similar under all alternatives, including the no-action alternative. For all alternatives, allotment areas do not overlap with focused recreation areas (management area 7). Additional road closures may occur within the three allotments in the Swan Valley portion of the primary conservation area under all alternatives, which may reduce permittee access, but the exact locations are not predictable.

Effects from noxious and invasive species

Infestations of noxious weeds can significantly impact livestock grazing if they are extensive enough to reduce the amount of available forage. Once established, noxious weeds and other invasive plant species have the ability to outcompete native vegetation for nutrients and water. In addition to being undesirable forage, noxious and invasive species are usually less dense, resulting in more bare soil and a higher erosion potential, resulting in less water storage and more difficulty and expense in the reestablishment of native plant communities. Any ground-disturbing activity has the potential to expose a site to noxious and invasive plants, particularly when motor vehicles are involved. Likewise, established motorized access can make noxious and invasive plant treatment much easier and more cost effective. Even though grazing can be used as a noxious weed and invasive species control mechanism, the risk of spreading undesired species to other areas within the Forest remains unless there is mitigation such as cleaning livestock before and after they have been in an area known to be infested with undesired species.

The impact of noxious and invasive species management on livestock is evaluated based on a qualitative assessment that compares action alternatives to the no-action alternative. Impacts are similar between all alternatives, including the no-action alternative. The permitted use and suitability and utilization of

grazing allotments would not change among the alternatives. Under all alternatives, noxious and invasive species management actions would not limit livestock forage. However, access to areas may be temporarily closed for weed management activities. Also, mitigations such as livestock washing may be included in the grazing permit and allotment plan. These temporary closures may limit access to permittee allotments.

Effects from renewable and non-renewable energy and mineral resources management

Increased energy and mineral development can lead to increased road systems, travel, and potential for the introduction of noxious weeds to result in reduced localized forage for livestock grazing. To evaluate the impact of energy and minerals management activities on livestock grazing, surface occupancy is used to determine the areas most likely to experience potential conflicts with livestock use. Surface occupancy is defined in section 3.23 and is used because it determines the locations where impacts would be most likely to occur. Areas with no surface occupancy would not experience impacts. For impacts from energy and mineral resource activities to occur, a surface occupancy would have to occur within an existing allotment.

Under alternative C, no surface occupancy would occur in either the primary conservation area or in zone 1. Since all of the grazing allotments are located in the primary conservation area and zone 1, no surface occupancy would occur on the existing grazing allotments and no impacts from renewable and non-renewable energy and mineral resource management would occur.

Under the no-action alternative (alternative A) and alternatives B modified and D, surface occupancy could occur in portions of the primary conservation area and zone 1. Therefore, if the surface occupancy occurs inside an existing grazing allotment, then the impacts discussed may potentially occur and livestock may experience less available forage and suitability and utilization could be affected.

Overall, alternative C would have no adverse effect on livestock grazing because renewable and non-renewable energy and mineral resource impacts would not occur. The no-action alternative (alternative A) and alternatives B modified and D could potentially impact livestock grazing by limiting suitability and utilization, but the likelihood is low because the Flathead's minerals and oil and gas potential is low (see section 3.23 for more details).

Effects from riparian and wetland management

Management and protection of riparian and wetland resources are emphasized under all alternatives. The plan components for protecting riparian and wetland resources have some of the greatest influence on the ability of the Forest's grazing program to achieve desired conditions. Changes have been made in grazing management and practices to protect riparian and wetland resources, which are reflected in current resource conditions. Effects to riparian and wetland management would be similar under all alternatives.

The impact of riparian and wetland management on livestock is evaluated based on a qualitative assessment that compares alternatives to the no-action alternative. Impacts are similar under all alternatives, including the no-action alternative. The permitted use and the suitability and utilization of grazing allotments would not change under the alternatives because management direction for all alternatives would limit access to riparian or wetland areas when conditions in the permit are not met. Under all alternatives, including the no-action alternative, riparian and wetland management could limit permitted use of the allotment or livestock forage. Also, mitigation, such as the construction of fences to limit access, may be used as part of the grazing permit and allotment plan. These may limit a permittee's ability to access an allotment.

Effects from soil and watershed management

These effects would be similar to those discussed above in the riparian and wetland management section).

Effects from cultural resources management

Livestock can contribute to the deterioration of cultural resources through physical contact (e.g., hoof action, rubbing on structures) or by contributing organic matter to a site. They can remove or alter vegetation that serves to protect sites from erosion and make these resources more visible for unauthorized collection. In cases where the level of impact is determined to be unacceptable, the impacts can be mitigated with fencing or with changes in management (intensity or timing). If livestock are excluded from a site or forage use levels are reduced, total animal unit months on an allotment may be reduced, which limits a site's suitability and utilization. Impacts would be similar under all alternatives.

Effects of management area direction

Management area direction includes specific designations, such as administrative sites, experimental and demonstration forests, general forest, and roadless areas. These areas could be grazed to maintain the vegetative desired conditions. However, livestock grazing would only occur in these areas if the permit holder has the ability to access the area and if it occurs in a permitted allotment. The management area direction would have little to no impact on livestock grazing because of the established goals and regulations for each management area and the existing allotment plans within these management areas.

Effects from recommended wilderness

If recommended wilderness occurs within grazing allotments it could affect future management. In accordance with congressional grazing guidelines, livestock grazing "and activities and the necessary facilities to support a livestock grazing program, will be permitted to continue in National Forest wilderness areas, when such grazing was established prior to classification of an area as wilderness" (Washington Office Amendment 2300-90-2, Forest Service Manual 2323.2 pp. 19-26). There is to be "no curtailment of grazing permits or privileges in an area simply because it is designated wilderness. . . . Wilderness designation should not prevent the maintenance of existing fence or other livestock improvements, nor the construction and maintenance of new fences or improvements which are consistent with allotment management plans and/or which are necessary for the protection of the range."

There are no grazing allotments within recommended wilderness areas on the Forest (see figure 1-69 and section 3.15 for more details). Impacts to livestock grazing would not occur under any alternative.

Effects of geographic area direction

Livestock allotments occur in the Salish Mountains and Swan Valley geographic areas. Under alternatives B modified, C, and D, these geographic areas have transitory forage, so grazing would be available within active grazing allotments as long as grazing is compatible with other resources. Management direction would have no effect on existing livestock grazing because it does not limit permitted use within existing allotments, nor does it affect the suitability and utilization of forage. Therefore, under this direction no impacts to livestock grazing would be expected to occur.

Guideline GA-SV-GDL-04 for the Swan Valley geographic area states: "For efficient management of the grazing program, open and active cattle grazing allotments should be closed if the opportunity arises with a willing permittee." Grazing allotments that are inefficient to operate may decrease in this geographic area in the future as a result.

Climate change

Climate change affects vegetation, which in turn could affect livestock grazing. Although outside the control of the Forest, potential effects include, but are not limited to, changes in type, amount, and distribution of precipitation, which directly affects type, abundance, and distribution of vegetation. Lower-elevation grasslands and shrubland habitat are expected to become drier and habitat zones to shift upward in elevation (Finch, 2012). The result of these potential changes could be an increase in suitable cattle forage, thereby causing increased suitable forage for cattle grazing at higher elevations within an allotment.

Another consideration is related to the time frame of climate change. It is possible for climate change to impact resource use within a short time frame, which could change the suitability and utilization of forage. For example, there have been periods of increased summer temperature and decreased summer precipitation over a 15- to 20-year period, which would indicate that changes in the suitability and utilization of forage within a grazing allotment may occur within a planning period. This could cause beneficial or negative impacts to the permitted use of a grazing allotment for the suitability and utilization of a grazing allotment.

Though the impacts to grazing from climate change remains to be fully understood or experienced by permittees of the Flathead National Forest, the Forest Service has tools to adapt to unexpected conditions and annual and long-term changes in resource conditions through stocking adjustments and management practices. The impact to livestock grazing could include limited use of allotments and a shortfall of available forage until suitable pasture is available.

Cumulative effects

Spatial context for effects analysis

The spatial context for this analysis is limited to the existing active allotments within the Flathead National Forest. Additionally, the properties adjacent to the Flathead National Forest were considered in respect to the associated permit-holding ranch operations and potential impacts to open space.

Cumulative effects common to all alternatives

This discussion considers impacts from the historic livestock use of the Flathead National Forest from the current forest plan (approved in 1986) through the next planning period (15 years from today). The impacts from historic livestock grazing influences livestock management today. For example, areas that were once heavily grazed or improperly grazed are continuing to recover. Riparian areas altered by livestock use continue to recover. Fire suppression activities in the past have resulted in conifer encroachment in affected areas, which in turn can limit forage production and availability and affect livestock use and distribution patterns today.

Based on continuing and increasing public use, it is expected that the impact of recreational uses could increase as the population of local communities increases, and as more people nationwide continue to look for places to recreate. Vegetation management and the use of prescribed fire would likely increase to address vegetative health, fuel loads, and public safety. These trends could result in short-term expenses and long-term benefits to livestock grazing.

Livestock grazing is influenced by the multiple effects described throughout this analysis. These include effects that impact the allocation of forage resources between livestock and wildlife; predation and disease transmission; management adjustments to protect cultural resources; fisheries; threatened and endangered species; water quality; considerations necessary due to wildfire and prescribed fire management, and recreation. All of these factors add to the complexity and expense for the ranching

operations that are permitted to graze livestock on the Forest (Rimbey & Torell, 2011). Despite all these factors, continued demand and the need for livestock grazing is likely to remain at, or below, current levels. Livestock management is generally considered more difficult on NFS lands than on private lands for many of the reasons previously presented. In addition, the business of livestock management is subject to factors most often not under the control of livestock operators, such as tourism; land values, and potential subdivision of ranches; labor prices and availability; domestic and foreign demand for livestock products, markets and meat prices; Forest Service budgets and farm programs; fuel prices; predator control; social values; and federal policy.

Because of, and in many cases despite of, the effects and unpredictability described above, livestock grazing is expected to continue at, or below, the current permitted level into the future.

Economic, Social, and Cultural Environment

The following sections are grouped under this heading:

- cultural resources
- American Indian rights and interests
- social and economic environment

3.25 Cultural Resources

3.25.1 Introduction

Cultural resources are defined by the National Historic Preservation Act and by Forest Service Manual 2360, as an object or definite location of human activity, occupation, or use identifiable through field survey, historical documentation, or oral evidence. Cultural resources are prehistoric, historic, or archaeological sites, structures, places, or objects and traditional cultural properties.

Historic properties include cultural sites that reflect past use of the area, having value as defined by the National Register of Historic Places (also known as the "National Register") criteria for eligibility for their association with important events, association with important people in our history, distinctive historical or architectural style, and potential to provide information about the past. A property can be eligible under one or more of these criteria and is generally at least 50 years old.

The process of determining the eligibility of a site to the National Register includes identifying historic properties through field inventory, evaluating sites for potential inclusion in the National Register, and then selecting sites to formally nominate to the National Register. Through this process, current and potential impacts to eligible properties are identified and protection measures are designed and implemented.

Cultural resources include the entire spectrum of resources for which the Forest Service's heritage program is responsible, from artifacts to cultural landscapes, without regard to eligibility for listing in the National Register of Historic Places (Forest Service Manual 2360).

Regulatory framework

Laws and executive orders

National Historic Preservation Act of 1966 (Pub. L. 89-665, as amended, 91-423, 94-422, 94-458 and 96-515):

> **Section 101(a) (8)**: Gives the Secretary of the Interior the responsibility and authority to assess "significant threats" to properties included in, or eligible for inclusion in, the National Register in order to determine the kinds of properties that may be threatened; ascertain the causes of the threats; and develop and submit to the President and Congress recommendations for appropriate action.
>
> **Section 106**: Requires each agency to take into account the effects of its actions on historic properties prior to approving expenditure of Federal funds on an undertaking or prior to issuing any license. Furthermore, an agency must afford the State Historic Preservation Office, the Tribal Historic Preservation Office, and the Advisory Council on Historic Preservation (an independent

Federal agency created by the National Historic Preservation Act) an opportunity to comment on any of the agency's undertakings that could affect historic properties.

Section 110 (a)(2)(A): Directs Federal agencies to establish "a preservation program for the identification, evaluation, and nomination to the National Register of Historic Places, and protection of historic properties" to "ensure that such properties under the jurisdiction or control of the agency are identified, evaluated, and nominated to the National Register." This would require development of a schedule for the identification, evaluation, and nomination of unrecorded sites.

36 CFR § 800: Provides explicit direction for the identification of sites, the determination of project effects on sites, and requirements for consultation with the appropriate State Historic Preservation Office, any relevant Tribal Historic Preservation Office, and the Advisory Council on Historic Preservation, as well as how to develop agreements.

36 CFR § 79: Establishes standards, procedures, and guidelines to be followed by Federal agencies to preserve collections of prehistoric and historic material remains and associated records that are recovered in conjunction with Federal projects and programs under certain Federal statutes. This action should ensure that federally owned and administered collections of prehistoric and historic materials remains and associated records are deposited in repositories that have the capability to provide adequate long-term curatorial services.

36 CFR § 60: Sets forth basic procedures for evaluating and nominating sites to the National Register of Historic Places, procedures for the operations of state historic preservation officers, and minimum qualification standards for cultural resource professionals.

36 CFR § 219.24: Provides guidance for addressing cultural resources in forest plans. Forest planning shall provide for the identification, protection, interpretation, and management of significant cultural resources on NFS lands. Forest planning shall provide an overview of known data relevant to the history, ethnography, and prehistory of the area under consideration, including known cultural resource sites; identify areas requiring more intensive inventory; provide for evaluation and identification of appropriate sites for the National Register of Historic Places; establish measures for the protection of significant cultural resources from vandalism and other human depredation as well as natural destruction; identify the need for maintenance of historic sites in or eligible for inclusion in the National Register; and identify opportunities for interpretation of cultural resources for the education and enjoyment of the American public.

Executive Order 11593 of 1971 (Protection and Enhancement of the Cultural Environment): States that the Federal government will provide leadership in preserving, restoring, and maintaining the historic and cultural environment of the nation. Directs Federal agencies through Federal plans and programs to preserve cultural resources and contribute to the preservation and enhancement of non-federally owned sites, structures, and objects of historic, architectural, or archaeological significance. It orders Federal agencies to locate, inventory, and nominate to the National Register all properties under their control or jurisdiction that meet the criteria for nomination. It also directs Federal agencies to exercise caution during the interim period to ensure that cultural resources under their control are not inadvertently damaged, destroyed, or transferred.

Archaeological Resources Protection Act of 1979 (Pub. L. 96-95, section 2a, and 43 CFR § 7, Section 2a): The Congress finds:

- Archaeological resources on public lands and Indian lands are an accessible and irreplaceable part of the nation's heritage;
- These resources are increasingly endangered because of their commercial attractiveness;
- Existing federal laws do not provide adequate protection to prevent the loss and destruction of these archaeological resources and sites resulting from uncontrolled excavations and pillage; and
- There is a wealth of archaeological information that has been legally obtained by private individuals for noncommercial purposes and which could voluntarily be made available to professional archaeologists and institutions.

Section 470ii (c): States that "each federal land manager shall establish a program to increase public awareness of the significance of the archaeological resources located on public lands and Indian lands and the need to protect such resources." It further directs that an annual report of such progress will be submitted to Congress.

Section 470mm: Directs Federal agencies to

- develop plans for surveying lands under their control to determine the nature and extent of archaeological resources on those lands;
- prepare a schedule for surveying lands that are likely to contain the most scientifically valuable archaeological resources; and
- develop documents for the report of suspected violations of this act and establish when and how those documents are to be completed by officers, employees, and agents of their respective agencies.

Native American Graves Protection and Repatriation Act of 1990 (Pub. L. 101-601, 25 U.S.C. 3001-3013; 43 CFR § 10): Addresses the rights of lineal descendants and members of Indian tribes and Alaska Native and native Hawaiian organizations to certain human remains and precisely defined cultural items. It covers items currently in Federal repositories as well as future discoveries. The law requires Federal agencies and museums to provide an inventory and summary of human remains and associated funerary objects. The law also provides for criminal penalties for illegal trafficking in Native American human remains and cultural items.

Executive Order 13287 of 2000 (Preserve America): Reinforces the Federal government policy of "protection and enhancement of America's historic treasures, and to recognize and treat cultural resources as assets. Federal agencies shall advance this policy through the protection of, continued use of, and reinvestment in, the federal government's historic buildings and sites and by conforming to the highest standards of care for, and consideration of, the unique cultural heritage of communities, and of the Nation." Each agency is directed to (a) review its regulations, management policies, and general operating procedures for compliance with section 110 of the National Historic Preservation Act and (b) develop annual goals and measures as part of their compliance with the Government Performance and Results Act (Pub. L. 103-62) and report annually on the protection of historic and archeological properties within its care. The order also encourages the formation of partnerships with tribal, State, and local governments and the private sector to promote public understanding of the preservation and use of historic properties.

Executive Order 13007, 1996 (Indian Sacred Sites): Directs Federal agencies, to the extent practicable, to accommodate access to and ceremonial use of sacred sites by Indian religious practitioners while avoiding adversely affecting the sites and maintaining the confidentiality of the sites.

Key indicators

Ground disturbance is a key consideration when determining impacts to cultural resources because ground disturbance may totally or partially expose properties. Adverse impacts to cultural resources can be further exacerbated by interactions with fire, weather events, human actions, and environmental change. The key indicators used in the analysis are shown in table 168.

Table 168. Key indicators for cultural resources

Resource Indicator	Measure
Ground disturbance	Degree of activity or natural condition that poses a potential threat to cultural resources
Access to sacred sites	Degree of activity that changes access to sacred sites

Methodology and analysis process

Analysis methods used for historic properties include a review and synthesis of all pertinent literature, records, and documentation available on the history and prehistory of the Forest. This includes not only information available from a variety of generalized sources but also information resulting from Forest Service cultural resource inventories. Information on previously documented sites can be an indicator of the type, frequency, and location of sites likely to be found within the analysis area.

Information sources

Information sources include literature, records, and document review, information from Forest Service cultural resource inventories and overviews, and information from Forest Service archaeologists.

Incomplete and unavailable information

No Forest has been fully assessed for cultural resources; however, many acres have been inventoried. These inventories have generally occurred in areas where there have been management activities in association with vegetation and fuels treatment, recreation development, special uses, and engineering projects. Information is continuously updated in conjunction with completed surveys and ongoing research.

Analysis area

The geographic scope of the analysis for cultural resources is the NFS lands of the Flathead National Forest. This area represents the NFS lands where changes may occur from activities that result from the action alternatives. The temporal scope of the analysis is the anticipated life of the plan (15 years).

3.25.2 Affected environment (existing conditions)

The Flathead National Forest encompasses an area with a long and rich heritage. The earliest evidence of human occupation in the Flathead Valley is after the last ice age, about 10,000 years ago.

Members of the Salish, Pend d’Oreille, and Kootenai Tribes commonly used and permanently occupied this area. Many other American Indian groups, including the Blackfeet Tribe, traveled through and briefly used the Flathead Valley.

Western Montana received some of the earliest European explorers in the Northwest. Shortly after the explorers, fur traders arrived. David Thompson, a fur trader for the British Northwest Company, came to the Flathead Valley in 1809. Trappers and traders traveled along the Flathead River in the 1820s and 1830s. The first settlers arrived in the Flathead Valley in the 1850s. Most were former employees of the Hudson’s Bay Company and made their living raising cattle or sheep or trading with American Indians.

By the 1880s, the natural resources of the land were attracting settlers to the area to pursue farming, ranching, and logging. Many settlements were established in the Flathead Valley during this period. The construction of railroads around the turn of the century played an important role in the settlement and development of the Flathead Valley.

The newly formed Forest Service also played a major role in the history of the Flathead Valley. In the early 1900s, its responsibilities included building trail and road systems; overseeing timber harvesting, livestock grazing, and mining activities; and suppressing forest fires. The historic district at Spotted Bear and patrol cabins in the Bob Marshall and Great Bear Wildernesses are physical reminders of the long-term role of the Forest Service in the history of the area.

The Flathead National Forest has approximately 350 recorded cultural resources on NFS lands within its boundaries. Of these, the majority (approximately 275) are historic-period sites associated with historic Forest Service land management (lookouts, ranger stations, ranger cabins, and phone lines), early-20th-century Euro-American farming and mining, and historic logging. The remaining sites (approximately 75) are archaeological sites associated with Native American uses of the land; these include lithic scatters, travel routes, Indian scarred trees, and rock art.

Five historic properties—Hornet Lookout, the Flathead National Forest Backcountry Administrative Facilities Historic District, the South Fork Phone Line, the Wurtz homestead, and the Big Creek Ranger Station Historic District—are listed in the National Register of Historic Places. The Backcountry Administrative Facilities Historic District has 67 contributing buildings, sites, and objects. The South Fork Phone Line is 40 miles long and is the last of its kind in the nation. A small part of a much larger Blackfeet traditional cultural property, the Badger-Two Medicine, located on the Lewis and Clark National Forest overlaps onto the Flathead; this traditional cultural property is eligible for listing in the National Register. There is also an aboriginal trail network with more than 30 associated archaeological sites in the South Fork that has been identified by the Confederated Salish and Kootenai Tribes and has been determined eligible for listing in the National Register. An additional 75 heritage properties also have been determined eligible for listing. Additional information about the Flathead's cultural resources can be found in the Flathead assessment (USDA, 2014a).

3.25.3 Environmental consequences

Compliance with section 106 of the National Historic Preservation Act and 36 CFR § 800 regulations is required for Forest Service activities and is fulfilled by a process of identifying the presence of any known or potential cultural resources within the area of potential effect for each alternative through background research, consultation with the Montana State Historic Preservation Office and appropriate tribes, and an appropriate level of field investigation. When consultation is conducted, the magnitude of the undertaking, its likely effects, and any alternatives are taken into account as well as the views of the State Historic Preservation Office, the appropriate Tribal Historic Preservation Office, and other interested parties.

Each Forest is required to consult with Native American traditional religious leaders on any project having the potential to affect Native American cultural sites, including burial and ceremonial sites and practices. Consultation requirements would apply under all alternatives.

Effects to eligible historic properties can be either "no adverse" or "adverse."

- No adverse effects could include stabilizing a property by controlling erosion of an archaeological site, restoring and maintaining a historic building, or reducing the fuels around a historic property.

The appropriate treatment is designed and agreed upon through consultation conducted under section 106 of the National Historic Preservation Act.

- Adverse effects are impacts to the integrity of a property that destroy a portion of the property or the entire property. A direct adverse effect occurs during the activity itself, such as when a road is built through a historic property and the construction process destroys the site. Indirect adverse effects are side effects of the activity or occur after the activity is complete; an example is runoff from a road that eventually erodes a historic property adjacent to it. Adverse effects can be mitigated or avoided altogether through project design. These mitigation or avoidance measures are agreed to in consultation conducted under section 106 of the National Historic Preservation Act with the State Historic Preservation Office and the Advisory Council on Historic Preservation.

Effects to cultural resources may be caused by implementing the forest plan as well as by largely uncontrollable secondary effects, such as from public use, vandalism, or natural causes (e.g., wind and water erosion). Direct effects of the action alternatives include those activities that are conducted and controlled by the Forest Service or authorized by Forest Service permits, including timber and silvicultural management, prescribed fire, wildlife and fisheries management, road and trail construction, facilities construction and maintenance, recreational use and management, and special-use authorizations to third parties.

Alternative A—No action

The existing forest plan, with permit and/or contract-specific terms and conditions, is the current management being used by the Flathead National Forest to address cultural resources. This direction represents the no-action alternative and is the baseline to which the action alternatives are compared. Thus, it is important to understand what actions would continue under the no-action alternative.

Management direction

Under the 1986 forest plan, no identified historic special interest areas for cultural resources are afforded special protection or enhancement treatment. Additionally, the current forest plan does not define a management area specific to cultural resources. Current forestwide guidance requires identification, evaluation, nomination, protection, and interpretation of cultural resources. Coordination and consultation with the Montana State Office of Historic Preservation is also required. Sites eligible for listing in the National Register of Historic Places must be evaluated and formally nominated. Protection protocols and mitigation measures are used when cultural resources or sacred sites are inadvertently discovered during project activities. The Flathead National Forest’s heritage program addresses known and unknown cultural resources and properties and locations of historic significance via management direction in the current plan (USDA, 1986).

Indirect effects of the no-action alternative

Under the no-action alternative, identification, evaluation, nomination, protection, and interpretation of cultural resources would continue. Coordination and consultation with the State Office of Historic Preservation would continue. Sites eligible for listing in the National Register of Historic Places would continue to be evaluated and formally nominated to the Register. Protection protocols and mitigation measures would still be used if cultural resources are inadvertently discovered.

Impacts to known and unknown cultural resources and sacred sites under the no-action alternative were considered in reference to the disturbance associated with continuing management and the proposed implementation of the draft Grizzly Bear Conservation Strategy and are summarized below.

Motorized use and access

Under the no-action alternative, ground disturbance associated with reclaiming roads may result in the inadvertent discovery of and/or damage to cultural resources or sacred sites. Long-term unavailability of roads could also result in reduced ground disturbance from road use and less potential to encounter or damage cultural resources. Under the no-action alternative, amendment 19 requirements would result in about 518 miles of roads being closed and/or reclaimed (see section 3.12). Long-term unavailability of roads could also result in less convenient access to areas of cultural importance that were once easily accessible. Depending on site-specific circumstances, access could require nonmotorized travel methods, which might increase travel times by minutes (feet) to hours (miles) depending on the specific locality.

Cultural resource surveys and consultation requirements would still be required and implemented under the no-action alternative during project-level activities such as road decommissioning to identify, evaluate, and protect National Register-eligible cultural resources. No impacts to known cultural resources or sacred sites were identified.

Recreation

Ground disturbance may result from the use, maintenance, and construction of existing and new recreation developments. Cultural surveys and consultation requirements would still be required and implemented under the no-action alternative during project-level activities, such as road decommissioning, to identify, evaluate, and protect National Register-eligible cultural resources.

Alternatives B modified, C, and D

Management direction

The primary difference between the action alternatives, B modified, C, and D, and the no-action alternative, as currently implemented, is the addition of objectives that provide performance requirements for the completion of inventories, outreach and interpretive projects, and National Register nominations.

Indirect effects

The effects to cultural resources as a result of the action alternatives are determined and defined by survey and consultation requirements at the project level. However, to estimate effects prior to consultation, the action alternatives are contrasted to the no-action alternative to estimate whether the alternative would increase, decrease, or result in no change to the potential for adverse effects to cultural resources.

The Flathead National Forest's proposed management formalizes current practices, specifically, inventory, public outreach, and National Register nomination-related activities. These administrative activities would result in no change in the potential of on-the-ground effects to cultural resources on NFS lands.

Effects to cultural resources are indirect by virtue of other programs within the Flathead National Forest. These effects are summarized below.

Motorized use and access

Ground disturbance with management activities could result in inadvertent discovery of and potential damage to cultural resources or sacred sites. However, unlike the no-action alternative, additional ground disturbance to close and/or reclaim roads would not be required, which may reduce the potential for ground disturbance that results in inadvertent discovery of and damage to cultural resources. Regardless, protection protocols are still applicable under the action alternatives to mitigate impacts to cultural resources and sacred sites. The exact extent and magnitude of this impact is uncertain until site-specific

analysis is conducted. Maintaining temporal and spatial restrictions in access and/or motorized use may make certain sacred areas and cultural resources more difficult to access. Restrictions to access could also require nonmotorized travel methods, which may increase travel times depending on the specific locality.

Recreation

Ground disturbance may occur in conjunction with construction, use, and maintenance of new developed recreation sites and capacity, and cultural resources may be encountered in these areas. However, under the action alternatives, unlike the no-action alternative, the number of new developed recreation sites and capacity would be restricted to support the continued recovery of the NCDE grizzly bear population. (refer to section 3.10.3). This restriction may result in a reduction in potential effects to cultural resources from activities associated with new developed recreation sites. Regardless, if encountered, evaluation and protection protocols are still applicable under the action alternatives to mitigate impacts to National Register-eligible cultural resources and sacred sites.

Consequences to cultural resources from forest plan components associated with other resource programs or management activities

Effects from fire and fuels management, access and recreation, vegetation management, and non-native invasive plant management

Management actions conducted at the site-specific level that result in ground disturbance may have effects on cultural resources and sacred sites. Because these effects are identified, detailed, and disclosed during site-specific analysis, the Forest Service has the opportunity to determine appropriate mitigation, avoidance, and protection measures. Thus, the consequences to National Register-eligible cultural resources from actions associated with programs such as fire and fuels management, access and recreation, vegetation management, and non-native invasive plant management programs are estimated to be minimal and/or avoidable under all alternatives.

Cumulative effects

The effects that past activities have had on cultural resources are discussed in the "Affected environment" section and are reflected in the current condition. Therefore, past activities are not carried forward into the cumulative effects analysis.

When comparing the alternatives qualitatively, continuance of amendment 19 management is a distinctive feature of the no-action alternative for the Forest. For the action alternatives, plan components for grizzly bears in the Northern Continental Divide Ecosystem are being implemented. Bear management subunits within the primary conservation area and zone 1 would have motorized access restrictions. Motorized access restrictions may make it more difficult for Native Americans to access cultural resources or sacred sites within these bear management units (see section 3.12).

Effects determination

Changes to proposed management, outside of implementing plan components for grizzly bears in the Northern Continental Divide ecosystem, are administrative in nature and would have no adverse effects to cultural resources. Ground disturbance associated with implementing the forest plan might result in inadvertent discovery of and potential damage to cultural resources or sacred sites. Protection protocols are in place under all alternatives to mitigate impacts to inadvertent discoveries of cultural resources and sacred sites.

The action alternatives are anticipated to result in less potential for ground disturbance because of limitations on new developed recreation sites and capacity and temporary restrictions to access/motorized

use associated with certain roads and project activities in the primary conservation area and zone 1. However, temporary spatial and temporal restrictions may potentially adversely impact access to sites of cultural importance in the spring during grizzly bear emergence. Project-level evaluation, and consultation as applicable, would be required to determine the exact extent and magnitude of adverse effects.

3.26 American Indian Rights and Interests

3.26.1 Introduction

The Forest Service has obligations under the American Indian Religious Freedom Act of 1978 to protect and preserve for American Indians the inherent right of freedom to believe, express, and exercise the traditional religions of the American Indian (Pub. L. 95-442). Executive Order 13007 of 1996 further directs Federal agencies to accommodate access to, and ceremonial use of, Indian sacred sites by Indian religious practitioners and to avoid adversely affecting such sites. Consultation with recognized tribal governments is further defined and required by the Native American Graves Protection and Repatriation Act of 1990 (Pub. L. 101-106), the 1992 amendments to the National Historic Preservation Act, and the 1999 revisions to the implementing regulations in 36 CFR § 800; Protection of Historic Properties. These obligations are applicable to all management actions no matter where they occur on the Forest.

National Forest System lands on the Flathead National Forest provide sustenance to American Indians, protect tribal spiritual values, and help perpetuate traditional uses and benefits for tribes and other cultures. Native Americans associated with the plan area, existing tribal rights, and areas of known tribal importance are identified in this section. Existing information is used to assess the condition and trend of resources that affect tribal rights and areas of tribal importance. Information shared by tribes at formal meetings and with individuals in conversations provide a rich source of information on tribal perspectives, resource uses, topics of interest, and the unique relationships tribes have with Federal agencies.

Regulatory framework

Laws and executive orders

Hellgate Treaty of 1855: The Flathead, Kootenai, and Upper Pend d'Oreille Tribes have reserved rights under the Hellgate Treaty of 1855 (July 16, 1855). These rights include the "right of taking fish at all usual and accustomed places, in common with citizens of the Territory, and of erecting temporary buildings for curing; together with the privilege of hunting, gathering roots and berries, and pasturing their horses and cattle upon open and unclaimed land." The Federal government has trust responsibilities to tribes under a government-to-government relationship to ensure that the tribes' reserved rights are protected. Consultation with the tribes in the early phases of project planning helps the Forest Service meet its trust responsibilities.

National Historic Preservation Act of 1966 (Pub. L. 89-665, as amended, 91-423, 94-422, 94-458, and 96-515) and regulations 36 CFR § 800 and 36 CFR § 7: This act pertains only to tangible properties (buildings, structures, sites, or objects) that are important in history and prehistory. It requires agencies to consider the effects of undertakings on properties eligible to or listed in the National Register of Historic Places by following the regulatory process specified in 36 CFR § 800.

The portions of the act that relate specifically to coordination with Indian tribes were added in the 1992 amendments. These additions reflect the increased importance placed on tribal relations. A section of the act directs State and Federal governments to assist in the establishment of preservation programs on Indian lands. These sections include:

> Chapter 3, section 2: It shall be the policy of the federal government, in cooperation with other nations and in partnership with the state, local governments, Indian tribes, and private organizations and individuals to:

- (2) Provide leadership in the preservation of the prehistoric and historic resources of the United States and of the international community of nations and in the administration of the national preservation program.
- (6) Assist state and local governments, Indian tribes and Native Hawaiian organizations and the National Trust for Historic Preservation in the United States to expand and accelerate their historic preservation programs and activities.

National Environmental Policy Act of 1969 (Pub. L. 91-190) and regulations 40 CFR § 1500–1508: Federal agencies began to invite Indian tribes to participate in forest management projects and activities that may affect them.

National Forest Management Act of 1976 (Pub. L. 4-588): Directs consultation and coordination of NFS planning with Indian tribes.

American Indian Religious Freedom Act of 1978 (Pub. L. 95-341 as amended and Pub. L. 103-344): The Act states that "it shall be the policy of the United States to protect and preserve for American Indians their inherent right for freedom to believe, express, and exercise the traditional religions of the American Indian, Eskimo, Aleut, and Native Hawaiians, including but not limited to access to site, use and possession of sacred objects, and the freedom to worship through ceremonies and traditional rites." Agencies must make a good faith effort to understand how Indian religious practices may come into conflict with other forest uses and consider any adverse impacts on these practices in their decisionmaking practices. The consideration of intangible, religious, ceremonial, or traditional cultural values and concerns that cannot be tied to specific cultural sites/properties could be considered under the American Indian Religious Freedom Act.

Archaeological Resources Protection Act of 1979 (Pub. L. 96-95) and regulations 43 CFR § 7: Establishes a permit process for the management of cultural sites on Federal lands that provides for consultation with affected tribal governments.

Native American Graves Protection and Repatriation Act of 1990 (Pub. L. 101-601, 25 U.S.C. 3001-3013) and regulations 43 CFR § 10: Addresses the rights of lineal descendants and members of Indian tribes, Alaska Natives, and native Hawaiian organizations to certain human remains and precisely defined cultural items. It covers items currently in Federal repositories as well as future discoveries. The law requires Federal agencies and museums to provide an inventory and summary of human remains and associated funerary objects. The law also provides for criminal penalties in the illegal trafficking in Native American human remains and cultural items.

Interior Secretarial Order 3175 of 1993: Establishes the responsibility of all agencies to carry out the trust responsibilities of the Federal government and to assess the impacts of their actions on Indian trust resources. Requires consultation with tribes when impacts are identified.

Executive Order 12866 of 1993, Regulatory Planning and Review: Enhances planning and coordination with respect to both new and existing regulations. Makes process more accessible and open to the public. Agencies shall seek the views of tribal officials before imposing regulatory requirements that might affect them.

Religious Freedom Restoration Act of 1993 (Pub. L. 103-141): Establishes a higher standard for justifying government actions that may impact religious liberties.

Executive Order 12898 of 1994, Environmental Justice in Minority Populations and Low-Income Populations: Directs Federal agencies to focus on the human health and environmental conditions in

minority and low-income communities, especially in instances where decisions may adversely impact these populations.

Forest Service Tribal Relations Enhancement Act of 2006:

- Reburial of Human Remains and Cultural Items: The Native American Graves Protection and Repatriation Act provides for repatriation of human remains and cultural items to lineal descendants and Indian tribes but does not address further disposition of these items. This act explicitly authorizes the reburial of human remains and associated cultural items on NFS lands when they were originally recovered from NFS or adjacent lands.
- Confidentiality of Information: An increased level of confidentiality is authorized to protect information relating to reburials, sites, or resources of traditional or cultural importance, including human remains and information relating to traditional and cultural resources and practices provided in the course of research activities.
- Forest Products for Traditional and Cultural Purposes: American Indian and Alaska Native tribes have special cultural and traditional needs for forest products located on NFS lands, such as logs and planks for cultural structures. The act creates an exception to the National Forest Management Act requirement to sell certain forest products by authorizing the Secretary to provide these products free of charge when used for traditional and cultural purposes.
- Access to NFS lands: The act reinforces the Forest Service's commitment to the American Indian Religious Freedom Act for access to NFS lands.

Executive Order 13007 of 1996, Indian Sacred Sites: This order acknowledges the role of Federal agencies in protecting and preserving the religious practices and places of federally recognized tribes and enrolled tribal members. It also requires agencies to consult with federally recognized tribes to address tribal concerns regarding sacred sites on public land and to ensure access to religious places and avoidance of adverse effects to sacred sites in accordance with existing legislation.

Executive Order 13175 of 2000, Consultation and Coordination with Indian Tribal Governments: Provides direction for consultation with tribal governments for formulating or implementing policies that have tribal implications. Also provides direction regarding consultation and coordination with Indian tribes relative to fee waivers. Calls upon agencies to use a flexible policy with tribes in cases where proposed waivers are consistent with applicable Federal policy objectives. Directs agencies to grant waivers, in areas where the agency has the discretion to do so, when a tribal government makes a request. When a request is denied, the agency must respond to the tribe in writing with the rationale for denial.[9]

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[9] Section 2 of this executive order states:

> In formulating or implementing policies that have tribal implications, agencies shall be guided by the following fundamental principles:
>
> - The United States has a unique legal relationship with Indian tribal governments as set forth in the Constitution of the United States, treaties, statutes, Executive Orders, and court decisions. Since the formation of the Union, the United States has recognized Indian tribes as domestic dependent nations under its protection. The Federal Government has enacted numerous statutes and promulgated numerous regulations that establish and define a trust relationship with the United States.
> - Our Nation, under the law of the United States, in accordance with treaties, statutes, Executive Orders, and judicial decisions, has recognized the right of Indian tribes to self-government. As domestic dependent nations, Indian tribes exercise inherent sovereign powers over their members

Executive Order 13084 of 1998, Consultation and Coordination with Indian Tribal Governments: Calls upon agencies to utilize flexible policy approaches at the Indian tribal level in cases when a proposed waiver is consistent with applicable Federal policy objectives. The executive order calls upon agencies to grant waivers in areas where the agency has discretion to do so. This is to be done when a tribal government makes a request; and for those instances where the agency may decline such a request, a reason must be supplied to the tribe.

Code of Federal Regulations

36 CFR § 261 Prohibitions in Areas Designated by Order; Closure of National Forest System Lands to Protect Privacy of Tribal Activities (2011): Provides "regulations regarding special closures to provide for closure of National Forest System lands to protect the privacy of tribal activities for traditional and cultural purposes" and "to ensure access to NFS land, to the maximum extent practicable, by Indians and Indian tribes for traditional and cultural purposes."

36 CFR § 223.239 and 223.240 Sale and Disposal of National Forest System Timber, Special Forest Products, and Forest Botanical Products: Section 223.239 provides regulations for free use without a permit for members of tribes with treaty or other reserved rights related to special forest products. Also provides regulations for free use without a permit upon the request of the governing body of a tribe. Section 223.240 provides regulations regarding harvest of special forest products by tribes with treaty or other reserved rights.

Key indicator

The measurements indicator for American Indian rights and interests were identified and defined by tribes through consultation with the Forest Service on the proposed action (see USDA, 2015c). Consultation provides the opportunity for tribes to identify potential effects to tribal interests, including native knowledge, tribally affiliated cultural resources, sacred sites, treaty rights, and religious freedom.

Disturbance is a key consideration for effects, as ground disturbance may negatively impact sacred sites and areas. These impacts can be further exacerbated by interactions with fire, weather events, human actions, and environmental change. Access to sacred areas to exercise religious ceremonies and freedoms is another key consideration for effects. Management actions that change access could either beneficially or negatively impact the exercise of treaty rights and expression of religious freedom. Table 169 lists the key indicators that will be used to measure differences among the alternatives.

Table 169. Indicators used to measure differences among alternatives

Indicator	Measure
Disturbance	Degree of activity or natural condition that poses potential threat to sacred sites
Access	Degree of activity or condition that poses potential change to access to areas of Native American interest

and territory. The United States continues to work with Indian tribes on a government-to-government basis to address issues concerning Indian tribal self-government, tribal trust resources, and Indian treaty and other rights.

- The United States recognizes the right of Indian tribes to self-government and supports tribal sovereignty and self-determination.

Methodology and analysis process

Effects to tribal interests are known through direct tribal consultation between the Forest Service and affected tribes. At the programmatic level of a forest plan, consequences are discussed qualitatively.

Information sources

Land use management plans, heritage reports, and information from Forest Service heritage resource specialists who consult with tribal members directly are the primary sources of information used for the analysis.

Incomplete and unavailable information

The Forest Service is not aware of all sites and interests of tribal importance. The Forest Service relies on its relationship and consultation with tribes to be informed as to where and what interests may be impacted by Forest Service actions. The consultation process affords both tribes and the Forest Service opportunities to identify sites, interests, and values of tribal importance as well as to identify mitigations and avoidance and protective measures to preserve tribal interests.

Analysis area

The geographic scope of the analysis for American Indian rights and interests is the NFS lands of the Flathead National Forest. This area represents the NFS lands where changes may occur from activities that result from the action alternatives. The temporal scope of the analysis is the anticipated life of the plan (15 years).

3.26.2 Affected environment (existing condition)

The Flathead National Forest is the traditional homeland of the Kootenai and Salish peoples and, to a lesser extent, the Blackfeet people. The Confederated Salish and Kootenai Tribes of Montana, which includes the Kootenai, the Bitterroot Salish, and the Pend d'Oreille Salish peoples, have reserved treaty rights in the plan area under the Hellgate Treaty of 1855. The Blackfeet Tribe does not have reserved treaty rights in the plan area. However, the Blackfeet Tribe has expressed interest in Forest Service activities in the Challenge Creek area because of its proximity to the Badger-Two Medicine area of the Lewis and Clark National Forest, an area eligible for listing in the National Register as a traditional cultural property important to the Blackfeet people. The Flathead National Forest consults with the Blackfeet Tribe on all projects and undertakings that may affect resources of interest to the Blackfeet in the vicinity of the Badger-Two Medicine traditional cultural property. Additional information on this topic can be found in the Flathead National Forest assessment (USDA, 2014a).

The Confederated Salish and Kootenai Tribes manage the Tribal Mission Mountains Wilderness, which is adjacent to the federally designated Mission Mountains Wilderness on the Forest. The tribes offer the general public recreational use on some of the tribal lands (recreation permit required), but some tribal lands are reserved for tribal members only.

The Confederated Salish and Kootenai Tribes were contacted in the initial project planning stages to advise them of the scope of the undertaking, including its potential effects, and to make their resource concerns (if any) an official part of the planning record. The Flathead National Forest planning team also met with tribal resource staff to review and discuss the proposed action prior to its release and met with the tribe subsequently, including within the format of the interagency meetings. The Flathead National Forest is also in partnership with the tribes to cooperatively manage the heritage resources in and around Hungry Horse Reservoir.

Sacred sites important to federally recognized tribes are managed under Executive Order 13007 (1996), which defines Indian sacred sites as “any specific, discrete, narrowly delineated location on federal land that is identified by an Indian tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion; provided that the tribe or appropriately authoritative representative of an Indian religion has informed the agency of the existence of such a site.” Information about sacred sites is often carefully guarded, sometimes even among other tribal members, making their care and management by the Forest Service a challenge.

The Confederated Salish and Kootenai Tribes have expressed concerns regarding Forest activities in the North Fork of the Flathead in areas associated with traditional travel routes and camp locations and regarding the few graves, rock art sites, and caves located on NFS lands in the plan area.

3.26.3 Environmental consequences

The action alternatives represent programmatic decisions; therefore, they would have no direct effects on American Indian rights and interests. Potential effects would be considered indirect effects in that they would occur later in time and at the site-specific level.

Alternative A—No action

Management direction for alternative A—No action

Under the 1986 forest plan, forestwide guidance requires coordination with Native American tribes on rights and interests issues and concerns. Specific issues addressed via direction and consultation in the current plan include marked and unmarked burial sites, areas of sacred or religious significance, and the accuracy of portrayals of Native Americans in displays and interpretive sites.

Indirect effects of the no-action alternative

Effects to tribal interests, including native knowledge, tribally affiliated cultural resources, sacred sites, treaty rights, and religious freedom, are identified and defined by tribes through consultation. Under the no-action alternative, the Flathead National Forest would continue to meet its obligations to tribes via consultation requirements.

Ground disturbance in conjunction with management activities may occur in the analysis area, and sites of Native American interest may be encountered in these areas. However, consultation requirements are required and implemented under the no-action alternative to protect and mitigate impacts to Native American sites within these areas.

Access and motorized use

Under the no-action alternative and the requirement to meet amendment 19 plan direction (USDA, 1995a) (see section 3.12), ground-disturbing activities needed to close and reclaim roads could have a potential impact on Native American interests. Ground disturbance in conjunction with road management, maintenance, and/or closure activities and public use of roads may occur, and Native American sites may be encountered. However, consultation requirements are required and implemented under the no-action alternative as needed to protect and mitigate impacts to Native American sites and access to these sites. Access to NFS lands under amendment 19 plan direction could make some areas that were previously accessible by motorized transport to Native Americans more difficult to reach as road closures could require nonmotorized use, which may increase travel time by minutes (feet) to hours (miles), depending on the specific locality. Details of site-specific effects would be disclosed and discussed during consultation.

Recreation

Ground disturbance may occur in conjunction with recreational use and facilities, and Native American sites may be encountered in these areas due to these activities. However, consultation requirements are required and implemented under the no-action alternative to protect and mitigate impacts to Native American sites if encountered.

Alternatives B modified, C, and D

Management direction

In addition to management direction to provide for grizzly bear habitat, the action alternatives B modified, C, and D include management direction specific to the Forest Service's heritage program. With regard to the latter, the action alternatives' plan components expand upon the current protections in place for areas of tribal importance, using more specific and detailed language than the language used in the Forest's 1986 forest plan.

Effects of forestwide, management area, and geographic area direction

The effects to tribal interests as a result of the action alternatives are determined and defined by the tribes and disclosed by the tribes to the Forest Service during consultation. To estimate effects prior to consultation, the action alternatives are contrasted to the no-action alternative to see if the alternative increases, decreases, or results in no change to the potential for adverse effects to American Indian rights and interests.

The difference between the action alternatives and the no-action alternative, as currently implemented, is the extent of road reclamation anticipated under amendment 19 plan direction as well as the addition of specific objectives to establish a tribal consultation protocol and complete formal management plans. The action alternatives also use more detailed language to articulate protections already afforded to the tribes under the no-action alternative.

Thus, the action alternatives have the potential to have less ground-disturbing activity due to less road reclamation needed, but they do propose additional administrative activities, a consultation protocol, and formalized management plans. It is anticipated that administrative activities that focus on improving communications and planning activities between the tribes and the Forest Service would result in a decrease in the potential for adverse effects to tribal interests.

The action alternatives are anticipated to impact Native American rights and interests associated primarily with access, motorized use, and recreation. The effects of the no-action alternative are presented in the context of these resources and uses for comparison to the action alternatives.

The risk of ground disturbance in conjunction with management activities proposed under the action alternatives for the Forest may still be present, and it may be in areas with Native American interests on NFS lands. However, consultation requirements would still be required and implemented under the action alternatives to protect and mitigate impacts to these interests.

Access and motorized use

All alternatives would support the continued recovery of the NCDE grizzly bear population. For example, all alternatives would retain levels of open or total road densities and secure core that have supported grizzly bear recovery on the Flathead National Forest. Alternatives differ in the range of future actions that could occur. The action alternatives would maintain baseline motorized access levels (see "baseline" in glossary). In contrast to the no-action alternative, these restrictions are expected to result in less ground disturbance and less potential for impacts to physical sites of Native American interest. However,

restrictions to public use of roads might make certain areas temporarily more difficult to reach and require nonmotorized travel methods, which might increase travel times.

Recreation

Ground disturbance may still occur in conjunction with developed recreational use and sites; Native American sites may still be encountered in these areas due to such activities. These restrictions may decrease the potential for impacts to American Indian rights and interests over the no-action alternative. Consultation requirements would be required and implemented under all action alternatives to identify, protect, and mitigate impacts to Native American sites and interests.

Forestwide plan components for access and recreation have similar effects on Native American interests. The allocation of management areas varies by alternative and may affect the type of recreation and access on specific areas of the Forest. Areas allocated to designated or recommended wilderness allocations may have less ground-disturbance impacts but decreased motorized or mechanized transport access to the Forest.

Effects of forestwide, management area, and geographic area direction

The effects to tribal interests are often defined by the tribes and brought to Forest Service awareness during consultation. Current management direction and requirements for consultation have been designed to ensure that areas on NFS lands important to Native Americans are not inadvertently impacted by the Forest Service.

Consequences to American Indian rights and interests from forest plan components associated with other resource programs or management activities

Effects from fire and fuels management, access and recreation, vegetation management, and non-native invasive plant management

Management actions conducted at the site-specific level that result in ground disturbance have the potential for effects to American Native sites and interests. Because these effects are identified, detailed, and disclosed by tribes during consultation, the Forest Service and tribes have the opportunity to work together to determine appropriate mitigation, avoidance, and protection measures. Thus, the consequences to American Indian rights and interests from actions associated with fire and fuels management, access and recreation, vegetation management, and non-native invasive plant management programs are estimated to be minimal and avoidable through consultation under all alternatives.

Cumulative effects

The effects that past activities have had on American Indian rights and interests were discussed in the “Affected environment” section and are reflected in the current condition. Therefore, past activities are not carried forward into the cumulative effects analysis.

The action alternatives represent no direct change to current management of American rights and interests, outside of the addition of a consultation protocol and formalized management plans. Because these are administrative, documentation-related activities, there are no cumulative effects.

3.27 Social and Economic Environment

3.27.1 Introduction

The mission of the Forest Service is to sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations. Flathead National Forest lands both influence and are influenced by local and national publics. Local communities, particularly those adjacent to NFS lands, benefit from a multitude of goods and services provided by the Forest and the Forest Service. These social benefits are often referred to as ecosystem services, which are defined "as goods and services provided wholly or in part by ecosystems and that are of value to people" (Olander et al., 2015, p. 1). The Forest's ecosystem services, alongside infrastructure and operations, are the main ways that public lands contribute to social and economic sustainability. Many local communities were formed based on the availability of roads and ecosystem goods and services such as timber, gold, silver, grazing lands, and other natural resources. Historically, individuals in these communities have benefited from a host of services such as recreation, scenery, employment, and opportunities to connect with nature. The general public across the United States also benefits from the Forest. The benefits include clean air, clean water, conservation of forests, and habitat for aquatic species, wildlife, and threatened or endangered species.

The 2012 planning rule states that plans are to guide management so that forests and grasslands contribute to social and economic sustainability, providing people and communities with ecosystem services and multiple uses that provide a range of social, economic, and ecological benefits for the present and into the future. Specifically, plan components must include standards or guidelines to guide the plan area's contribution to social and economic sustainability, taking into account ecosystem services as well as multiple uses that contribute to local, regional, and national economies and communities in a sustainable manner. Furthermore, reasonably foreseeable risks to social benefits shall be considered when developing the forest plan.

The Forest Service manages NFS lands according to the principle of multiple use. This principle allows the agency to manage land for a variety of uses, including amenity, commodity, non-commodity, and recreation. The Multiple-Use Sustained-Yield Act (Pub. L. 104–333) formalized this management philosophy, stating that the Forest Service is to manage resources to best meet the needs of the American public, with flexibility to provide for "periodic adjustments in use to conform to changing needs and conditions" (Section 4(a) of the Act [16 U.S.C. 531]). For instance, areas suitable for timber production may contribute to the local economy by sustaining timber sector jobs and income, thereby maintaining the social fabric and lifestyles of the community. Wilderness areas also generate significant social and economic well-being by providing world-class recreational settings. Visitors from near and far may benefit from experiencing solitude in these pristine locations while contributing to the regional economy (i.e., the travel- and tourism-related sectors) in terms of jobs, income, and other economic activities.

This section (1) describes the social and economic conditions of the affected environment using key indicators of social and economic sustainability; (2) describes how key benefits of the Forest currently contribute to the social and economic sustainability of beneficiaries, both locally and at a broader scale; and (3) evaluates the impacts of the alternatives B modified, C, and D on the benefits the Forest provides to local residents and the general public.

Regulatory framework

The following is a select set of statutory authorities that govern the evaluation of social and economic resources in the plan area. Many other laws and regulations and policies not listed below also guide the management of these resources.

Laws and executive orders

National Forest Revenue Act (amended 1908): This act requires 25 percent of revenues generated by NFS lands to be paid to the States for use by the counties in which the lands are situated for the benefit of public schools and roads.

Multiple-Use Sustained-Yield Act of 1960: This act identifies principles for managing the resources of the NFS. The direction to manage these resources for the greatest good over time includes the use of economic and social analysis to determine management of the NFS.

National Environmental Policy Act of 1969: This act mandates consideration of the consequences to the quality of the human environment from proposed management actions. The agency must examine the potential impacts to physical and biological resources as well as potential socioeconomic impacts (40 CFR § 1508.14).

Forest and Rangeland Renewable Resources Planning Act of 1974: As amended by the National Forest Management Act of 1976, this act requires consideration of potential economic consequences of land management planning.

Office of Management and Budget Circular A-116 (issued August 16, 1978): This act requires executive branch agencies to conduct long-range planning and impact analysis associated with major initiatives.

Executive Order No. 12898 on Environmental Justice (issued February 11, 1994): This act mandates Federal agencies to make achieving environmental justice part of their mission. This includes identification of and response to disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations.

Secure Rural Schools and Community Self-Determination Act of 2000: This act is designed to stabilize annual payments to States and counties containing NFS lands and public domain lands managed by the Bureau of Land Management. Funds distributed under the provisions of this act are for the benefit of public schools, roads, and related purposes.

Regulations

36 CFR § 219, National Forest System Land Management Planning Rule of 2012: Forest plans are to guide management so that forests and grasslands are ecologically sustainable and contribute to social and economic sustainability. The 2012 planning process leads to plans that contribute to ecological, social, and economic sustainability by protecting resources on the national forests to maintain a flow of goods and services from NFS lands over time.

> 36 CFR § 219.19 Ecological, Social, and economic Sustainability: The Forest Service is directed to “contribute to ecological, social, and economic sustainability by ensuring that all plans will be responsive and can adapt to issues such as the challenges of climate change; the need for forest restoration and conservation, watershed protection, and species conservation; and the sustainable use of public lands to support vibrant communities.”
>
> 36 CFR § 219.8 Sustainability: The forest plan must provide for social, economic, and ecological sustainability within Forest Service authority and consistent with the inherent capability of the plan area, as follows:

(b) Social and economic sustainability. The plan must include plan components, including standards or guidelines, to guide the plan area's contribution to social and economic sustainability, taking into account

1) Social, cultural, and economic conditions relevant to the area influenced by the plan;
2) Sustainable recreation; including recreation settings, opportunities, and access; and scenic character;
3) Multiple uses that contribute to local, regional, and national economies in a sustainable manner;
4) Ecosystem services;
5) Cultural resources and uses; and
6) Opportunities to connect people with nature.

36 CFR § 219.10 Multiple Use: the plan must include plan components for integrated resource management to provide ecosystem services and multiple uses in the plan area. Reasonably foreseeable risks to ecological, social, and economic sustainability should be considered (a)(7).

The term "social sustainability" refers to the capability of society to support the network of relationships, traditions, culture, and activities that connect people to the land and to one another and support vibrant communities. "Economic sustainability" refers to the capability of society to produce and consume or otherwise benefit from goods and services, including contributions to jobs and market and nonmarket benefits.

Key indicators

The social and economic benefits of the Forest are measured by identifying how ecosystem services, operations, infrastructure, and multiple uses contribute, either directly or indirectly, to economic and social sustainability. Specifically, ecosystem services are those social benefits the Forest provides, including both goods and services, that are of value to people. Infrastructure and operations benefits include both physical structures, such as facilities, as well as all the services the Forest staff provide, such as fire suppression.

The social and economic benefits identified in the Flathead National Forest assessment (USDA, 2014a) are listed in table 170. Each benefit is categorized by the type of contribution it makes to social and economic sustainability. These contributions are divided into three main categories: income, jobs, and quality of life. Quality of life is subdivided into three subcategories: well-being, health and safety, and traditional, cultural, and spiritual values. These categories are not mutually exclusive. Some indicators fall under more than one category. For example, outdoor recreation contributes to income, jobs, and quality of life.

Table 170. Contribution of the Flathead National Forest to social and economic sustainability

Key Forest Benefit to Society	Income	Jobs	Well-Being	Health and Safety	Traditional, Cultural, and Spiritual Values
Water quality and quantity				X	
Clean air—particulate matter/haze				X	

Key Forest Benefit to Society	Income	Jobs	Well-Being	Health and Safety	Traditional, Cultural, and Spiritual Values
Inspiration—spiritual values and solitude					X
Cultural and heritage values					X
Carbon sequestration and climate regulation				X	
Flood control				X	
Forest products, vegetation management, and forage	X	X			X
Outdoor recreation	X	X	X	X	X
Scenery	X		X	X	X
Fish and wildlife	X	X			X
Research and education			X	X	X
Other income and jobs (payment in lieu of taxes, indirect and induced income and jobs)	X	X	X		
Direct income and jobs (Forest Service employees and contractors)	X	X		X	
Fire suppression	X	X		X	

Economic and social sustainability

Numerous approaches exist for measuring society's condition or progress towards achieving social and economic sustainability. In the forest planning context, a broad ecosystem services framework, which catalogues the social benefits of national forests, is an ideal framework for identifying how the plan area contributes to social and economic sustainability.

Ecosystem services indicators

Key ecosystem services were identified in the Flathead National Forest assessment. Most of these services, and their corresponding indicators, are described in greater detail in the appropriate resource sections. Note that some key ecosystem services are listed separately in the following section on multiple-use indicators. The following are key ecosystem services identified in the assessment:

- Water quality and quantity
- Clean air—particulate matter, scenic quality/haze
- Inspiration—spiritual values and solitude
- Cultural/heritage values
- Carbon sequestration and climate regulation
- Flood control

Multiple-use indicators

Key multiple uses are included in detail in the given resource chapter. Below is the list of key multiple uses. For more detailed description of each use, please refer to the relevant resource chapter. The following represent key multiple uses:

- Forest products/vegetation management/grazing (for details, see sections 3.3, 3.21, and 3.24)
- Outdoor recreation (for details, see section 3.10)

- Scenery (for details, see section 3.11)
- Fish and wildlife (for details, see sections 3.2 and 3.7).

Operations and Infrastructure

The Forest Service staff, management, and infrastructure also contribute to social and economic sustainability. Key infrastructure and operations contributions are as follows:

- Direct income and jobs (Forest Service employees, contractors, etc.)
- Other income and jobs (payments in lieu of taxes, indirect income and jobs, induced income and jobs)
- Research/education (for details, see sections 3.10 and 3.20)
- Fire suppression (for details, see section 3.8).

Methodology, analysis process, and information sources

To analyze the impacts of the alternatives on contributions to social and economic sustainability, the key benefits provided by the plan area were first identified. The "Affected environment" section describes the condition of income, jobs, and quality of life of local beneficiaries. Then, the social benefits the Forest provides that contribute to the income, jobs, and/or quality of life of local beneficiaries and the general public are described. Some indicators are easier to quantify than others. Jobs and income data are provided when available.

Less quantifiable measures of quality of life, such as well-being or cultural values, are discussed qualitatively. Information provided in the section on the affected environment is drawn mainly from part 2 of the Flathead assessment (USDA, 2014a). The assessment documented various data sources, methodologies, and modeling assumptions used throughout this analysis, such as sources of socioeconomic data (p. 3) and the economic contribution input-output model (p. 82).

Social benefits of the Forest are used and/or valued differently by different groups and communities. To get a clearer understanding of which services are most valued by beneficiaries and contribute most to social and economic sustainability, the Flathead National Forest assessment provided an in-depth study of social and economic conditions and local community values and beliefs. In the "Affected environment" section, the information collected on social, cultural, and economic conditions is synthesized to identify the key social benefits the Forest provides to beneficiaries.

Analysis area

The land administered by the Forest is spread among six counties in Montana: Flathead, Lake, Lewis and Clark, Lincoln, Missoula, and Powell. After a detailed look at commuting patterns, timber processing areas, and recreational visitation, it was determined that the area of influence (the analysis area) for the social and economic analysis would consist of four counties in northwestern Montana that are adjacent to, or in the immediate vicinity of the Flathead National Forest: Flathead, Lake, Lincoln, and Sanders. See section 3.27.2, subsection "Local beneficiaries," for a discussion of the analysis area.

Notable changes between draft and final EIS

Economic data and the economic impacts analysis in the "Environmental consequences" section were refined between the draft EIS and the final EIS. In the final EIS, IMPLAN and Forest Service input data were replaced with more current (2015) data. Corrections to the economic model were also made between the draft EIS and the final EIS to address two errors that influenced model output presented in the draft

EIS. First, a typo in a proportion in the model led to overstated impacts from household spending. Second, a multiplier error was identified to have had a similar influence, overstating impacts from industries related to multiple use. Model outputs in the final EIS provide a more accurate estimate of the economic contributions from management of the Flathead National Forest under the various alternatives.

3.27.2 Affected environment (existing condition)

Introduction

Different segments of the public have different connections to the land as well as different interests, cultures, and values. Communities characterized in terms of geographical boundaries are placed-based (people who live, work, or play in the same general locality), whereas communities characterized according to shared interest, passion, culture, and values transcend geography and can be regarded as "communities of interests."

The distinction between place and interest is not mutually exclusive. In fact, many communities share location and values, beliefs, and attitudes (because community members choose to live near like-minded people or because of the historical development of natural resource-dependent communities. At the same time, it is equally plausible that people with different or opposing viewpoints reside in the same locality. Considering the overlapping values of different communities, this analysis does not try to parse out individual communities but rather takes a more holistic approach by examining the social benefits the Forest provides to all types of beneficiaries.

Beneficiaries are those who derive specific, local, placed-based benefits from the Forest such as employment, income, scenic views, or connection to scared sites, as well as those who benefit from the Forest more broadly, such as those who value the grizzly bear and benefit from the Forest's ability to provide safe habitat for the grizzly bear.

Beneficiaries are those in the local communities as well as those in other counties, States, and nations. For example, residents of Missoula County benefit from recreation services on the Forest and are therefore taken into consideration as beneficiaries of recreation. Similarly, national and international beneficiaries are included as recipients of the social benefits of carbon sequestration and climate regulation.

Uses, products, services, and visitor opportunities supported by national forests produce a steady flow of benefits that contribute to the social and economic sustainability of both Forest-dependent communities and the general public. This framework of social benefits provides unique opportunities to explore the linkages between people and the Flathead National Forest that may transcend geographically defined communities.

Local beneficiaries

Although beneficiaries exist in many counties and even countries, this section describes in more detail the social, cultural, and economic conditions of the geographic areas most closely tied to, and impacted by, the Forest. The land administered by the Forest is spread among six counties in Montana: Flathead, Lake, Lewis and Clark, Lincoln, Missoula, and Powell.

After a detailed look at commuting patterns, timber processing areas, and recreational visitation, it was determined that the area of influence (hereinafter called the analysis area) for the social and economic analysis would consist of four counties in northwestern Montana that are adjacent to or in the immediate vicinity of the Flathead National Forest: Flathead, Lake, Lincoln, and Sanders. Although recreation ties suggest the inclusion of Glacier County, the extremely light commuting from Glacier County to the other affected counties led to its exclusion from the analysis area. Lincoln County, on the other hand, is

included due to both substantial commuting across county lines and also some timber processing of Forest timber products in Lincoln County. Sanders and Lake Counties were included because of commuting, trade, and travel corridors across these counties that connect with corridors in Flathead County. Even though Missoula County does process timber harvested from the Forest and does contain Flathead National Forest land, it was not included in the impact area because it is a metropolitan statistical area, unlike Flathead County, and the size of its economy would tend to mask the impacts on the other affected counties. Lewis and Clark and Powell Counties were not included due to the light commuting from these counties and the weak economic ties to the rest of the counties in the analysis area. The geographical relationship of the Forest to the analysis area counties is shown in figure 71.

Demographic information on local beneficiaries provides insight into the social and economic conditions of the affected environment. It also provides a backdrop for understanding how different members of society may be benefitting from the Forest and which services they value most. The data below provide insight into the beneficiaries of the Forest. Beneficiaries are heterogeneous, ranging in age, income, race/ethnicity, educational attainment, employment rate, industry, health, cultural values, priorities, and spiritual beliefs.

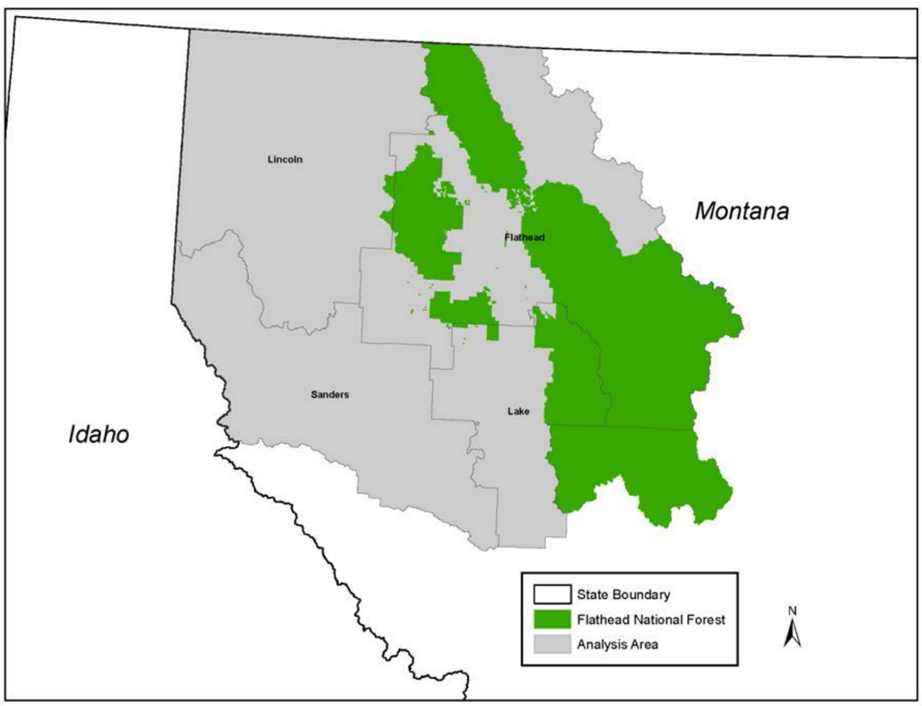


Figure 71. Counties in the social and economic analysis area

The largest county by land area is Flathead County, at 5,088 square miles. The smallest is Lake County, at 1,490 square miles. The majority (71 percent) of the Forest is within Flathead County, which has more than 1.7 million acres of the Flathead National Forest. Although a small fraction of the forested land in Flathead County is administered by the Kootenai National Forest, the bulk of the forested lands is administered by the Flathead National Forest. Lincoln County also has a substantial amount of NFS land; however, the majority of that land is administered by the Kootenai National Forest. Larger towns in Flathead County include Kalispell, Columbia Falls, Bigfork, Whitefish, and other smaller towns and census-designated places. Lake County includes the communities of Polson, St. Ignatius, and Pablo.

Sanders County includes Thompson Falls, Noxon, and Trout Creek. Lincoln County includes Libby, Troy, and Eureka.

Population demographics

From 1990 to 2011, the four-county analysis area had a 90 percent increase in population—from 79,485 to 151,254 people. In comparison, the overall United States population increased by 53 percent during the same period. In the more recent period of 2000 to 2011, the analysis area's population grew by 16 percent, and 79 percent of that increase came from migration into the area. People are choosing to move into the four-county area. According to the U.S. Department of Commerce, Flathead County has the largest population of the four counties (91,301 in 2011) and witnessed the largest positive annual net migration between 2000 and 2012 (Headwaters Economics). Looking at the population change by census tract, it is clear that Flathead County has experienced the most significant growth in the past decade (see figure 72).

The recent sustained population growth in the analysis area has been placing a considerable financial burden on government entities, which are struggling to provide the necessary infrastructure and emergency services for the influx of new residents as well as to maintain and upgrade current facilities (LCCDC, 2012; MWED-FCEDA, 2012). In addition, the population growth occurring in the four counties increases the residential density along the edge of the Forest, which has consequences on riparian and environmentally sensitive areas, use of recreational facilities, fire suppression, and Forest management in general.

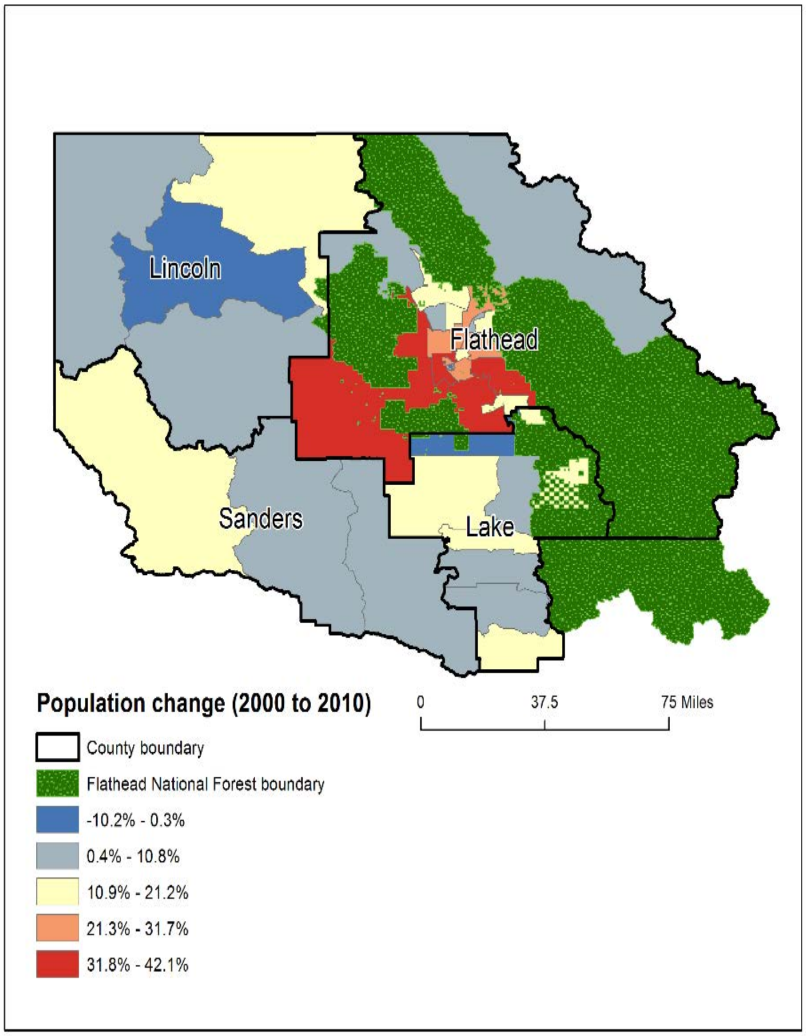


Figure 72. Population change in counties in the analysis area (2000–2010)

Map Source: USDA Forest Service Northern Region, 2015. Data Source: U.S. Census, Population by census tract, 2000 and 2010.

The Forest Service's 2010 Renewable Resources Planning Act Assessment projected county-level population changes through the year 2060 (Zarnoch, Cordell, Betz, & Langner, 2010). The average population of the four-county area is projected to increase 39 percent from 2010-2035 and then 37 percent from 2035-2060, with Flathead County again having the highest increase (52 percent from 2010-2035 and 45 percent from 2035-2060).

Figure 73 displays the distribution of the population of the analysis area by census tract. The population of the analysis area is not evenly distributed across the counties. The census tracts closest to the Flathead National Forest tend to be more populated.

The racial composition of the four counties also varies considerably (see figure 74). The Flathead Indian Reservation is located in Lake and Sanders Counties. Census tracts within reservation boundaries tend to have the highest concentrations of Native Americans of any area across the analysis area (over 20 percent Native Americans).

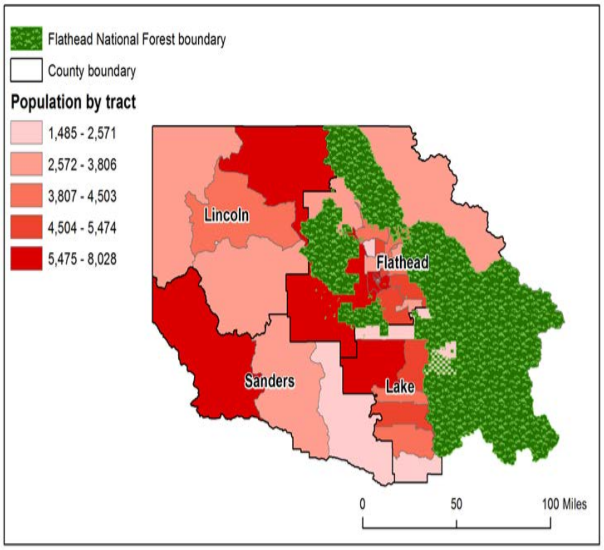


Figure 73. Population by census tracts in the analysis area (2009–2013)
Source: The data in the map are from the U.S. Census American Community Survey, 2013 five-year tables.

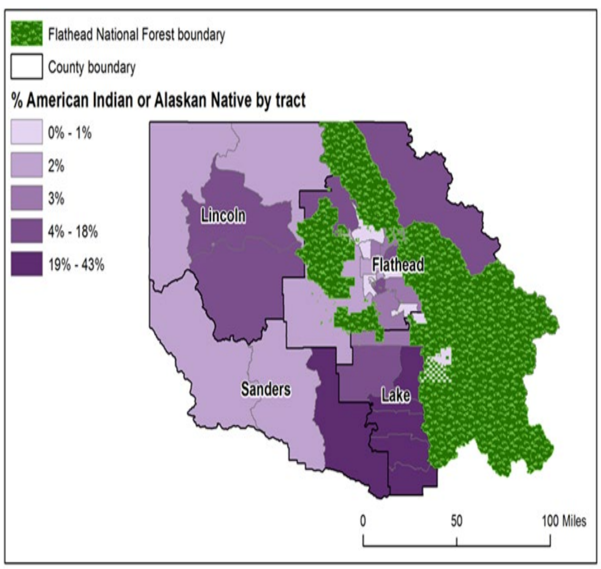


Figure 74. Native American population by census tracts in the analysis area (2009–2013)
Source: The data in the map are from the U.S. Census American Community Survey, 2013 five-year tables.

Table 171 charts the racial makeup of each county. Lake County has a high percentage of American Indians at 22 percent of the county's population. This is a significant percentage because the figure for the four-county region is only 5.7 percent. Lake County, at 6.2 percent, also has a much higher percentage of American Indians than the State of Montana. Much of the Confederated Salish and Kootenai Tribes Indian Reservation is located in Lake County, with portions also in Sanders, Flathead, and Missoula Counties, and the Confederated Salish and Kootenai Tribes tribal government and council is headquartered in Pablo. In Sanders County, 5.6 percent of the population is American Indian. This is

similar to the State's population percentage of 6.2. Flathead, Lincoln, and Sanders Counties have little ethnic diversity, and they have a higher percentage of "White alone" than the State.

Table 171. Total population, and percent of the total population by race, 2011[1]

Population	Montana	Flathead County	Lake County	Lincoln County	Sanders County	County Region	United States
Total Population	**982,854**	**90,317**	**28,628**	**19,574**	**11,421**	**149,940**	**306,603,772**
White alone (%)	89.7	95.8	70.6	96.2	92.0	90.8	74.1
Black or African American alone (%)	0.4	0.2	0.2	0.1	0.2	0.2	12.5
American Indian alone (%)	6.2	1.3	22.0	2.1	5.6	5.7	0.8
Asian alone (%)	0.6	0.5	0.5	0.4	0.2	0.5	4.7
Native Hawaiian and Other Pacific Islander alone (%)	0.1	0.0	0.0	0.0	0.0	0.0	0.2
Some other race alone (%)	0.6	0.3	0.1	0.1	0.3	0.3	5.1
Two or more races (%)	2.3	1.8	6.6	1.0	1.6	2.6	2.5

Source: U.S. Department of Commerce, Census Bureau, American Community Survey Office, Washington, DC, 2012, accessed via EPS-HDT.

1. The data in this table are calculated by the American Community Survey using annual surveys conducted during 2007-2011, and the data are representative of average characteristics during this period.

The age structure of the population is also relevant to land management decisions because people of different ages tend to use national forests in different ways. For example, some people change from nonmotorized activities to motorized as they have aged (USDA, 2014a, ch. 2). From 2000 to 2011, the analysis area has experienced a mild aging of the population (see table 172). The percent of residents 65 and over increased from 13.9 to 15.8 percent, and the percent aged 45–64 jumped from 27.0 to 31.6 percent. This trend is consistent with the United States population as a whole. As the "baby boomer" generation (those born between 1946–1964) transitions into the older age brackets, the age structure of the population becomes more top heavy (USDA, 2014a, pp. 24-25).

Table 172. Age distribution of residents in analysis area, 2000 and 2011[1]

Age Category	2000	% of Total Population	2011	% of Total Population
Total Population	**130,042**	**-**	**149,940**	**-**
Under 18	33,932	26.1	34,769	23.2
18-34	22,357	17.2	27,018	18.0
35-44	20,564	15.8	17,153	11.4
45-64	35,099	27.0	47,318	31.6
65 and over	18,090	13.9	23,682	15.8

Source: U.S. Department of Commerce, Census Bureau, American Community Survey Office, Washington, DC, 2012, and U.S. Department of Commerce, Census Bureau, Systems Support Division, Washington, DC, 2000 (Headwaters Economics).

1. The data in this table are calculated by the American Community Survey using annual surveys conducted during 2007-2011, and the data are representative of average characteristics during this period.

This phenomenon of an aging population is not evenly distributed across the study area. Census tracts farther away from Flathead National Forest boundaries tend to have the highest percentage of residents 65 and over, save the northeastern region of Lake County (see figure 75). The aging of the study area population is significant as it could shift demand for recreation services. One possible way is with a larger

portion of the population entering retirement, residents may have more leisure time available for recreating on NFS lands.

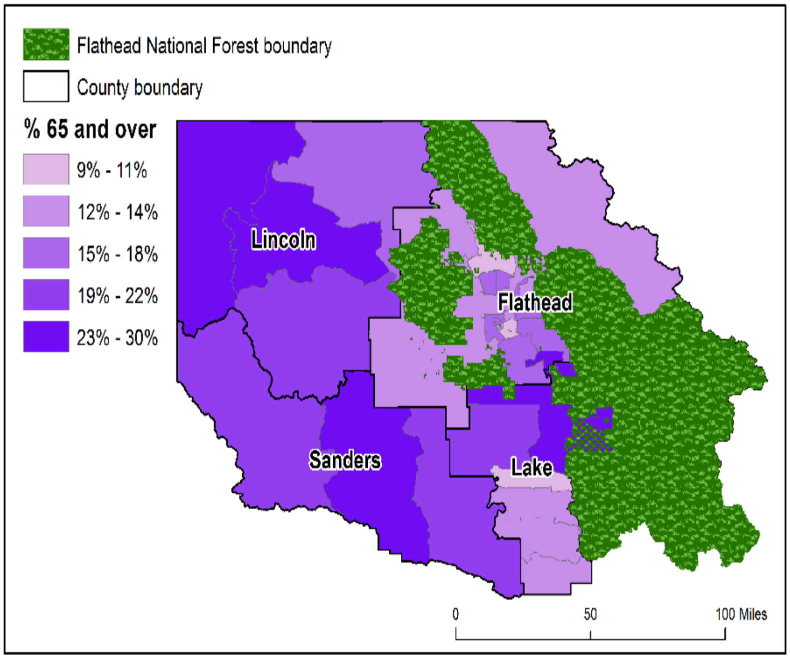


Figure 75. Percent of population 65 and over in the analysis area, by census tract.
Source: The data in the map are from the U.S. Census, American Community Survey, 2013 five-year tables (USCB, 2013).

Economy

Within the four-county analysis area, Flathead County is the largest population center; the main communities in the county are Kalispell, Columbia Falls, and Whitefish (figure 76). Compared to the rest of the multi-county area, Flathead County offers greater economic opportunities, with more diversified industries and higher earnings per capita. Sanders and Lincoln County, conversely, face higher rates of unemployment, lower earnings per job, and a high level of non-labor income from aging and hardship payments. Lake County falls somewhere between Flathead and the other two counties in that it has a different mix of demographics, and economic activity.

Overall, economic conditions in the analysis area lag behind national averages. Lower income levels and higher unemployment are reported from this region. Flathead County had the highest per capita income in 2014, at $38,982, which was 16 percent lower than the U.S. average of $46,049. Lincoln, Sanders, and Lake Counties recorded per capita incomes that were more than 30 percent lower than the national average. Unemployment was also higher than the national average for Lincoln and Sanders Counties (figure 77). Lincoln County recorded the highest unemployment rate in 2015, at 11.3 percent.

Additional economic concerns are raised by the data on non-labor personal income, which is high in this region—nearly 50 percent of recorded total personal income (figure 78). Non-labor personal income comes from three sources: investments, age-related payments such as Social Security, and hardship-related payments such as Medicaid. In the West, non-labor personal income is most often higher in rural counties, where fewer and less diverse opportunities for labor income exist. In the strongest metro-area economies, non-labor personal income is at or below 20 percent, and in the more challenged of rural economies, non-labor personal income rises above 50 percent. Across the analysis area, Flathead County

stands out, with dividends, interest, and rent income making up a higher percentage of non-labor personal income (24–48 percent of total). In the other three counties, age- and economic hardship-related payments make up a greater percentage of the non-labor personal income (Lawson, 2014).

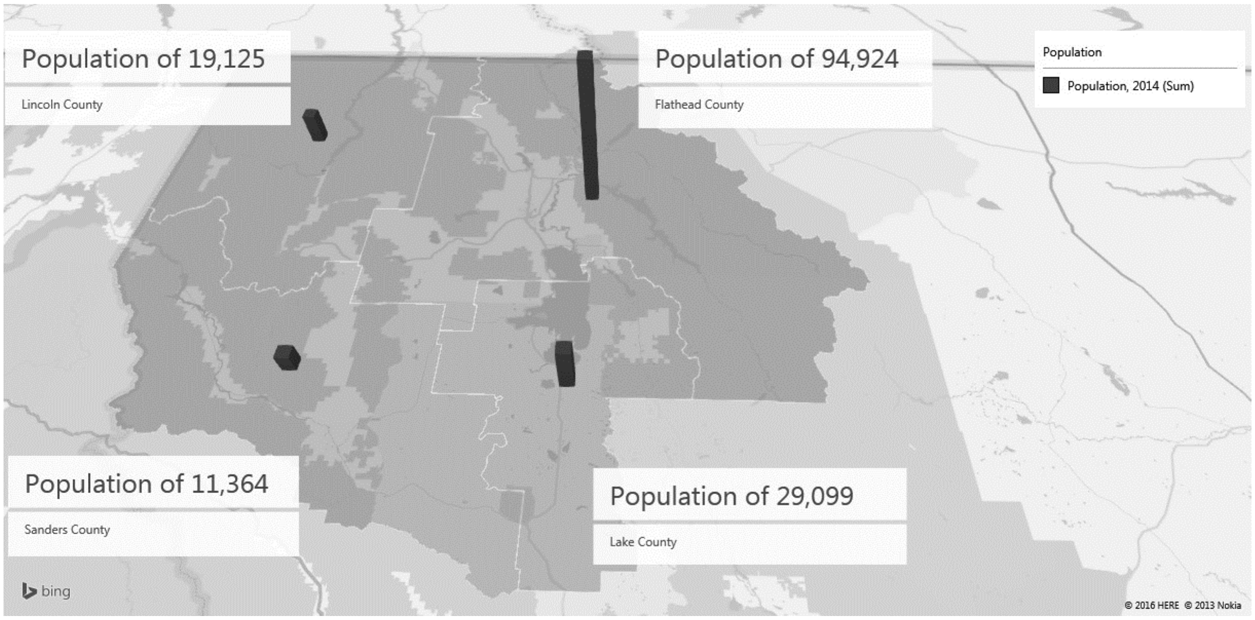


Figure 76. Population (2014) by county in the analysis area

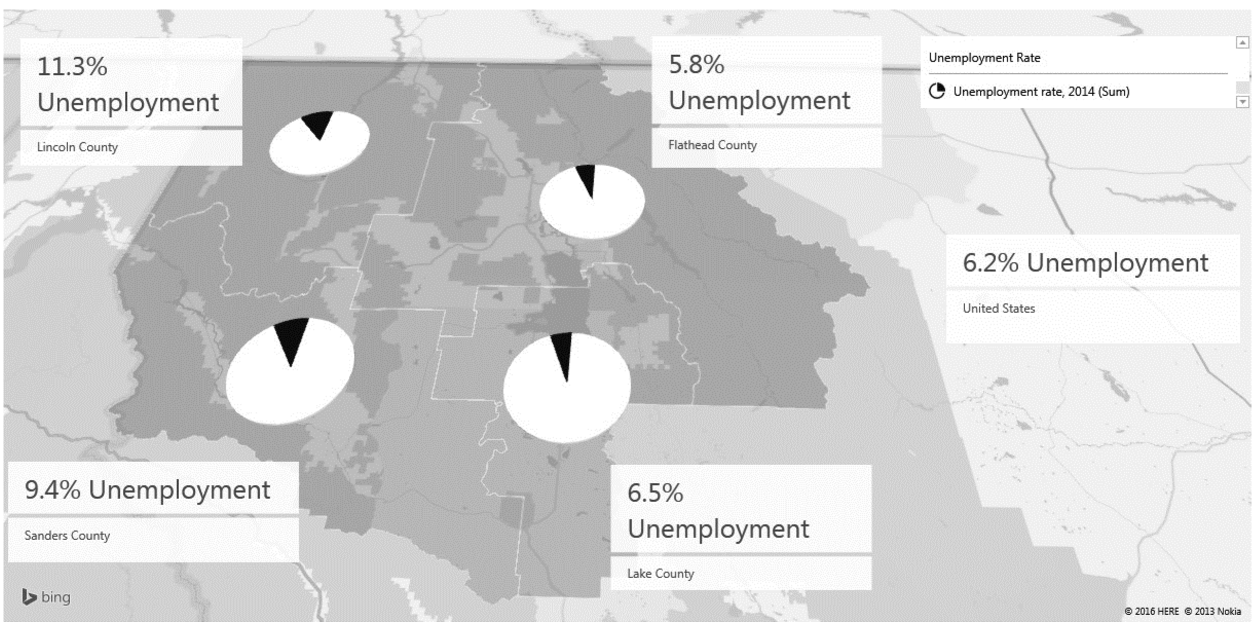


Figure 77. Unemployment rate by county in the analysis area

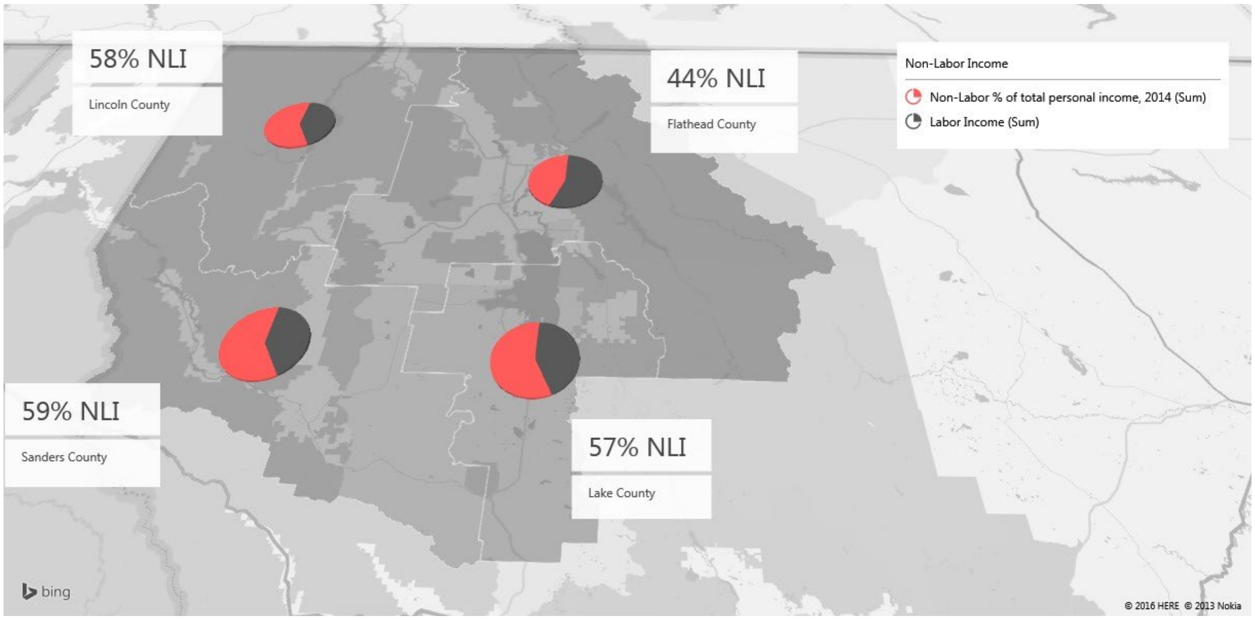


Figure 78. Non-labor income (NLI) by county

In table 173, non-labor personal income and other important economic measurements are listed across the analysis area. Comparing the population, economy, and land measurements for the county region, and individual counties to U.S. national averages provides additional information regarding the four-county analysis area surrounding the Forest.

Table 173. Population, economy, and land summary of the analysis area

Category	Economic Measure	Lake County	Flathead County	Lincoln County	Sanders County	County Region	United States
Population	**Population, 2013, Total**	**29,099**	**94,924**	**19,125**	**11,364**	**154,512**	**318,857,056**
Trends	Population change (%), 1970-2013	99.4	139.0	5.9	59.8	94.4	56.5
Trends	Employment change (%), 1970-2013	184.8	280.7	20.5	82.9	186.4	103.6
Trends	Personal income change (%), 1970-2013	280.1	325.0	54.9	160.1	241.6	178.7
Properity	Unemployment rate (%), 2014	5.8	6.5	11.3	9.4	7.1	6.2
Prosperity	Average earnings per job, 2013 (2014 dollars)	$31,075	$39,896	$32,121	$27,670	$37,052	$56,965
Prosperity	Per capita income, 2013 (2014 dollars)	$31,460	$38,982	$30,996	$29,094	$35,849	$46,049
Economy	Non-labor income, % of total personal income, 2013	57.4	44.4	58.3	59.4	48.9	35.8
Economy	Services employement, % of total employment, 2013	54.4	73.0	62.9	57.3	68.2	72.1
Economy	Government employment, % of total employment, 2013	22.8	9.0	14.1	13.5	11.9	12.9
Use Sectors	Timber employment, % of total private employment, 2013	2.3	3.5	5.5	6.5	3.7	0.7
Use Sectors	Mining employment, % of total private employment, 2013	0.1	0.1	4.6	1.0	0.5	0.6
Use Sectors	Fossil fuels (oil, gas, & coal) employment, % of total employment, 2013	0.0	0.0	0.1	0.0	0.0	0.5
Use Sectors	Other mining employment, % of total employment, 2013	0.1	0.1	4.5	1.2	0.5	0.3
Use Sectors	Agriculture employment, % of total employment, 2013	8.7	1.8	3.9	9.7	3.5	1.4
Use Sectors	Travel & tourism employment, % of total private employment, 2013	17.8	20.1	19.5	22.4	19.9	15.5
Federal Land[1]	Federal land, % of total land ownership	16.5	72.9	75.4	54.4	62.8	28.8
Federal Land[1]	NFS lands, % of total land ownership	15.1	52.7	74.1	53.8	54.1	8.4
Federal Land[1]	Bureau of Land Management, % of total land ownership	0.0	0.0	0.0	0.0	0.0	11.1
Federal Land[1]	National Park Service, % of total land ownership	0.0	19.1	0.0	0.0	7.6	3.4
Federal Land[1]	Military, % of total land ownership	0.0	0.0	1.3	0.0	0.4	1.1
Federal Land[1]	Other federal land, % of total land ownership	1.5	1.1	0.0	0.6	0.7	4.7
Federal Land[1]	Federal land, % Type A*	17.9	55.4	3.4	5.5	28.2	40.3
Federal Land[1]	Federal payments, % of government revenue, FY2012	1.9	5.2	24.8	22.8	9.2	-
Development	Residential land area, % change, 2000-2010	44.7	37.7	75.5	70.2	47.0	12.3
Development	Wildland-urban interface, % developed, 2010	12.2	27.2	15.1	6.6	15.5	16.3

Source: Headwaters Economics Economic Profile System, 2015.
* Federal public lands that are managed primarily for natural, cultural, and recreational features. These lands include National Parks and Preserves (NPS), Wilderness (NPS, FWS, FS, BLM), National Conservation Areas (BLM), National Monuments (NPS, FS, BLM), National Recreation Areas (NPS, FS, BLM), National Wild and Scenic Rivers (NPS), Waterfowl Production Areas (FWS), Wildlife Management Areas (FWS), Research Natural Areas (FS, BLM), Areas of Critical Environmental Concern (BLM), and National Wildlife Refuges (FWS).

In terms of land base, Flathead and Lincoln County boundaries have a higher percentage of public land in that approximately three out of every four acres are Federal land (figure 79). Among private industries that utilize these lands, the travel and tourism industries remain the largest in terms of employment (figure 80). For example, Flathead County maintains a travel and tourism industry that is roughly 10 times the size of the county's private forestry and forest products sector.

Income and jobs

The Flathead assessment included extensive information on income and jobs for the analysis area. Table 89 in the assessment (USDA, 2014a, pp. 56-57) displays average earnings per job, per capita personal income, total personal income, and components of personal income for the analysis area. The assessment indicates that, although per capita personal income is increasing for all four counties, per capita personal income in Montana, at $39,684, was lagging somewhat behind the national average of $42,433 in 2011. For three of the counties in the analysis area, per capita personal income was substantially lower than both the state and the nation. Lake, Lincoln, and Sanders Counties' per capita income ranged from $26,609 in Sanders County to $28,556 in Lake County.

In many places, non-labor personal income is the single largest component of total personal income and also the largest source of new personal income. For the four counties in the analysis area, only in Flathead County were labor earnings (56.2 percent) a larger component of personal income than non-labor earnings. Sanders County, at 57.9 percent, had the largest percentage of personal income attributable to non-labor income.

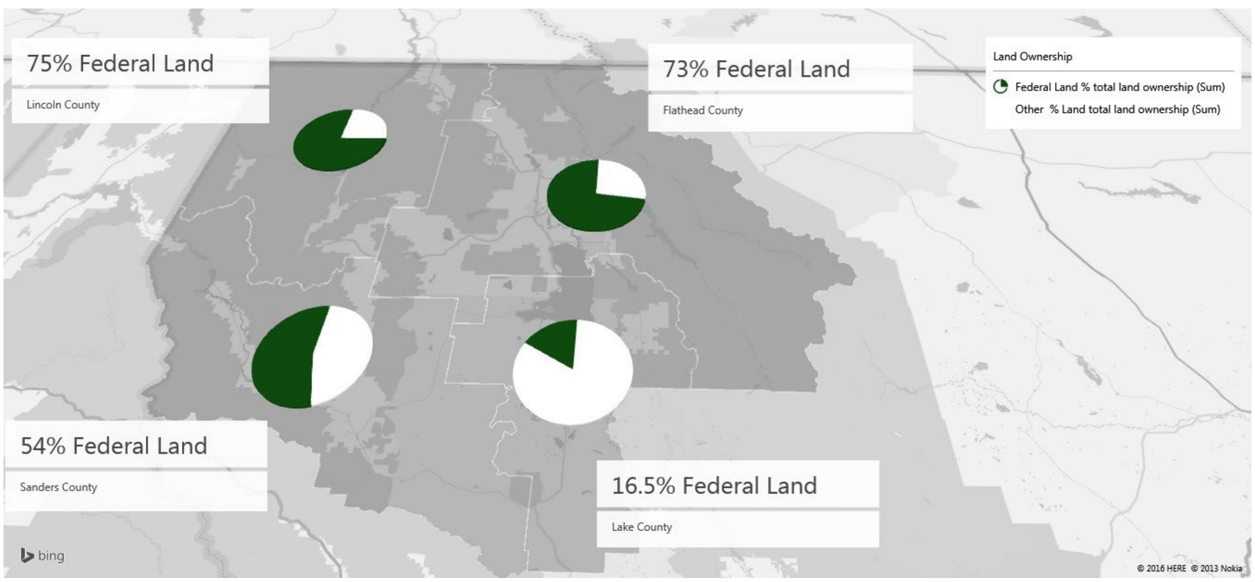


Figure 79. Federal land ownership by county in the analysis area

Figure 80. Private employment sectors by county in the analysis area

From 1970 to 2011, there was enormous growth in income-maintenance transfer payments (welfare payments), which grew from $8 million to $261 million (in 2011 dollars). Although other types of transfer payments have also seen large increases over this period, the large rise in income-maintenance payments can have important implications for social and economic sustainability. It also indicates a need for land management agencies to pay particular attention to this segment of society when assessing environmental justice impacts. This is particularly important in Lake County, where the percentage of non-labor income derived from income-maintenance payments (at 6.7 percent) is higher than either the state (4.6 percent) or the nation (6.3 percent).

Employment is also an important indicator of the economic health of an area. Employment (measured as total surveyed jobs in the economy) in the state of Montana increased 12.3 percent from 2001 to 2011, down from the 28 percent increase reported from 1990 to 2000. Except for Flathead County, where employment increased by 15.5 percent from 2001 to 2011, all other counties in the analysis area saw employment growth that was slower than that of the state as a whole.

The Flathead assessment also contains detailed information on employment by place of work, type of work, and industry, as well as the amount and percentage of employment in each category (service vs. non-service sectors; wage earners vs. proprietors) for the state of Montana and the four-county analysis area (USDA, 2014a, tables 90-93).

Services-related employment (which includes a wide range of jobs, from restaurant workers and software developers to doctors) makes up a larger share of the economy than does non-service-related employment in the analysis area. Over the 10 years from 2001 to 2011, services-related employment increased for all counties in the analysis area, ranging from a 3.2 percent increase in Lake County up to a 25 percent increase in Flathead County. On the other hand, non-services-related employment (such as farming, forestry, mining, construction, and manufacturing) decreased between 7 to 16 percent for the four counties in the analysis area.

From 1990 to 2012, all four counties in the analysis area had a higher rate of unemployment than the state of Montana. With a few exceptions, Lincoln County had the highest unemployment rate in the four-county analysis during these years, ranging from a high of 16 percent in 1994 down to 6.4 percent in

2006. See figure 92 in the Flathead assessment (USDA, 2014a, p. 54) for the average annual unemployment rate in the four-county analysis area.

In terms of the industries that relate most directly to NFS lands, agriculture and timber-related industries make up a relatively low percentage of the total private employment in the analysis area. Travel and tourism make up a larger portion of private employment in this area. In figure 81, these specific industries are displayed based on the percent of private employment they contribute to the overall economy in the analysis area. In Sanders County, for example, timber industry employment is a much higher percentage than employment in arts, entertainment, and recreation. Conversely, in Flathead County these employment sectors are nearly equal. In all counties considered, accommodations and food services employs more individuals than all other sectors considered, combined.

The trends in these national forest-related industries are different. In figure 82, timber-related employment, tracked from 1998-2013, diverges from the other forms of employment in the analysis area. This data coincides with other evidence of the region's timber industry's decline over recent decades. Conversely, in figure 83, a different trend is evident, in which travel- and tourism-related employment grows in step with employment in the rest of the analysis area. Although both sectors are tied to NFS lands, the timber industry is declining in its employment presence relative to other industries. This makes the significance of impacts to the timber industry less significant in terms of the impact to the overall economy. However, it places greater significance, or sensitivity, on the impacts to the timber industry when considering the industry in isolation, as its own beneficiary.

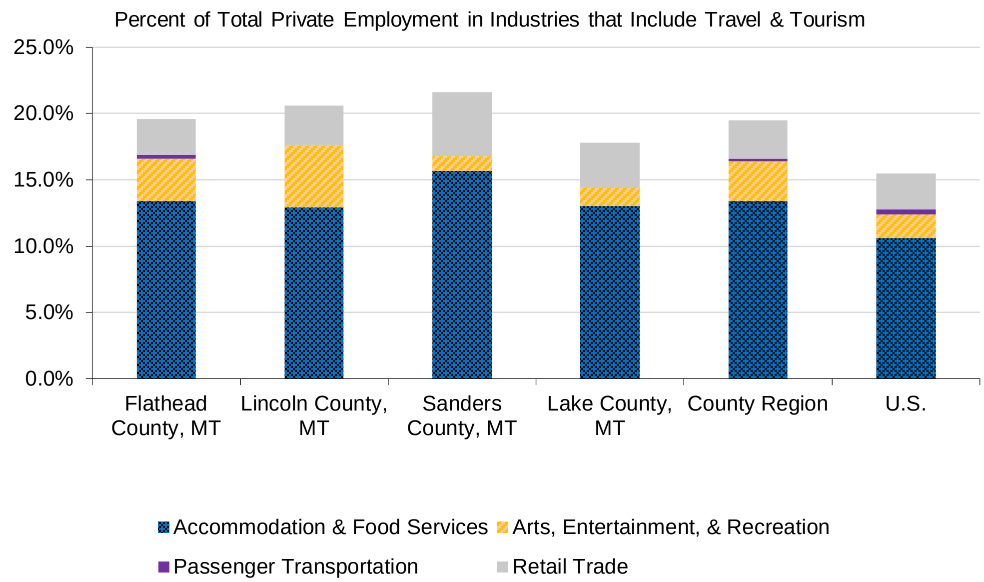


Figure 81. Percent of employment represented by industries that support travel and tourism compared to timber in counties within the analysis area

Source: Headwaters Economics Economic Profile System, 2015.

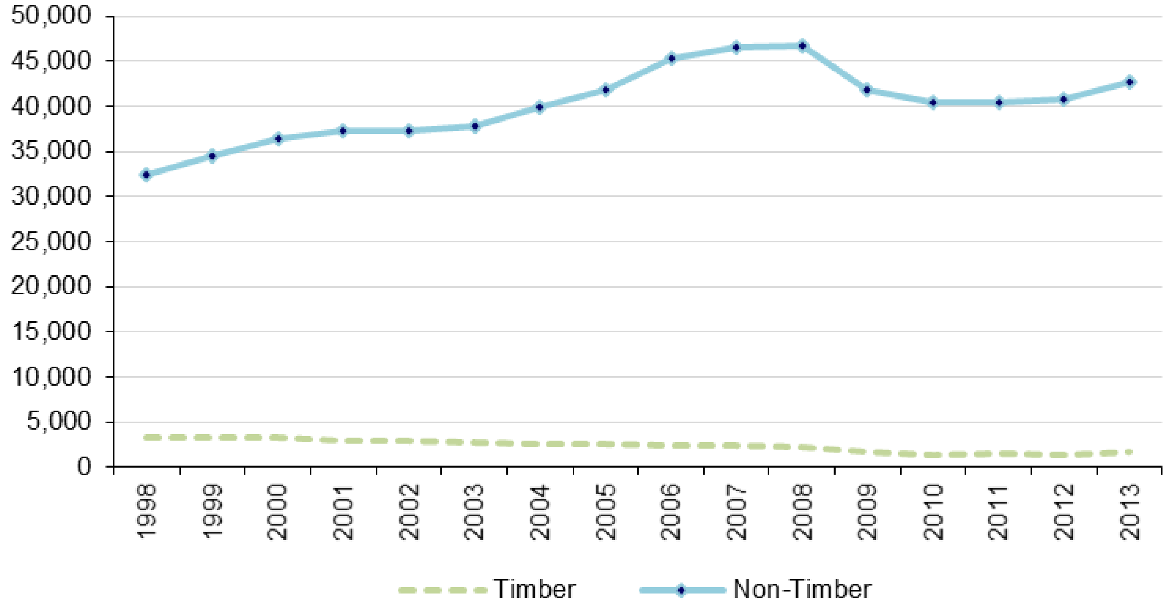


Figure 82. Timber vs. non-timber private employment in counties within the analysis area
Source: Headwaters Economics Economic Profile System (Headwaters Economics).

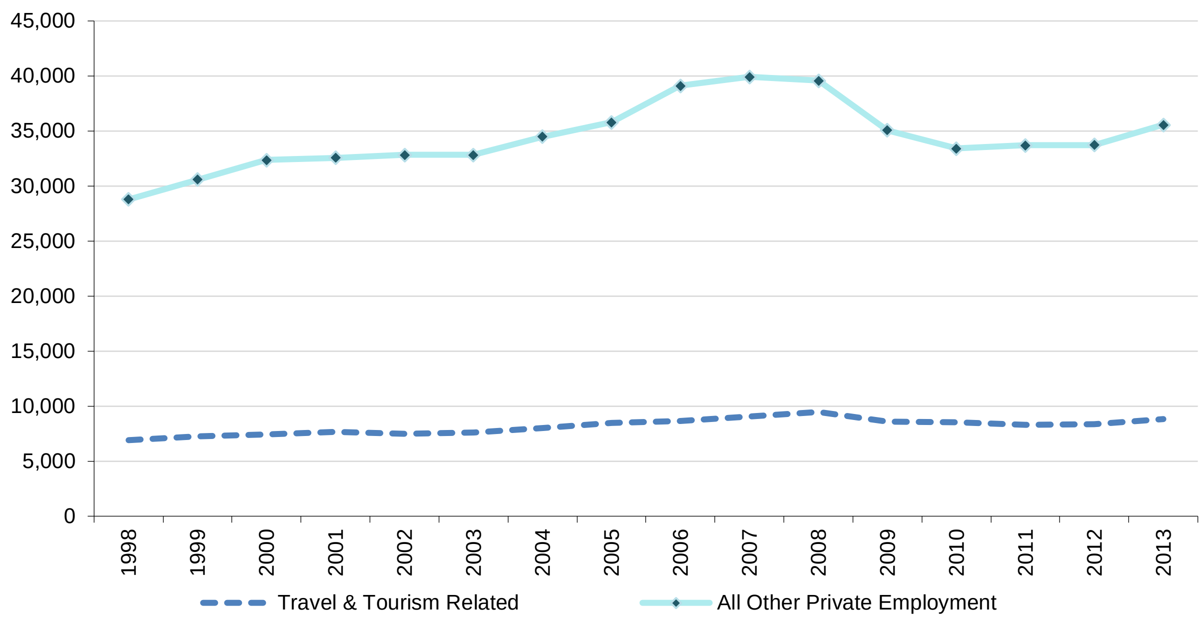


Figure 83. Travel and tourism vs. non-travel private employment in counties within the analysis area
Source: Headwaters Economics Economic Profile System (Headwaters Economics).

Poverty

In the 2007-2011 period, Lake County had the highest estimated percentage of individuals living below poverty (23.2 percent), and Flathead County had the lowest (12.7 percent) (table 174). In this same period, Sanders County had the highest estimated percentage of families living below poverty (16.3 percent), and Flathead County had the lowest (9.1 percent).

Table 174. Poverty level by age and family type in Montana and by county, 2011[1]

Family Type	Montana	Flathead	Lake	Lincoln	Sanders	County Region	United States
People	958,682	89,319	28,170	19,323	11,206	148,018	298,787,998
Families	256,806	24,188	7,949	5,987	3,381	41,505	76,507,230
Individuals below poverty (% of total)	139,904 (14.6)	11,325 (12.7)	6,533 (3.2)	3,933 (20.4)	2,371 (21.2)	24,162 (16.3)	42,739,924 (14.3)
Families below poverty (percent of total)	25,026 (9.7)	2,212 (9.1)	1,254 (15.8)	893 (14.9)	550 (16.3)	4,909 (11.8)	8,000,077 (10.5)

1. The data in this table are calculated by the American Community Survey using annual surveys conducted during 2007-2011, and they are representative of average characteristics during this period. Source: U.S. Department of Commerce, Census Bureau, American Community Survey Office, Washington, DC, 2012 (Headwaters Economics).

In summary, the affected economic environment in the analysis area is mixed across counties. The counties that remain most sensitive to Forest Service planning are those with a higher percentage of private employment in industries that benefit directly from adjacent National Forest lands. Furthermore, counties with higher poverty rates, higher unemployment, lower income per capita, and higher non-labor personal income will remain more vulnerable to impacts to employment (i.e., labor opportunities and income).

Quality of life

The quality of life of local beneficiaries is discussed below. For ease of analysis, quality of life is divided into three main categories: well-being; health and safety; and traditional, cultural, and spiritual practices.

Well-being

General indicators of the well-being of populations are educational attainment, income, and jobs. Income and jobs were addressed in the previous section; this section focuses on education.

Educational attainment

Educational attainment (the highest level of formal education a person has received) is a common indicator of well-being as it is linked to a host of social and economic outcomes, including median earnings, homeownership, health, and children's outcomes. Those with higher levels of educational attainment are also considered less vulnerable to economic and environment shocks (such as the Great Recession and climate change) (Romero Lankao & Qin, 2011). Lack of education is closely linked to poverty. At the county level, studies show that areas with a more highly educated workforce grow faster, have higher incomes, and suffer less during economic downturns than other areas. Those with higher levels of educational attainment also tend to be more civically engaged, with higher rates of voting and volunteering and lower rates of criminal behavior (Dee, 2004).

In the four-county analysis area, for the years 2007-2011, educational attainment levels are above the state and national averages in terms of high school graduates (see table 175). The vast majority of residents, aged 25 and above, in the study area, 90.5 percent, have graduated from high school. One quarter (24.8 percent) have earned a bachelor's degree or higher. This rate is slightly below the national level and the State level of 28.2 percent. There are also significant differences in educational attainment among the counties. Flathead and Lake Counties track closely to state and national averages, but Sanders and Lincoln Counties trail behind. Only 16.5 percent and 17.2 percent of residents (25 and older) in Sanders and Lincoln Counties, respectively, had earned a bachelor's degree or above. These disparities in

educational attainment suggest that Flathead and Lake County residents may be less socially vulnerable than their counterparts in Lincoln and Sanders Counties.

Table 175. Educational attainment as percent of total population age 25 and over, in Montana, by county in the analysis area, and in the United States

Education	Montana (%)	Flathead (%)	Lake (%)	Lincoln (%)	Sanders (%)	County Region (%)	United States (%)
No high school degree	8.6	8.0	10.1	13.2	12.9	9.5	14.6
High school graduate	91.4	92.0	89.9	86.8	87.1	90.5	85.4
Associate degree	8.0	8.4	9.3	8.9	5.9	8.4	7.6
Bachelor’s degree or higher	28.2	27.6	25.5	17.2	16.5	24.8	28.2
Bachelor’s degree	19.4	19.3	16.1	12.1	12.8	17.2	17.7
Graduate or professional degree	8.8	8.3	9.3	5.0	3.6	7.7	10.5

* The data in this table were calculated by the American Community Survey using annual surveys conducted during 2007-2011, and they are representative of average characteristics during this period.
Source: U.S. Department of Commerce, Census Bureau, American Community Survey Office, Washington, DC, 2012 [accessed via EPS-HDT].

Well-being summary

Overall, residents of the four-county analysis area enjoy a relatively high level of well-being. The percentage with a high school degree and an associate degree is higher than that of the nation as a whole, which is a key social indicator of overall well-being. The percentage of those with a bachelor’s degree, 17 percent, is on par with the national average. Income and jobs are also important indicators of well-being and are summarized in the Economy subsection above.

Health and safety

General indicators of the level of health and safety of communities include access to exercise opportunities, air quality, water quality, income inequality, violent crime, and life expectancy. The health and safety conditions of the study area are relevant to forest planning as certain land management decisions may improve or worsen county health conditions. Therefore, it is important to consider the current health levels and conditions in the study area. Indicators included in the County Health Rankings and Roadmaps (a database of community health indicators provided by the University of Wisconsin) most relevant to land managers include access to exercise opportunities, water quality, and air quality. Income inequality and violent crime rates are also pertinent as resource extraction projects may lead to the creation of “boom towns,” which have been shown to increase income inequality, temporarily disrupt communal ties, and increase fear of violent crime in the short term (M. D. Smith, Krannich, & Hunter, 2001).

There are significant disparities in health conditions across the four counties in the analysis area. Although a large majority of the residents of Flathead, Lincoln, and Sanders counties enjoy access to exercise opportunities (defined as living reasonably close to a park or recreational facility such as a gym or pool), only 51 percent of residents in Lake County have adequate access.

Table 176. Indicators of health and safety levels in the analysis area related to land management

Health and Safety Indicators	Montana	Flathead County	Lake County	Lincoln County	Sanders County
Access to exercise opportunities[1]	72%	79%	51%	95%	74%
Air pollution—particulate matter[2]	10.9	11.4	11.3	11.4	11.2
Drinking water violations[3]	12%	3%	27%	67%	6%
Income inequality[4]	4.4	4.1	4.9	4.4	3.9
Violent crime[5]	272	298	392	224	195

1. Percentage of population with adequate access to locations for physical activity.
2. Average daily density of fine particulate matter (2.5 micrometers or less in diameter) in micrograms per cubic meter.
3. Percentage of population potentially exposed to water exceeding a violation limit during the past year.
4. Ratio of household income at the 80th percentile to income at the 20th percentile.
5. Number of reported violent crime offenses per 100,000 population.

Source: County Health Rankings and Roadmaps (UWPHI, 2015).

The air pollution levels in the analysis area are only slightly above the state as a whole and are relatively constant across the four counties. The low levels of air pollution local beneficiaries enjoy are likely due, in part, to the high concentration of forested land in the area. Section 3.9 contains more details on air quality on the Flathead National Forest.

Although current air pollution levels are low, some residents in the analysis area have been exposed to significant pollution from the asbestos-contaminated vermiculite ore taken from the W.R. Grace mine near Libby, Montana. The exposure to asbestos from mining operation resulted in significant impacts to the health of Lincoln County residents.

The Lake County violent crime rate is significantly higher than the other three counties and over one third higher than the state average.

Lake and Lincoln Counties have also experienced higher than average rates of exposure to unsafe drinking water (measured as reported Environmental Protection Agency violations of drinking water systems). Violations could be related to maximum contaminant levels, treatment techniques, and/or monitoring and reporting requirements to ensure that water systems provide safe water. For more details on water quality on the Flathead National Forest, see section 3.2.8.

Income inequality, a marker of social cohesion (Wilkinson & Pickett, 2006), also varies across the study area. In Lake County, households in the top 20 percent of the income distribution earn almost five times as much as those in the bottom 20 percent. In Sanders and Flathead Counties, households at the top earn four times as much.

A common indicator of overall health used by the World Health Organization and other international organizations is life expectancy at birth. This measures the number of years a child born today is expected to live, given current mortality trends. It is considered by public health professionals a helpful snapshot of the overall health levels in a given area. The Institute of Health Metrics and Evaluation at the University of Washington calculates life expectancy for U.S. counties. In 2013, the life expectancy at birth for males in Montana was 76.4 years, slightly below the U.S. average of 76.5. Although the levels of life expectancy do not differ substantially across counties, it is worth noting that the life expectancy in Flathead County is about two years longer than that in Lincoln County, for both men and women. In Lake County, female life expectancy is above the state average but male life expectancy is slightly below.

Table 177. Life expectancy at birth

Life Expectancy	United States	Montana	Flathead County	Lake County	Lincoln County	Sanders County
Life Expectancy at Birth (Males)	76.5	76.4	77.1	75.5	75	76.2
Life Expectancy at Birth (Females)	81.2	81.2	82.4	82	80.1	80

Source: U.S. Health Map, Institute of Health Metrics and Evaluation, 2013, University of Washington, Seattle, WA, http://vizhub.healthdata.org/us-health-map/.

The health conditions identified using the County Health Ranking indicators above may be contributing to the lower-than-average life expectancies observed in Lincoln and Lake Counties and the higher than average levels in Flathead County.

Health and safety summary

The analysis area enjoys a relatively high level of health and safety. Life expectancies for all counties are at or near the state level. Air pollution is only slightly above the state level, highlighting the importance the Forest plays in providing clean air. Water quality varies by county, with both Lincoln and Lake Counties receiving a high level of violations, likely due to the quality of the systems providing drinking water rather than the water quality on the Forest. All counties except for Lake County enjoy a high level of access to exercise opportunities, likely due in part to their proximity to outdoor recreation activities on the Forest.

Traditional, cultural, and spiritual values

The Forest has been supporting cultural traditions for thousands of years, and its landscapes serve as a reminder of traditions shared across generations. Contemporary uses of resources and places are critical to maintaining the cultural identity of these communities. Given the ranges of uses, it is not surprising that beneficiaries hold conflicting values and understandings of how the Forest should be managed. Whereas nearly half of Americans believe more public lands should be designated as wilderness, the remainder believe the current amount is either sufficient or too high (D. W. Scott, 2003). Although some favor motorized recreation opportunities, others prize more primitive experiences. The following section discusses the benefits the Forest provides to local beneficiaries and the general public in terms of opportunities to express traditional, cultural, and spiritual values. For more detailed information on traditional, cultural, and spiritual values, see section 3.26.

Traditional, cultural, and spiritual values summary

Beneficiaries of the Forest enjoy a high level of opportunity to express traditional, cultural, and spiritual values. The Forest provides these opportunities by employing a multiple-use management strategy that allows for timber harvest and the gathering of forest products, grazing, outdoor recreation, scenery, fishing, hunting, wildlife viewing, inspiration (spiritual and existence values), solitude, and cultural/heritage values.

Social benefits

The Forest contributes to economic and social sustainability by providing the following key benefits. These benefits provide income and jobs and/or enrich the quality of life of local communities and the general public. This is not an exhaustive list of all the benefits the Forest provides. These are “key” benefits—those that were identified as highly valued and likely to be affected by the forest plan.

Water quality

The provision of abundant clean water is a key forest ecosystem service that contributes to human health and safety. Although forests, forest soils, and watersheds provide a considerable amount of clean water to human populations, human uses and natural events can also diminish a forest's ability to provide plentiful, clean water. The primary water pollutant delivered from NFS lands is sediment, which in high, sustained concentrations can limit the ability of watersheds to support aquatic life. Sediment can also be a maintenance cost concern for municipal watersheds and, if untreated, can lower the quality of drinking water, changing both its smell and taste.

Surface water quality is regulated under the authority of the U.S. Clean Water Act, whereby Montana's Department of Environmental Quality assesses waters within its jurisdiction and reports to the Environmental Protection Agency those stream segments and other waterbodies with "impaired" quality, meaning they do not meet water quality standards for beneficial uses. These segments or bodies of water must then be assigned and regulated by a total maximum daily limit and monitored for improving conditions.

Within the Forest, the Montana Department of Environmental Quality identified sediment-caused impaired conditions on Logan, Sheppard, Coal, Goat, and Jim Creeks. Additionally, Haskill Creek was ranked as a top municipal water supply priority of the USFS Legacy Program due to rising concerns about increasing sediment caused by human modifications, including permanent developments.

Groundwater is also an important resource in Montana, and it will likely become more important in the future as the state's population and industries grow. More than half of Montanans depend on groundwater for their primary water supply. According to the Natural Resource Information Service, groundwater provides 94 percent of Montana's rural domestic water supply and 39 percent of the public water supply. Water generated in the mountains of the Forest is an important source of recharge for valley aquifers and is therefore an important Forest product.

Groundwater can be contaminated by leaks from underground fuel storage tanks and pipes, leaks from cemeteries, leaks from waste disposal sites such as landfills, seepage from septic systems and cesspools, accidental spills from truck and train mishaps, saline runoff from roads and highways, seepage from animal feed lots, irrigation return flow, leaching and seepage from mine spoils and tailings, and improper operation of injection wells (Keller, 1992). None of these activities occurs on the Forest, although hauling of coal from North Dakota on railcars along the Middle Fork of the Flathead River remains a concern to water quality and human health and safety.

Water quality on and around the Forest remains relatively high, and delivery of water from the Forest to municipal sources, including valley aquafers, will remain an important ecosystem service contributing to the social and economic landscape surrounding the Forest.

Clean air

The provision of clean air and the cleansing of air are two key Forest ecosystem services that contribute to human health and safety in the area. Healthy forests respire oxygen and actively scrub particles and gaseous pollutants out of the air, but they can also become a liability to air quality during wildfires. The primary pollutant delivered from NFS lands is smoke, which contains three of six regulated pollutants: carbon monoxide, particle matter, and volatile organic compounds. These pollutants can negatively impact human health and can contribute to unsafe visibility conditions.

Inspiration and spiritual values, existence values, and solitude

The opportunity to experience solitude or a spiritual connection to nature is another benefit the Forest provides. These inspirational benefits enhance the quality of life of those who hold these values. Both local community members and the general public enjoy these benefits. People can be inspired by and connect with nature in all recreation opportunity spectrum classes (see section 3.10 for a description of the recreation opportunity spectrum). For some user groups, such as backpackers and backcountry skiers, primitive and semiprimitive nonmotorized settings provide the most inspirational opportunities associated with solitude. For motorized and mechanized recreation users, roaded natural and rural settings provide the most inspiration or opportunities to connect with nature through activities such as snowmobiling, skiing, and camping in developed campgrounds. For others, simply knowing that wild lands (such as wilderness), wildlife (such as grizzly bear and lynx), and wild and scenic rivers exist in the Forest is a benefit, even if they never plan to visit. Native American tribes in the region hold particularly strong existence values around grizzly bear (Kellert, Black, Rush, & Bath, 1996). The existence of these lands and species, in and of themselves, serves as an inspiration and enhances their quality of life (Watson, Martin, Christensen, Fauth, & Williams, 2015). For others, opportunities to experience solitude, particularly in wilderness areas, is a benefit (McKenna et al., 2016).

For more details on specific areas where visitors may experience inspiration through solitude or a spiritual connection to nature on the Forest, see sections 3.10, 3.14, 3.15, and 3.17. For more details on rare species, see section 3.7.

Cultural and heritage values

The plan area is the traditional homeland of the Kootenai and Salish peoples and, to a lesser extent, the Blackfeet people. The Flathead National Forest contains many historic and prehistoric sites that are valued by local communities, tribes, and the general public. The Forest is generally perceived as an important part of the culture and heritage of area communities and is recognized as protecting a number of sites of cultural and historical importance. Many stakeholders believe that Forest management of these sites increases public awareness of and access to opportunities to learn about and interpret the sites' cultural and historic significance. By preserving and facilitating the interpretation of these resources, the Forest provides cultural legacy and heritage values and helps ensure that these values will be passed on to present and future generations. The existence of these sites, as well as the ability to access these sites, increases the quality of life of those of who value them.

In addition to specific cultural sites, ecosystem integrity also contributes to the sustainability of tribal belief systems. These belief systems, including traditional ecological knowledge, are inextricably linked to ecosystem health and resilience (CTKW, 2014).

For more details on the cultural and heritage sites on the Forest, see section 3.25.

Carbon sequestration and climate regulation

Measuring the degree to which national forests contribute to carbon sequestration and climate regulation is a complex matter because forest soil and stand conditions, along with human uses and natural events, all affect the sequestration and release of greenhouse gases. The Forest Service recognizes the vital role that carbon sequestration plays in mitigating greenhouse gases emissions. Carbon dioxide uptake by forests in the coterminous United States offsets over 14 percent of the national total carbon dioxide emissions each year (EPA, 2013). Forests and other ecosystems are carbon sinks because, through photosynthesis, growing plants remove carbon dioxide from the atmosphere and store it. For a description of the carbon storage potential on the Flathead National Forest and its association with greenhouse gas emissions and climate change, see section 3.4.

Flood control

Forest vegetation and soils provide help with flood control. As the wildland-urban interface continues to expand, more people and property may be at risk of flooding. By minimizing erosion and maintaining healthy riparian areas, the Forest ecosystem mitigates flood risk to communities. Fire is also a main driver of erosion and flood risk. By helping to maintain a healthy ecosystem and reduce fire risk, the Forest provides for flood control.

Forest products, vegetation management, and forage

Forest products are key income- and job-sustaining resources provided by the Forest. Forest products provide a wide range of incomes across a number of economic sectors, from raw materials for wood products manufacturing to foraged products that are often sold in local markets. As discussed earlier, forest products are linked to a sector of the economy that is shrinking relative to other areas of activity in the four-county analysis area. This is both a limiting factor in the potential scale of economics impacts and, simultaneously, increases impact sensitivity for this particular beneficiary group.

Outdoor recreation

Outdoor recreation contributes to income, jobs, and quality of life. Outdoor recreation on the Forest generates a considerable amount of income and sustains a number of jobs by helping drive demand for goods and services that support recreational travelers and recreational activities. Downhill skiing, for example, generates direct and indirect spending and jobs related to the recreation, food and hospitality, and arts and entertainment sectors. Although recreation by local visitors is important, the recreational activities of non-local parties are especially important to track because their spending on goods and service is higher than that of local visitors (Stynes & White, 2006). For more details on recreational use, see section 3.10.

Scenery

Scenery is a key benefit of the Flathead National Forest and contributes to well-being. Local community members enjoy the scenic values of the Forest lands on a regular basis. Many have the opportunity to view scenic landscapes on the way to work or during their daily routine. The opportunity to enjoy these scenic landscapes is a key benefit to analysis area residents. Scenery is also a benefit to visitors who come to the area for business or recreation, and it contributes income to local communities (Berrens, Talberth, Thacher, & Hand, 2006). There are many areas with high scenic integrity throughout the Forest. Property values are affected by high-quality scenery, which contributes to higher rental incomes and home values (Berrens et al., 2006). For more detailed information on the scenery resource, see section 3.11.

Fish and wildlife

Fish and wildlife from the Forest contribute to the overall income and jobs benefit by influencing non-local travel and, ultimately, influencing key forms of travel and recreation. Hunting, fishing, and wildlife viewing generate considerable direct and indirect spending and jobs in the recreation, food and accommodation, and arts and entertainment sectors. In Montana, the hunting, fishing, and wildlife viewing economy is estimated to total over $1.2 billion in direct annual expenditures (USDI-USDC, 2011). A good portion of this activity occurs in and around the Flathead National Forest as a result of wildlife and fish opportunities provided by the Forest.

Beyond spending and job creation, benefits to people from wildlife and wildlife experiences include more directly the opportunities for recreation, food provision, and a variety of less tangible, yet valued experiences. These values are not always accessible to measure as economic trends or quantitative data but are generally viewed to be a crucial quality-of-life factor for many of the residents around the Forest and for many who travel to this area of Montana seeking wildlife experiences.

Research/education

The Forest provides opportunities for research and education. This is a key benefit that enhances the quality of life for the local communities and as well as the general public. Research conducted on the Forest benefits the larger scientific community. Educational programming benefits those who take part, both local community members and the general public, by enriching their understanding of ecosystems, wildlife, and the cultural and heritage sites on the Forest. The educational programming on the Forest offers a supplement to public education in the analysis area. The Forest also provides educational programming related to wildlife, wildfires, and general best practices in outdoor recreation that are invaluable in forest fire prevention as well as in instances of human-wildlife interaction. The Forest also contains six designated research natural areas that provide excellent opportunities for researchers to advance forest science. For more details on the research natural areas within the Forest, see section 3.20.

Other income and jobs (including payments to counties in lieu of taxes and Secure Rural Schools)

Agency operations, in addition to the other multiple-use resources, provide income and jobs to local economies surrounding the Forest. Another main economic relation between Federal land and county economies are Federal revenue-sharing and land payments, including Secure Rural Schools and payments in lieu of taxes. State and local governments cannot tax federally owned lands the way they can tax privately owned lands. As a result, a number of Federal programs exist to compensate county governments for the presence of Federal lands. These programs can represent a significant portion of local government revenue in rural counties with large Federal landholdings, such as the counties in the analysis area.

Before 1976, all Federal payments were linked directly to receipts generated on public lands. Congress funded payments in lieu of taxes, with appropriations beginning in 1977, in recognition of the volatility and inadequacy of Federal revenue-sharing programs. Payments in lieu of taxes are intended to stabilize and increase Federal land payments to county governments. More recently, the Secure Rural Schools and Community Self-Determination Act of 2000 decoupled Forest Service payments from commercial receipts. Secure Rural Schools received broad support because it addressed several major concerns around receipt-based programs—volatility, the payment level, and the incentives provided to counties by linking Federal land payments directly to extractive uses of public lands.

Payments in lieu of taxes and Secure Rural Schools each received a significant increase in Federal appropriations in fiscal year 2008 through the Emergency Economic Stabilization Act of 2008. Despite increased appropriations at times, Secure Rural Schools funding status remains in question. A number of bills presented in the 115th (2017-2018) Congress address Secure Rural Schools funding, but have not yet been passed by congress or into law.

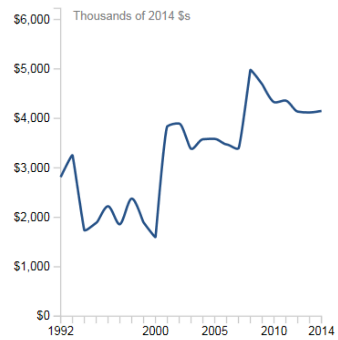
Payments in lieu of taxes formulas are specifically based primarily on population and acres of Federal land. Under this payment structure, Flathead County receives considerably higher payments in lieu of taxes ($2.4 million annually) than the other counties in the analysis area. Conversely, Lincoln and Sanders Counties rely heavily on Secure Rural Schools payments, which make up a large percentage of their total Federal land payment. Four graphs that show the data that support this discussion are provided in figure 84.

Flathead, MT

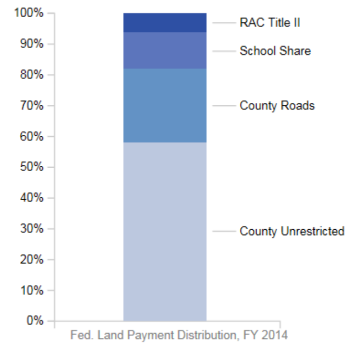
Fed. Land Payments Sources, FY 2014

Total Fed. Land Payment	$4,150,925
FS SRS Title I	$1,475,382
FS SRS Title II	$260,362
FS SRS Title III	
FS 25% Fund	
FS Special Acts	
FS Owl Payments	
BLM O&C (SRS) Title I	
BLM O&C (SRS) Title II	
BLM O&C (SRS) Title III	
BLM 50% Revenue Share	
BLM O&C Owl Payments	
PILT Payment	$2,415,181

Federal Land Payments History



Programs Receiving Payments

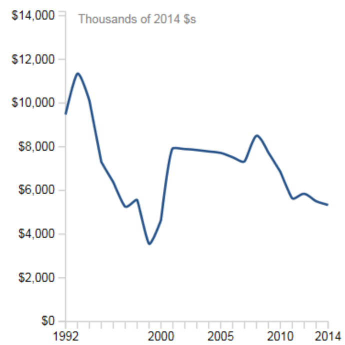


Lincoln, MT

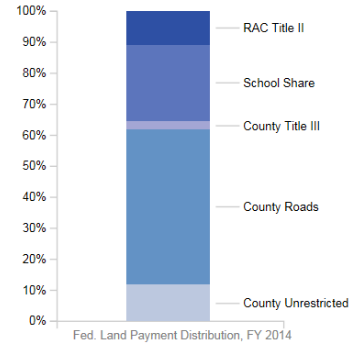
Fed. Land Payments Sources, FY 2014

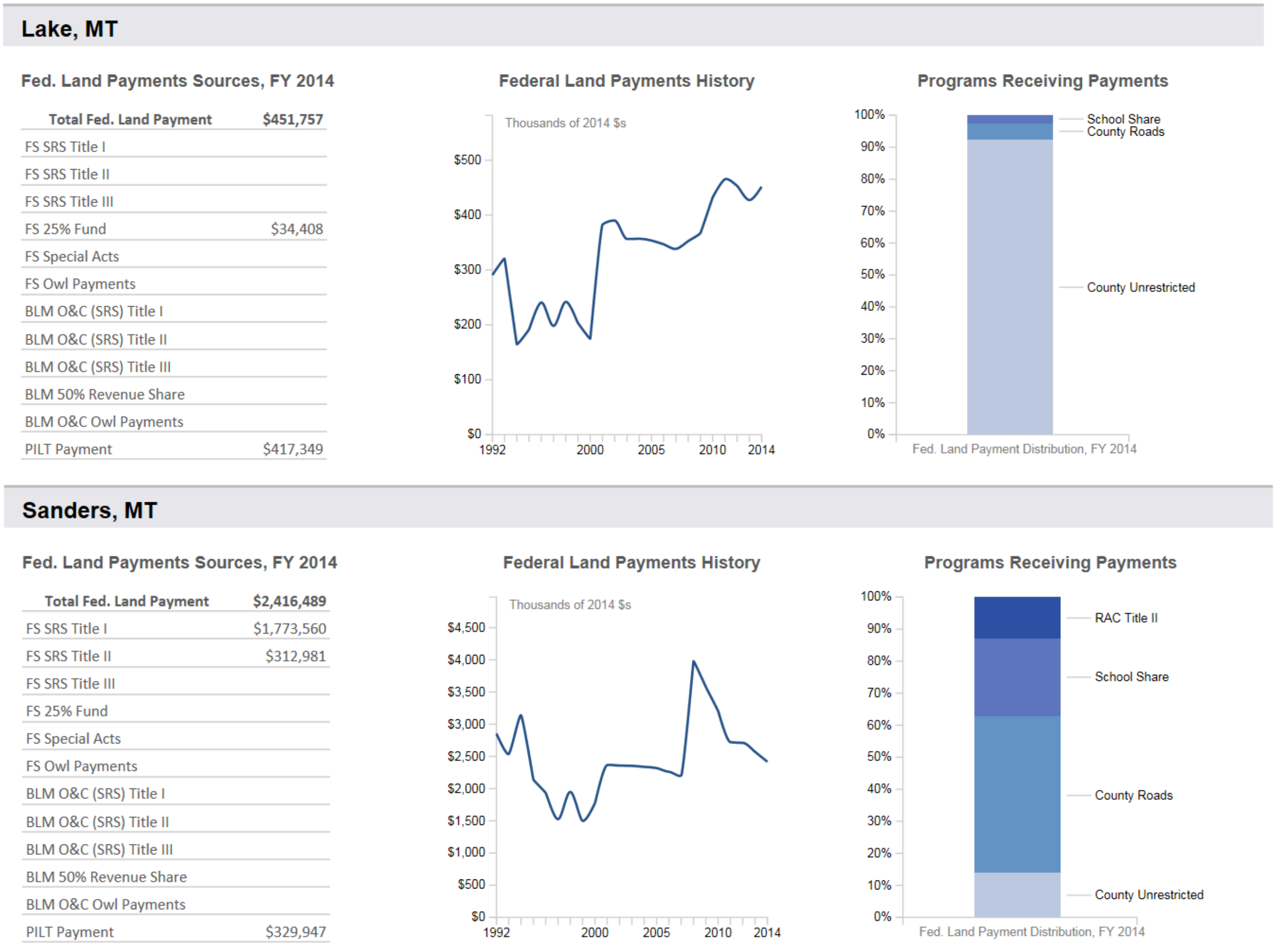
Total Fed. Land Payment	$5,336,415
FS SRS Title I	$4,002,038
FS SRS Title II	$564,994
FS SRS Title III	$141,248
FS 25% Fund	
FS Special Acts	
FS Owl Payments	
BLM O&C (SRS) Title I	
BLM O&C (SRS) Title II	
BLM O&C (SRS) Title III	
BLM 50% Revenue Share	
BLM O&C Owl Payments	
PILT Payment	$628,135

Federal Land Payments History



Programs Receiving Payments





Lake, MT

Fed. Land Payments Sources, FY 2014

Total Fed. Land Payment	$451,757
FS SRS Title I	
FS SRS Title II	
FS SRS Title III	
FS 25% Fund	$34,408
FS Special Acts	
FS Owl Payments	
BLM O&C (SRS) Title I	
BLM O&C (SRS) Title II	
BLM O&C (SRS) Title III	
BLM 50% Revenue Share	
BLM O&C Owl Payments	
PILT Payment	$417,349

Sanders, MT

Fed. Land Payments Sources, FY 2014

Total Fed. Land Payment	$2,416,489
FS SRS Title I	$1,773,560
FS SRS Title II	$312,981
FS SRS Title III	
FS 25% Fund	
FS Special Acts	
FS Owl Payments	
BLM O&C (SRS) Title I	
BLM O&C (SRS) Title II	
BLM O&C (SRS) Title III	
BLM 50% Revenue Share	
BLM O&C Owl Payments	
PILT Payment	$329,947

Figure 84. Federal land payments by source and county

Source: Headwaters Economics Economic Profile System (Headwaters Economics).

Note. BLM = Bureau of Land Management, FS = Forest Service, Owl Payments = payments related to the spotted owl, O&C = Oregon and California, PILT = payment in lieu of taxes, RAC = Resource Advisory Council, SRS = Secure Rural Schools.

Fire suppression

The Forest and other Forest Service units provide wildland fire suppression services to local communities. These services contribute to the safety of community homes and infrastructure. Fire-suppression activities also provide jobs and income to local communities, as often local businesses are contracted to provide fire-suppression equipment and resources.

3.27.3 Environmental justice

In 1994, President Clinton issued Executive Order 12898, which directs Federal agencies to focus attention on the human health and environmental conditions in minority and low-income communities. The purpose of this order is to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects on minority and low-income populations.

Environmental justice is the fair treatment and meaningful involvement of people of all races, cultures, and incomes with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. The goal of environmental justice is for Federal agencies to identify adverse impacts that are disproportionately high on minority or low-income populations and identify alternatives that will avoid or mitigate those impacts.

In the context of forest planning, it is important to assess whether the forest plan and alternatives would affect how key social benefits are currently distributed across populations. Specifically, the environmental justice mandate dictates that the Forest examine whether low-income and minority groups would be disproportionately deprived of these benefits or have more difficulty accessing these benefits compared to the population as a whole.

The census data presented in the previous sections describe the demographics of communities surrounding the Forest. These data indicate that there is a concentration of minority and low-income populations within the analysis area. These environmental justice populations are most prevalent in Lake County, where there are high concentrations of Native American families living below the poverty line.

3.27.4 Environmental consequences

The previous sections assessed the social and economic conditions and demographic trends in order to establish a baseline understanding of how the Forest contributes to the social and economic sustainability of local beneficiaries and the general public. The key dimensions assessed are how the Forest currently contributes to income, jobs, and the quality of life of local beneficiaries and the general public. The following section will consider the potential consequences of alternative management scenarios on contributions of the Forest to these three key dimensions of social and economic sustainability: income, jobs, and quality of life. Quality of life is subdivided into three subcategories: well-being, health and safety, and traditional, cultural, and spiritual values.

Effects common to all alternatives

Population trends

As described in the “Affected environment” section, the population of local beneficiaries of the Forest is growing, particularly in Flathead County, due to net in-migration. These new migrants, often referred to as natural amenity migrants, chose to migrate to the area, at least in part, due to the scenic beauty and outdoor recreation supported by the Forest. Communities close to the Forest, such as Whitefish, Montana, have become increasingly attractive as places to live because of their proximity to open spaces and natural settings that provide residents with easy access to recreational opportunities year-round. Under all the alternatives, these open spaces and natural settings would continue to contribute to a higher quality of life for area communities. As populations continue to grow due to natural amenity migrants, there will be increased demand for the benefits the Forest provides, including outdoor recreation, forest products, and fish and wildlife. Population growth in the wildland-urban interface is also a concern. The higher number of homes in these areas increases demand for fire suppression and increases the challenge of fire and fuels management efforts. For more details on how population growth affects fire and fuels management, see section 3.8.

Income and jobs

All alternatives provide similar economic contributions in relation to employment and labor income. Alternatives A, B modified, and D provide the highest levels of these contributions. Results of the economic contribution analysis appear in the two tables below. For more information regarding the following two tables, see Larson (2017). In table 178, labor income refers specifically to earned wage or proprietor income and does not include Social Security, Medicaid, dividends, or capital gains, i.e., government programs or investments. In table 179, employment refers to levels of employed individuals on an annual basis.

Income and employment levels contributed by the Forest and Forest Service operations do not fluctuate widely between alternatives. However, as shown in table 178 and table 179, income and employment

levels would be higher than current (years 2015 and 2016) for all alternatives. Alternatives A, B modified, and D all would produce more jobs and income over current levels, with alternative D producing the most. Alternative C would produce the least amount of jobs and income of the alternatives but would provide slightly more income than currently contributed from the Forest. Variation in employment, across alternatives stems from known differences in wood quantities sold, and hence more or fewer jobs from timber resources. It is anticipated that recreation related visitation to the Forest will increase over time, regardless of the alternatives and so the economic impact model does not differentiate visitation levels, or the recreation impacts between alternatives. However, the Forest anticipates increased local and non-local visitation through higher profile, focused recreation areas, and public information, including signage to those areas. Any benefits from the enhancements to focused recreation areas would be best captured in alternatives B modified and D, as these alternatives have the most focused recreation management.

For more information regarding the following two tables, see the IMPLAN Analysis (J. Larson, 2017).

Table 178. Labor Income in the analysis area by resource and by alternative (average annual labor income, in thousands of 2015 U.S. dollars)

Resource	Current (2015-2016)	A	B Modified	C	D
Recreation (non-local plus local)	$12,209	$12,209	$12,209	$12,209	$12,209
Wildlife and Fish (non-local plus local)	$2,618	$2,618	$2,618	$2,618	$2,618
Grazing	$168	$168	$168	$168	$168
Timber	$10,578	$15,545	$14,839	$10,599	$16,016
Minerals	$0	$0	$0	$0	$0
Payments to States and Counties	$5,008	$5,008	$5,008	$5,008	$5,008
Forest Service Expenditures	$20,110	$20,110	$20,110	$20,110	$20,110
Total Forest Management	$50,692	$55,658	$54,952	$50,712	$56,130

Table 179. Employment in the analysis area by resource and by alternative (direct employment contribution, estimated number of jobs)

Resource	Current (2015-2016)	A	B Modified	C	D
Recreation (non-local plus local)	532	532	532	532	532
Wildlife and Fish (non-local plus local)	95	95	95	95	95
Grazing	5	5	5	5	5
Timber	228	335	320	228	345
Minerals	0	0	0	0	0
Payments to States and Counties	125	125	125	125	125
Forest Service Expenditures	506	506	506	506	506
Total Forest Management	1,490	1,597	1,582	1,490	1,607

Federal land payments to counties

Under all the alternatives, payments in lieu of taxes and other Federal land payments would continue to reflect Federal land ownership and population growth patterns. Very little change is likely to occur in Federal land ownership; however, population change will remain a driving factor in future payment in lieu of taxes payments. Populations are not expected to fluctuate as a result of the alternatives, and therefore the payments in lieu of taxes are not expected to change across alternatives.

For Secure Rural Schools and other revenue sharing, Federal policy changes and executive budgets establish the structure of the payments and how they will continue into the future. Forest planning will not protect or guarantee these payments but may influence the payment levels, which are currently formulated on forest receipts. Alternative C may reduce forest receipts due to lower overall project levels. This would decrease revenue sharing proportionally.

Quality of life

Under all the alternatives, the Forest would continue to provide benefits to local beneficiaries and the general public that enhance their quality of life through contributions to well-being, health and safety, and traditional, cultural, and spiritual values. The contributions are described in detail in the subsections that follow.

Scenery

Direct and indirect effects: According to section 3.11 on scenery, under all alternatives there would be little to no change in the landscape character of a natural-appearing and naturally evolving forested landscape. Therefore, there would be no significant impact to the quality of life of local beneficiaries and the general public in terms of impacts to the scenic character of the Forest. For more detailed information on scenery, see section 3.11.

Research and education

Direct and indirect effects: Under all the alternatives, the Forest would continue to provide opportunities for research and education. Conservation education programs would continue to provide benefits to the public under all alternatives. According to section 3.20 on research natural areas, all six research natural areas would be maintained; there would be no adverse effects to these areas. Therefore, there would be no significant impact to the quality of life of local beneficiaries and the general public in terms of research and educational opportunities provided by the Forest.

Outdoor recreation and access

Direct and indirect effects: Under all the alternatives, the Forest would continue to offer a spectrum of recreation opportunities and settings to local communities and non-local visitors. Recreation spending has an important influence on local economies; however, it is not anticipated that recreation-related spending would significantly change across alternatives.

Though economic impacts from recreation are estimated to be similar across alternatives, substantive differences are anticipated in recreation experiences. For example, alternatives B modified and D have the same amount of focused recreation areas; these amounts are higher compared to alternative C and alternative A (which has no focused recreation areas). Focused recreation areas typically feature certain types of recreational activities that take place near or at a large lake or reservoir, developed ski area or year-round resort, large campgrounds, or trail systems for featured recreational activities. These areas recognize a variety of sustainable recreation settings and opportunities throughout the four seasons on the Forest. Management activities such as trail and facilities maintenance and increased visitor contacts and education would be emphasized. Recreational use is already occurring in many of these areas, but in some

cases, additional recreational opportunities such as mountain bike trails, hiking trails, or boat ramps would be enhanced or developed. This type of management area provides a focal point not only for existing recreation but also for new recreational activities, thus accommodating existing as well as increases in recreation. A primary benefit to recreationalists would be that the Forest Service would be able to respond better to changing use (patterns and demands), and conditions. Though focused recreation areas may or may not directly contribute to economic growth, the increased management emphasis and visibility of these areas might encourage additional recreational use.

Recreation activities are critically important to local communities; a high percentage (83 percent) of visitors to the Flathead National Forest live within 100 miles of the Forest. Though these visitors typically consume less goods and services per visit, collectively they do generate additional economic activity, especially when consumer spending would otherwise leak or occur outside of the area of interest (e.g., travel, online retailers, etc.). In total, it is estimated that local visitation to the Forest annually contributes $4.4 million in local labor income.

Water quality

Direct and indirect effects: Under all alternatives, adherence to applicable laws and intentions, such as participation in watershed conservation networks, Forest restoration related to impaired watersheds, and best management practices, would continue.

Clean air

Direct and indirect effects: All action alternatives must meet air quality standards established by Federal and State agencies through the requirements of State implementation plans and smoke management plans. Use of prescribed fire under the action alternatives would be restricted in terms of how much vegetation can be burned and when and where burns can occur. The costs of conducting prescribed fire also increases as a result of burning regulations, which also affects how much vegetation is burned. The limitations related to the use of prescribed fire affect the rate and volume of smoke and particulate emissions, which in turn limit negative impacts on visibility.

Carbon sequestration and climate regulation

Direct and indirect effects: Under all the alternatives, management strategies would increase the likelihood of sustaining and perhaps increasing the Flathead National Forests' ability to sequester carbon over both the short and long term. All action alternatives include a desired condition addressing the sustainability of carbon storage and sequestration potential through maintenance or enhancement of biodiversity and function and managing for resilient forests.

Flood control

Direct and indirect effects: Under all the alternatives, the Forest will continue to mitigate flood risk to communities within the Forest watersheds by minimizing soil erosion and promoting healthy vegetation conditions across the Forest. The level of management activities does vary by alternative, but the extent to which soils are affected under each alternative will vary by project site, so it is not possible to determine differences in the extent to which the Forest may provide for flood control under each alternative. For more detailed information on soil and watershed impacts, see section 3.2.

Forest products

Direct and indirect effects: Under all the alternatives, the Forest would continue to provide opportunities for forest product utilization, including foraging for forest products such as huckleberry or mushroom picking. Opportunities for noncommercial forest product utilization would not vary greatly by alternative.

Traditional values associated with forest products would not be impacted greatly by any of the plan alternatives, although commercial timber harvest is decreased under alternative C.

As described in section 3.21, the projected wood sale quantities for alternatives A, B modified, and D are higher than the average wood products volume sold over the last five years (2011 through 2015), which was 5.7 million cubic feet per year. Only alternative C would produce less than the current timber sale levels.

Grazing

Direct and indirect effects: Under all the alternatives, the Forest would continue to provide opportunities for livestock grazing, including transitory forage. Opportunities for both existing and new grazing allotments would not vary greatly by alternative. Traditional values associated with range management would not be impacted greatly by any of the plan alternatives.

Fish and wildlife

Direct and indirect effects: Under all the alternatives, the Forest would continue to manage habitat to support diverse wildlife species. To the extent to which alternatives influence wildlife and wildlife habitat, there might be linkages to recreation opportunities and recreation spending. The most critical spending for local economies comes from non-local visitation. Though none of the alternatives is currently anticipated to have substantial impacts on wildlife-related recreation, it is important to note that were an alternative to promote or deter non-local wildlife recreation, it could lead to an impact on local economies. For more detailed information on specific wildlife impacts, see the fish and wildlife sections below under specific alternatives as well as section 3.7.

Cultural and heritage values

Direct and indirect effects: Under all alternatives, the Forest would provide protection and access to areas of cultural and historic importance.

Inspiration, spiritual values, and solitude

Direct and indirect effects: Under all the alternatives, the Forest would continue to provide opportunities for inspiration through outdoor recreation and protection of fish and wildlife, wild and scenic rivers, and wilderness areas. Opportunities for solitude are provided under all alternatives. Solitude and inspiration could occur in all recreation opportunity spectrum classes. For more details on areas and opportunities of inspiration (through solitude or spiritual connection to nature) on the Forest, see sections 3.10, 3.14, 3.15, and 3.17.

Alternative A—No action

Income and jobs

Under alternative A, the Forest would continue to provide economic opportunities and would sustain jobs and income to a similar degree as alternatives B modified and D, whereas alternative C would produce less. Alternative A, relative to alternative C, would allow for greater annual forest management activity and would sustain harvest volumes that would equate to approximately $15.5 million in income and 335 jobs across all four counties. Relative to the entire county area economy, this is a relatively small impact, but to the timber industry specifically, this would be a noticeable change in economic activity.

Quality of life

Under alternative A, the no-action alternative, the Forest would continue to provide benefits to local beneficiaries and the general public that would enhance their quality of life through contributions to well-

being, health and safety, and traditional, cultural, and spiritual values. Contributions that differ for alternative A are described in the subsections below.

Water quality

The most significant change between action alternatives and the existing plan (alternative A) is the incorporation of additional forestwide standards that are specifically designed to protect aquatic resources. Alternative A would not implement these additional forestwide standards, but INFISH standards and guidelines would be carried forward and would largely provide for water quality. No specific plan components would exist for municipal watersheds and source water protection areas.

Outdoor recreation

Outdoor recreation influences quality of life, and alternative A would provide a wide variety of recreation opportunities and settings for users. Although alternative A does not have focused recreation areas, new campgrounds as well as trails may still be built under this alternative. However, focused recreation areas are designed to be more responsive to increases in recreational use than simply increasing site capacity, and alternative A might not offer the same level of responsiveness as alternatives B modified, C, and D.

Additional road closures or road reclamation would benefit individuals who enjoy accessing the Forest to view wildlife, hunt, or fish using nonmotorized means but would be of less benefit to individuals who enjoy accessing the Forest using motorized means of transportation.

Forest products

Under alternative A, commercial timber harvest levels would be higher than under alternatives C and B modified but less than under alternative D. Traditional values associated with forest products and forest product industries would not be impacted greatly by this alternative.

Grazing

Under the no-action alternative, grazing management, as outlined in the “Affected environment” subsection of section 3.24, would continue. Additionally, allotment plans and associated protections for forest resources would also continue. Forage management would continue to provide the necessary animal unit months designated on grazing permits. The quantity and size of grazing allotments could change from the current condition. Additional grazing allotments could be added if they were to meet the goals and guidelines of the existing management areas.

Under alternative A, the no-action alternative, more acres of timber would be suitable for timber harvest than under the action alternatives. This means that suitability and utilization for livestock grazing under alternative A could result in the creation of more transitory range than under the action alternatives. The no-action alternative would provide the most potential for transitory range creation.

Fish and wildlife

Benefits to people from wildlife and wildlife experiences vary broadly but generally relate positively with levels of biodiversity and sustainability. Evidence of this is observed in many places, including locations where biodiversity is demanded by the global tourism and travel industries. Beyond the present time, additional benefits from wildlife occur from repeated and generationally shared experiences. All alternatives would maintain wildlife habitat diversity and associated wildlife experiences and benefits, but the no-action alternative places more emphasis on reducing motorized access, less emphasis on habitat connectivity considering all lands, and less emphasis on sustainability with respect to a changing climate (see section 3.7 and appendix 7 for more details).

Inspiration, spiritual values, and solitude

Alternative A provides about 47 percent of the Forest that is in designated or recommended wilderness. These acres provide primitive and semiprimitive nonmotorized settings that often are associated with solitude, although many areas not within designated or recommended wilderness also provide for solitude. Visitors connect with nature though many different activities and thus are inspired not only in wilderness or primitive areas but also by activities such as snowmobiling, mountain biking, and camping in developed campgrounds Thus, opportunities for inspiration are provided across the entire Forest for different desired experiences of visitors. This alternative provides more solitude and inspiration values associated with motorized and mechanized recreation opportunities than alternative C but less than alternatives B modified and D. It provides less solitude and inspirational values associated with wilderness and recommended wilderness than alternatives B modified and C but more than D.

Cultural and heritage values

For details on the effects to cultural and heritage resources under alternative A, see section 3.25.

Alternatives B Modified, C, and D

Income and jobs

Under alternative B modified, the Forest would continue to provide economic opportunities and sustain jobs and income to a similar degree to alternatives A and D, whereas alternative C would produce less. Alternative B modified, relative to alternative C, would allow for greater annual forest management activity and would sustain harvest volumes that would equate to approximately $14.8 million in income and 320 jobs across all four counties. Relative to the entire analysis area economy, this would be a relatively small impact, but to the timber industry specifically, this would be a noticeable change in economic activity.

Under alternative C, the Forest would continue to provide economic opportunities and would sustain jobs and income to a lesser degree than under all the other alternatives. This alternative would allow for less annual forest management activity and would sustain harvest volumes that would equate to approximately $10.6 million in income and 228 jobs across all four counties than would be sustained in the other alternatives. Relative to the entire analysis area economy, this would be a relatively small impact, but to the timber industry specifically, this would be a noticeable change in economic activity.

Under alternative D, the Forest would continue to provide economic opportunities and would sustain jobs and income to a similar degree as under alternatives A and B modified, whereas alternative C would produce less. Alternative D, relative to alternative C, would allow for greater annual forest management activity and would sustain harvest volumes that would equate to approximately $16 million in income and 345 jobs across all four counties. Relative to the entire analysis area economy, this would be a relatively small impact, but to the timber industry specifically, this would be a noticeable change in economic activity.

Quality of life

Under alternative B modified, the Forest would continue to provide benefits to local beneficiaries and the general public which would enhance their quality of life through contributions to well-being, health and safety, and traditional, cultural, and spiritual values. Under alternative C, the Forest would continue to provide benefits to local beneficiaries and the general public that would enhance their quality of life through contributions to well-being, health and safety, and traditional, cultural, and spiritual values. Under alternative D, the Forest would continue to provide benefits to local beneficiaries and the general public that would enhance their quality of life through contributions to well-being, health and safety, and

traditional, cultural and spiritual values. Contributions that would differ by alternative are described in detail in the sections below.

Outdoor recreation and access

As displayed in table 114, alternatives B modified and D have 24 individual areas in the focused recreation management area, covering about 61,000 acres (about 3 percent of the Forest). In contrast, alternative C has 19 individual areas, totaling about 31,200 acres. Alternative A includes approximately 5,655 acres of recreation areas that are similar in character to focused recreation management area 7. Alternatives B modified and D would have the most number of sites and acreage, and alternative C has less than alternatives B modified and C but more than alternative A. As discussed above, the differences in availability of designated recreation areas might or might not directly contribute to changes in local economies but would likely influence local and non-local visitation patterns. It is generally expected that focused recreation areas would encourage visitation through enhanced management and might increase recreation-based economic activity in local areas.

Outdoor recreation influences quality of life, and alternatives B modified, C, and D would provide a wide variety of recreation opportunities and settings for users. Areas not within a focused recreation management area may still build developed recreation sites as well as trails but might not be as responsive to increases in recreational use as focused recreation areas.

Both motorized and nonmotorized access to recreation activities would be provided under the action alternatives. Alternative C would have the most recommended wilderness (management area 1b), with the greatest level of restrictions on motorized use and mechanized transport. Additional access restrictions would benefit individuals who enjoy accessing the Forest using nonmotorized and nonmechanized transport but would be of less benefit to individuals who enjoy accessing the Forest using motorized means of transportation.

Water quality

The most significant difference between the action alternatives and alternative A is the incorporation of additional forestwide plan components that are specifically designed to protect aquatic resources. Plan components for water quality are the same between action alternatives and can be found throughout the watershed and riparian management zone sections of the forest plan. FW-STD-WTR-02 and 03 would benefit groundwater and source water protection areas for public water supplies. FW-DC-WTR-06 would also lead to improved water quality relative to the no-action alternative.

Forest products

Under alternative B modified, commercial timber harvest levels would be higher than under alternative C but would be less than under alternatives A and D. Traditional values associated with forest products and forest product industries would not be impacted greatly by these alternatives.

Grazing

Under alternatives B modified and D, the acres available for timber harvest are the same, and therefore the potential for the creation of transitory range is the same. Under the no-action alternative and alternatives B modified and D, the acres available for summer recreation opportunities are the same, and the potential for livestock conflicts are the same. Recreation effects on livestock grazing of the no-action alternative (alternative A) and alternatives B modified and D would be similar.

Under alternative C, fewer acres of timber would be suitable for harvest than under other alternatives. Alternative C has the lowest acres suitable for timber harvest and thus would have the lowest potential for the creation of transitory range limiting potential suitability and utilization. Under alternative C, more

acres of summer recreation opportunities would be available, resulting in more opportunities for livestock conflicts than the other alternatives. Alternative C would also have the most adverse effects on livestock grazing as it relates to the creation of transitory range.

Under alternatives B modified and D, the acres available for timber harvest are the same, and therefore the potential for the creation of transitory range would be the same. Under the no-action alternative and alternatives B modified and D, the acres available for summer recreation opportunities would be the same.

Fish and wildlife

All alternatives would maintain wildlife habitat diversity and associated wildlife experiences and benefits, but the action alternatives would place more emphasis on maintaining motorized access, more emphasis on habitat connectivity considering all lands, and more emphasis on sustainability with respect to a changing climate (see section 3.7 and appendix 7 for more details).

Inspiration, spiritual values, and solitude

Under alternative B modified, about 53 percent of the Forest would be in designated or recommended wilderness. This alternative would provide more solitude and inspirational values associated with motorized and mechanized recreation opportunities than alternative C but less than alternatives A and D. It would provide less solitude and inspirational values associated with wilderness and recommended wilderness than alternative C but more than alternatives A and D.

Alternative C provides about 66 percent of the Forest that is in designated or recommended wilderness. This alternative provides the least solitude and inspiration values associated with motorized and mechanized recreation opportunities of all the alternatives, but it provides the most solitude and inspiration values associated with wilderness and recommended wilderness.

Alternative D would provide about 45 percent of the Forest in designated wilderness. This alternative would provide the highest amount of solitude and inspiration values associated with motorized and mechanized recreation opportunities of all the alternatives, but it would provide the least solitude and inspiration values associated with wilderness and recommended wilderness.

Cultural and heritage values

For details on the effects to cultural and heritage resources under the action alternatives, see section 3.25.

Environmental justice

As discussed in the “Affected environment” section, environmental justice populations exist within the four-county analysis area. Populations most at risk of experiencing disproportionately high and adverse human health or environmental effects include low-income households and Native Americans living on reservation lands. These populations are not mutually exclusive and are present throughout the analysis area, as discussed in the section on demographics above.

Under all the alternatives, the Forest and management activities would contribute to social and economic sustainability by providing key benefits to environmental justice communities, improving quality of life, and providing opportunities for income and jobs. The Forest would continue to provide for traditional, cultural, and spiritual values that are of particular interest to Native American tribes. No populations in the plan area would experience significant adverse human health impacts or environmental effects due to management actions proposed under any of the alternatives.

Cumulative effects

Many factors influence and affect the local social and economic environment. National, State, and county policies affect population growth, demographics, and land uses. Following is a brief description of some topics that are changing or may change in the future, adding to the effects on local communities from the alternatives.

Population growth and climate change

The West is the fastest-growing region in the country, and this trend is expected to continue for the next 20 years (U.S. Census 2010 data and projections). With this increased growth rate comes an increased diversification of the population. More new residents are migrating in, and the adult children of families living in the region are moving out of the area to find employment. This change in population composition has added to the diversity of attitudes, lifestyles, and values of the population within the four-county analysis area. The social assessment found a concern among some stakeholders that new residents are changing the nature of their communities. As natural amenity migration increases, the demand for outdoor recreation and the cultural value of wildlife viewing may increase. The new wave of natural amenity migrants, who are primarily moving to urban areas, may be more likely to hold existence values around wildlife and recreation over more traditional resource uses (Montag, Patterson, & Sutton, 2003).

For example, Glacier National Park continues to experience an increase in visitation. This suggests that opportunities for inspiration and solitude in Glacier National Park may be reduced in the future. This increase in Glacier National Park visitation may shift some visitors who are in search of solitude and inspiration to areas of the Flathead National Forest. This shift may result in an increased demand for solitude and inspiration in the primitive and semiprimitive areas of the Forest.

Climate change is predicted to increase the number of hot days in the region, leading to increased summer visits to the national forests (Hand & Lawson, in press). As a result, there may be added demand for recreational facilities in the summer months.

Development of forestlands and subdivision of private timberlands

Housing density adjacent to has been increasing, and this trend is expected to continue over the next several decades. Moderate and high increases in residential development are projected around national forests located in Montana (Stein et al., 2007). Although local city, county, and regional planners and the public are making progress in defining desirable development and are recognizing the inherent costs and negative effects associated with subdivision sprawl, growth will continue in some form and overall density will increase. This development would likely add pressure on adjacent Forest Service lands. Pressure would include increased demand for potentially conflicting recreational opportunities, services such as road maintenance, demand for undeveloped and semiprimitive settings, and increased fire management problems.

Montana, like many states across the West, is experiencing a massive divestiture of commercial timberlands for development and subdivisions (MTDNRC, 2010). Corporate timberland has become more valuable for recreational or residential real estate than for timber production. This development results in increased fragmentation of forested landscapes along with an increasing ex-urban migration and a greater desire for recreational properties and other amenity values. Impacts of fragmentation include wildlife habitat degradation, public access issues, and the increased challenges of providing public services and fire protection for new housing developments. Divestiture of corporate timberlands adds to the current trend of increased housing density adjacent to the national forest.

Resource development

Diversification of wood product manufacturing has historically allowed Montana mills to be more resilient in changing markets (MTDNRC, 2010). The majority of the timber harvested in Montana comes off State and private lands, with one third from nonindustrial private lands. The Montana Statewide Forest Resource Strategy (MTDNRC, 2010) recognizes the need to foster responsible management of private lands that integrates harvest of traditional and nontraditional forest products as a tool for good land stewardship. The amount of timber harvest on State and private lands and adjacent national forests will affect the local economy. Additional harvest from these lands would help to stabilize local jobs and income. Any decrease in harvest would add to a decrease in associated jobs and income.

Wildlife

Under the no-action alternative, grizzly bear habitat management would lack the benefit of a coordinated, multi-agency approach to NCDE grizzly bear habitat management that would be provided by the action alternatives. In the future, the signatories to the NCDE grizzly bear conservation strategy would commit to a coordinated approach to motorized access, developed recreation sites, livestock grazing, vegetation management, minerals management, and monitoring of the NCDE grizzly bear population and its habitat. A coordinated approach would be taken even if the grizzly bear is delisted. This could result in a positive impact on the Forest’s ability to contribute to existence values for the NCDE grizzly bear on all lands (for more details, see section 6.18).

Clean air

Most impacts to air quality and visual quality within the analysis area are related to the contribution of smoke from areas to the south and west of the Forest, including all the way to the West Coast. Historically, when there are not large fires providing additional smoke to the area, prescribed fires and most wildfires have not produced long-term declines in air or visual quality.

Cultural and heritage values

Cumulative effects: As a result of the implementation of the draft Grizzly Bear Conservation Strategy on the amendment forests, “bear management units within the primary conservation area and zone 1 would have temporary access restrictions during denning season. During denning season it may be more difficult for Native Americans to access sites within these bear management units across all the forests” (see section 6.16.7).

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