Appendix C: Potential Management Approaches and Possible Actions

Table of Contents

Introduction C-1
Possible Forest Management Actions and Timber Harvest Levels C-2
Possible Management Strategies and Approaches C-5
Watershed and Aquatic Species C-5
Bull trout and bull trout critical habitat C-5
Flathead Geographic Region / Flathead Lake Core Area (Complex) C-6
Multi-scale analysis C-7
Stormproofing prioritized Conservation Watershed Networks C-9
Riparian management zones C-11
Threatened species, endangered species, wildlife species of conservation concern (SCC) associated with aquatic or riparian habitats C-12
Black swift (SCC) C-12
Harlequin duck (SCC) C-12
Other wildlife associated with aquatic habitats, wetlands, and riparian management zones C-13
Bald eagle nests and screening vegetation C-13
Great blue heron nesting rookeries C-14
Common loon nesting territories C-15
Veery C-16
Wildlife habitat connectivity in riparian management zones C-16
Terrestrial Vegetation C-16
Desired conditions — general information C-16
Objectives — possible actions and strategies C-17
Management areas C-18
General Forest MAs 6a, 6b, 6c C-18
Focused Recreation MA 7 ..... C-18
MAs that are designated unsuitable for timber production C-18
Coniferous forest types C-18
General strategies C-18
Strategies specific to biophysical setting C-20
Live tree retention within regeneration harvest units C-22
Old growth forests and old growth habitat C-24
Desired condition FW-DC-TE&V-15 – old growth forest C-24
Desired conditions FW-DC-TE&V-11, 12, 13 – forest size classes and very large tree subgroup C-24
Guideline FW-GDL-TE&V-07 ..... C-24
Snags and downed wood C-26
Desired condition FW-DC-TE&V-16, 17, 18 – key points C-26
Standards and guidelines (FW-STD-TE&V-05, 10) C-26
Forest pattern, patch sizes C-27

Application of the standard specifying maximum opening size for timber harvest (FW-STD-TIMB-07) ... C-28
Potential strategies ... C-29
Managing forest pattern to provide wildlife habitat connectivity ... C-29
Burned forests ... C-31
Non-coniferous plant communities ... C-32
Threatened species, endangered species, and species of conservation concern associated with terrestrial habitats ... C-33
Plants ... C-33
Water howellia ... C-33
Whitebark pine ... C-33
Wildlife ... C-34
Canada lynx habitat and/or critical habitat ... C-34
Grizzly bear habitat ... C-38
Fisher (SCC) ... C-42
Flammulated owl (SCC) ... C-42
Clark's nutcracker (SCC) ... C-43
Possible strategies for the Townsend's big-eared bat and other bat species ... C-43
All wildlife species ... C-44
Non-native invasive plants ... C-44
Fire management and air quality ... C-45
Management approaches for unplanned ignitions ... C-45
Management approaches for prescribed fires (planned ignitions) ... C-46
Recreation ... C-46
Wilderness ... C-47
Other special designations ... C-47
Research natural areas (MA 4a) ... C-47
Special areas (MA 3b) ... C-48
Coram Experimental Forest (MA 4b) ... C-49
Infrastructure ... C-49
Lands ... C-50
Special forest products ... C-50
Minerals ... C-50
Livestock grazing ... C-51
Cultural resources and areas of tribal importance ... C-51
Conservation education ... C-51

List of Tables

Table C-1. Vegetation management practices for timber harvest, annual average acres for the first and second decades of the plan period ... C-2
Table C-2. Projected timber sale program, annual average volume outputs for the first and second decades of the plan period ... C-3
Table C-3. Conservation Watershed Network high priority sub-watersheds ... C-10
Table C-4. Food plants used by snowshoe hares in the Western Rockies, Cascades and Intermountain West (source: table 2.1 Lynx Biology Team 2013) ... C-35
Table C-5. Changes in values in a bear management subunit for open motorized route density, total motorized route density, and secure core for project in years 7 through 10 ... C-41

Table C-6. Changes in values in a bear management subunit for open motorized route density, total motorized route density, and secure core for project in years 5 through 10 ..... C-41
Table C-7. Unfilled research natural area target recommendations for the forest and woodland class and priority ranking for assessments for the Flathead National Forest..... C-47
Table C-8. Unfilled research natural area target recommendations for the shrubland and herbaceous class and priority ranking for assessments for the Flathead National Forest..... C-48

List of Figures

Figure C-1. Example of habitat connectivity analysis C-30
Figure C-2. Diagram of Bull's patch thinning technique..... C-36
Figure C-3. Traditional thinning 20 years after harvest – 30 years later. All trees thinned to an average of 300 trees per acre–dense understory providing hare habitat lacking..... C-37
Figure C-4. Same forest stand as shown in the previous figure with modified precommercial thinning: C-20 years after harvest – 30 years later. Western larch and Douglas fir canopy thinned to an average of 300 trees per acre, but smaller spruce and fir in the understory not thinned –dense understory providing hare habitat present C-37

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Introduction

This appendix describes the possible actions and potential management approaches and strategies the Flathead National Forest may undertake to make progress in achieving the desired conditions described in the plan. It is also intended to clarify how the planned outcomes (i.e., objectives, desired conditions) in the plan may be achieved.

The 2012 planning rule requires land management plans to "…contain information reflecting proposed and possible actions that may occur on the plan area during the life of the plan, including: the planned timber sale program; timber harvesting levels; and the proportion of probable methods of forest vegetation management practices expected to be used (16 United State Code (U.S.C.) 1604(e)(2) and (f)(2)). Such information is not a commitment to take any action and is not a 'proposal' as defined by the Council on Environmental Quality regulations for implementing the National Environmental Policy Act (40 CFR 1508.23, 42 U.S.C. 4322(2)(C)). (36 CFR 219.7(f)(1))." Management approaches and strategies presented in this section may include suggestions for on-the-ground implementation, analysis, assessment, inventory or monitoring, and partnership and coordination opportunities the forest is proposing as helpful to make progress in achieving its desired conditions. The potential approaches and strategies are not intended to be all-inclusive, nor commitments to perform particular actions.

The Revised Flathead National Forest Plan employs a strategy of adaptive management in its decision making and achievement of Forest Plan desired conditions and objectives. An adaptive management strategy emphasizes the learning process. It involves using the best current knowledge to design and implement management actions, then monitoring and evaluating results and adjusting future actions on the basis of what has been learned. This is a reasonable and proactive approach to decision making considering the degree of uncertainty in future ecological, social and economic factors.

This appendix provides information intended to clarify the intent and provide suggested means to achieve specific forest plan direction and components for individual resource areas. This approach recognizes the highly variable site conditions and management situations that can occur across the Forest that are most appropriately addressed at the level of project analysis.

This appendix includes a list of possible project types that may be undertaken to move toward the desired conditions and objectives. The types of actions that are exemplified do not commit the Flathead National Forest to perform or permit these actions, but are provided as actions that would likely be consistent with plan components, particularly the desired conditions and objectives. Information included does not direct or compel processes such as analysis, assessment, consultation, planning, inventory, or monitoring.

These possible actions includes the possible timber sale program, timber-harvesting levels, and the proportion of probable methods of forest vegetation management practices expected to be used over the life of the plan. However, speculation about the specific amount or treatment types, frequency, location, magnitude, or numbers of actions during the plan period are not included. This appendix does not serve as a "to do" list of projects and expected dates in the plan. The potential management approaches included may be used to inform future proposed and possible actions. Additionally, a plan may also include optional content, such as strategies and partnership opportunities or coordination activities.

Possible Forest Management Actions and Timber Harvest Levels

As required by the 2012 planning rule, this section identifies the possible actions and proportion of probable methods of forest vegetation management practices expected to be used to achieve desired timber harvesting levels and outputs. The identification of possible actions includes an estimate of timber harvesting levels anticipated over the next 1 to 2 decades, but does not include speculation about the specific amount, frequency, location, magnitude, or numbers of actions during the plan period.

Estimated acres of treatment and associated timber product outputs (reported in million cubic feet (mmcf) and million board feet (mmbf)) were determined through use of the SPECTRUM model. This model is an analytical tool used to evaluate vegetation management scenarios that achieve resource objectives. Among other things, the model provides an estimate of the level of timber products expected and the management practices applied to achieve that level, given a set of inputs that includes existing and desired vegetation conditions, budget and resource constraints, and expected vegetation change pathways.

Table C-1 displays the acres and probable treatments expected for each action alternative for the first and second decades of the plan period. Production of sawtimber and other wood products is expected through commercial timber harvest activities, which includes even-aged regeneration harvests (e.g., clearcut, seedtree, shelterwood) and other non-regeneration harvests (for modeling purposes, these are mostly commercial thinning, with lesser amounts of group selection harvests). The appropriate or optimum methods of harvest would be based upon site-specific determinations, as evaluated and determined during project planning and documented in a silvicultural prescription.

Table C-1. Vegetation management practices for timber harvest, annual average acres for the first and second decades of the plan period

Type and Decade of Harvest	Alternative B	Alternative C	Alternative D
Even-aged Regen (decade 1)	1,845	77	1,833
Even-aged Regen (decade 2)	1,942	411	908
Non-Regen (decade 1)	1,000	2,500	-
Non-Regen (decade 2)	860	2,827	1,500
Total (decade 1)	**2,845**	**2,577**	**1,833**
Total (decade 2)	**2,802**	**3,238**	**2,408**

Table C-2 displays the projected timber sale quantity (for products meeting utilization standards) and the projected wood sale quantity (for products such as fuelwood or biomass that does not meet timber product utilization standards) for lands suitable and not suitable for timber production.

As required by the 2012 planning rule, the estimates in table C-2 take into account the fiscal capability of the planning unit and are consistent with all plan components. They are based on Flathead National Forest's average budget levels over the past 3 years. However, the estimates of timber outputs may be larger or smaller on an annual basis, or over the life of the plan, if budget or other constraining factors change in the future. The maximum quantity of timber that may be sold is limited to the sustained yield limit of 25.4 mmcf.

Table C-2. Projected timber sale program, annual average volume outputs for the first and second decades of the plan period

Category and Decade	Alt. B (mmcf)	Alt. B (mmbf)	Alt. C (mmcf)	Alt. C (mmbf)	Alt. D (mmcf)	Alt. D (mmbf)
Timber Products[a] A1. Lands suitable for timber production (decade 1)	5.2	25.8	3	13.8	5.8	28.6
Timber Products[a] A1. Lands suitable for timber production (decade 2)	5.2	24.5	3.7	17.6	5.7	27.6
Timber Products[a] A2. Lands not suitable for timber production (decade 1)	0.3	1.6	0.9	4.2	0.1	0.6
Timber Products[a] A2. Lands not suitable for timber production (decade 2)	0.3	2.7	0.9	4.4	0.2	1
Projected Timber Sale Quantity (PTSQ, A1 + A2) (decade 1)	**5.5**	**27.4**	**3.9**	**18**	**5.9**	**29.2**
PTSQ (A1 + A2) (decade 2)	**5.5**	**27.2**	**4.6**	**22**	**5.9**	**28.6**
Other Wood Products[b] B. All lands (decade 1)	0.8	n/a[c]	0.6	n/a[c]	0.9	n/a[c]
Other Wood Products[b] B. All lands (decade 2)	0.8	n/a[c]	0.6	n/a[c]	0.9	n/a[c]

Category and Decade	Alt. B (mmcf)	Alt. B (mmbf)	Alt. C (mmcf)	Alt. C (mmbf)	Alt. D (mmcf)	Alt. D (mmbf)
Projected Wood Sale Quantity (PWSQ) – Timber Products[a] and Other Wood Products[b] (A1 + A2 + B) (decade 1)	**6.3**	**n/a[c]**	**4.5**	**n/a[c]**	**6.8**	**n/a[c]**
PWSQ – Timber Products[a] and Other Wood Products[b] (A1 + A2 + B) (decade 2)	**6.3**	**n/a[c]**	**5.2**	**n/a[c]**	**6.8**	**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).

c. n/a – not applicable

Source: SPECTRUM model analysis

Possible Management Strategies and Approaches

Watershed and Aquatic Species

Watersheds, habitats, and aquatic species exist within a larger, interconnected hydrological system, which often extends beyond forest management boundaries such as Flathead Lake or even to Canada.

The Flathead National Forest's plan components for aquatic ecosystem diversity and species diversity involve a two-tiered approach. First, in a coarse-filter approach, aquatic ecosystems are managed toward reference conditions, which are approximated by conditions found in watersheds that have experienced minimal human disturbances. The assumption is that managing toward reference conditions would provide the majority of necessary habitat conditions to support the native aquatic species that have evolved here. Due to societal and ecological changes, the Flathead National Forest cannot be managed to exactly mimic reference conditions, but managing aquatic ecosystems within this context would provide suitable aquatic habitats for native species. A primary mechanism of the coarse filter is the designation of riparian management zones (RMZs). These are areas along streams, lakes, ponds, and other wetland areas that have specific protections in the form of standards and guidelines. Desired conditions for watersheds and RMZs as well as plan components are based upon best available science or previously overlooked components from our 1986 plan as amended. In addition, best management practices, including "Montana Best Management Practices" and "R1 Soil and Water Conservation Practices" are implemented to protect or restore water quality under the Clean Water Act. These practices are also considered a key element of the coarse filter.

Second, species are evaluated to determine limiting habitats, population influences, and whether they have special habitat needs that may not be provided through coarse filter plan components. Fine filter plan components are listed for species in one of the following categories: threatened and endangered species (bull trout) and species of conservation concern (westslope cutthroat trout). Species may need additional species-specific plan components as specified in conservation strategies for individual species or groups of species. Bull trout is currently listed as a threatened species under the Endangered Species Act. Through the plan components, including desired conditions, objectives, standards and guidelines, this species would be anticipated to trend toward recovery and subsequent delisting.

Bull trout and bull trout critical habitat

The desired condition to work cooperatively to recover bull trout sets the stage for management.

> FW-DC-P&C: 15 Bull trout population trends toward recovery through cooperation and coordination with USFWS, tribes, state agencies, other federal agencies, and interested groups. Recovery is supported through the Bull Trout Conservation Strategy and the Bull Trout Recovery Plan.

There is direction within the *U.S. Forest Service Bull Trout Conservation Strategy*[1] that would move the current baseline condition to an upward trend for each local bull trout population for indicators (temperature, barriers, pools, and sediment). There are restoration activities such as barrier removal, road decommissioning etc. that are listed for each local population. The *Recovery Plan for the Coterminous United States Population of Bull Trout (Salvelinus confluentus)* (also known as the Bull Trout Recovery

[1] USFS. 2013. *U.S. Forest Service Bull Trout Conservation Strategy*. Missoula, Montana.

Plan[2]) has recovery goals, objective and criteria that the Forest would cooperate with partners to achieve. By doing this, threats can be managed and a sufficient distribution and abundance of bull trout would be ensured across the forest. The *Columbia Headwaters Recovery Unit Implementation Plan for bull trout (Salvelinus confluentus)* (also known as the Recovery Unit Implementation Plan[3]) is a subset of the recovery plan that identifies threats and actions within each core area.

Flathead Geographic Region / Flathead Lake Core Area (Complex)

As an example, for the Flathead Lake Core area, which includes the Middle and North Fork of the Flathead rivers, the Recovery Unit Implementation Plan[4] proposes to address habitat threats and water quality through the following actions:

1. Actions to Address Habitat Threats

    1.1. Upland/Riparian Land Management

        1.1.1. Conserve existing habitat and support passive restoration. Long-term habitat protection is in place for much of the Middle Fork and North Fork headwaters (Bob Marshall and Great Bear Wilderness and Glacier National Park) which comprise the largest interconnected network of cold water SR habitat in the recovery unit. Passive restoration should continue in order to consolidate habitat gains in the managed portions (west side) of the North Fork and its British Columbia headwaters.

    1.2. Instream Impacts

        1.2.1. Improve productivity and stability of the Flathead Lake fish community by restoring habitat quality. Improve tributary passage and minimize nonnative species (i.e., brook trout) in potential tributary SR habitat.

        1.2.2. USBOR [U.S. Bureau of Reclamation] will follow VARQ (variable discharge) flood control procedures at Hungry Horse to balance refill with downstream flow. Maintain minimum flows all year for bull trout with a sliding scale based on the forecast. Operate to meet minimum flows of 3200 to 3500 cubic feet per second (cfs) at Columbia Falls on the mainstem Flathead River and 400 to 900 cfs in the South Fork Flathead River (downstream of dam). Provide even or gradually-declining flows during summer months (minimize double peak). Limit outflow fluctuations by operating to ramping rates set in the 2000 Service Biological Opinion to avoid stranding bull trout.

    1.3. Water Quality

        1.3.1. USBOR will limit spill at Hungry Horse to maximum of 15 percent of outflow to avoid exceeding Montana State total dissolved gas standards of 110 percent.

        1.3.2. Supply cold water. The primary prescription to address climate change in the Flathead Core Area is to continue to strengthen connectivity and consolidate habitat gains in

[2] USFWS. 2015. Recovery Plan for the Coterminous United States Population of Bull Trout (*Salvelinus confluentus).* U.S. Fish and Wildlife Service, Pacific Region. Portland, Oregon. 179 pp.
[3] USFWS. 2015. Columbia Headwaters Recovery Unit Implementation Plan for bull trout (*Salvelinus confluentus*). Kalispell, Montana. 184 pp.
[4] Ibid.

headwater SR tributaries while seeking to secure sources of cold water in the SR tributaries.

In this example, the forest would address the threats that have been identified by continuing restoration efforts in the North Fork such as road decommissioning and culvert upgrade and continue to provide cold water through riparian management and hydrologically disconnecting road networks.

The Recovery Unit Implementation Plan identifies the greatest threat to bull trout in the Flathead Core area from non-native species such as lake trout and northern pike. Management agencies would need to work cooperatively to address interactions with non-native species not only in the Flathead Core area but the Swan Core area as well.

Multi-scale analysis

Watershed analysis, the precursor to multi-scale analysis, has been a widely applied methodology that was first required for use by the US Forest Service in the Pacific Northwest Region.[5] It was also described and recommended for use in the interior Columbia Basin key and priority watersheds by Pacific Fish (PACFISH) and Inland Fish (INFISH) strategies.[6] As originally envisioned and implemented, watershed analysis was a rigorous procedure developed to ensure that the emerging concept of ecosystem management was incorporated in agency planning and actions.

While multi-scale analysis is a logical continuation and refinement of watershed analysis, it is important to understand differences. Watershed analysis placed a heavy emphasis on methodology and the collection and analysis of data from different disciplines for the purpose of understanding biological and physical processes and how they interacted in specific locations. It was expected to blend socio-economic expectations with the biophysical capabilities of a particular watershed.[7] Resulting analyses could be over 100 pages long and yet still not address integration. When watershed analysis was combined with riparian reserves (Pacific Northwest Region) or Riparian Habitat Conservation Areas (Intermountain and Northern Regions) these components proved successful at preventing actions that harmed riparian reserves. Regarding the Pacific Northwest, Thomas and others noted that strategies in that plan were not as successful promoting active restoration and adaptive management and in implementing economic and social policies set out under the plan[8].

Geographic data sets and analysis have dramatically progressed since those early efforts providing much more analysis capability today. Multi-scale analysis seeks to focus more on the integration of existing information and "provides a basis for integration and prioritization of conservation measures for wide-

[5] USDA Forest Service and USDI Bureau of Land Management. 1994. *Final supplemental environmental impact statement on management of habitat for late-successional and old-growth forest related species within the range of the northern spotted owl*. USDA Forest Service, Portland, Oregon, and USDI BLM, Moscow, Idaho.
[6] USDA. 1995. Inland Native Fish Strategy: Environmental Assessment—Decision Notice and Finding of No Significant Impact. "Interim strategies for managing fish-producing watersheds in eastern Oregon and Washington, Idaho, western Montana, and portions of Nevada." USDA, Forest Service, Intermountain, Northern, and Pacific Northwest Regions. 211 pp.
[7] USDA Forest Service and USDI Bureau of Land Management. 1994. *Final supplemental environmental impact statement on management of habitat for late-successional and old-growth forest related species within the range of the northern spotted owl*. USDA Forest Service, Portland, Oregon, and USDI BLM, Moscow, Idaho.
[8] Thomas, J.W., J.E. Franklin, J. Gordon and K.N. Johnson. 2006. The Northwest Forest Plan: origins, components, implementation experience, and suggestions for change. *Conservation Biology* 20:277-287.

ranging species."[9] Multi-scale analysis does not require new data gathering or data generation. Rather, multi-scale analysis uses available data summaries from relevant resources at sometimes different scales to consider multiple management objectives for the management area. The analysis considers existing conditions, factors limiting aquatic species populations, resource risks, restoration options, and available recovery planning information. Various scales of data help place management issues and opportunities into meaningful context. Efforts mirror the sensitivity and complexity of the issues being addressed.

A multi-scale analysis is an assessment that looks at aquatic species and habitat conditions at different scales and takes those conditions into consideration to inform a decision maker. The analysis considers basin, subbasin, watershed, and reach scale conditions including habitat conditions from the PACFISH/INFISH biological opinion (PIBO) and other stream surveys, factors limiting aquatic species (including non-native species), resource risks, management requirements, restoration opportunities, and interagency coordination with Montana Fish, Wildlife and Parks and the USFWS. A multi-scale analysis provides information useful for assessing project proposals within RMZs.

Management of riparian areas has multiple objectives of providing clean water (minimizing nutrient and sediment inputs), aquatic habitat including temperature, habitat for riparian species, and connectivity across landscapes.[10] Consideration of the scales of management and the potential effects of management would be a key to ensuring the maintenance of ecosystem resilience for riparian systems.[11] Proposed activities within RMZs consider habitat conditions and the function and processes of riparian areas to provide shade, minimize nutrients and sediment and the potential impacts that may occur. Further, the analysis considers which species occur within the stream and the strength of that population.

Multi-scale analysis was used to develop the Forest's Conservation Watershed Network, starting with the scale of the Columbia River Basin. The best available science indicates the Flathead is important for conservation of native fish (bull trout and westslope cutthroat trout) across their range.[12], [13], [14], [15] The Flathead River basin is along the spine of the continent and is predicted to provide cold water into the future due to high elevation and slow climate velocities of mountain streams.[16]

[9] USDA. 2014. The Interior Columbia Basin Strategy, Interagency Memorandum of Understanding. A strategy for applying knowledge gained by the Interior Columbia Basin Ecosystem Management Project to the revision of land use plans and project implementation. Forest Service Agreement No. 03-RMU-11046000-007. 6 pp.
[10] Lee, B. N.L. Poff, D. Miller, T. Dunne, G. Reeves, G. Pess and M.M. Pollock, 2004. The network dynamics hypothesis: How channel networks structure riverine habitats. *Bioscience* 54: 5. 413–427.
[11] Bisson, P.A., S.V. Gregory, T.E. Nickelson and J.D. Hall. 2008. The Alsea Watershed study: a comparison with other multi-year investigations in the Pacific Northwest. Pages 259-290 *In* J. Stednick, editor. Hydrological and biological responses to forest practices: the Alsea Watershed study. Ecological Studies 199, Springer, New York.
[12] USFWS. 2015. Columbia Headwaters Recovery Unit Implementation Plan for bull trout (*Salvelinus confluentus*). Kalispell, Montana. 184 pp.
[13] Isaak, D., M. Young, D. Nagel, D. Horan and M. Groce. 2015. "The cold-water climate shield: Delineating refugia for preserving salmonid fishes through the 21st Century." *Global Change Biology* 21:2540–2553.
[14] Shepard, B.B., B.E. May and W. Urie. 2005. "Status and conservation of westslope cutthroat trout within the western United States." *North American Journal of Fisheries Management* 25, no. 4 (2005): 1426–1440.
[15] Muhlfeld, C.C., T.E. McMahon, M.C. Boyer and R.E. Gresswell. 2009. "Local habitat, watershed, and biotic factors influencing the spread of hybridization between native Westslope Cutthroat Trout and introduced Rainbow Trout." *Transactions of the American Fisheries Society* 138:1036–1051.
[16] Isaak, D., M. Young, C. Luce, S. Hostetler, S. Wenger, E. Peterson, J. Ver Hoef, M. Groce, D. Horan and D. Nagel. 2016. "Slow climate velocities of mountain streams portend their role as refugia for cold-water biodiversity." *Proceedings of the National Academy of Sciences*. doi:10.1073/pnas.1522429113.

We then looked at the climate shield model[17] and temperature model[18] across the Flathead River basin (6th hydrologic unit code) to look closer where cold water is predicted to persist into the future in the face of climate change. The models both identified that cold water is predicted to persist in many of our local bull trout populations that were previously identified as priority watersheds under INFISH.[19] Therefore, we carried over our priority bull trout watersheds and those watersheds designated as critical habitat by the USFWS[20] into our network.

The forest also needed to take a closer scale look at our westslope cutthroat trout populations at the subbasin level (8th hydrologic unit code). There are many pure populations of westslope cutthroat trout on the forest, unlike many other watersheds across their range where brook trout have either outcompeted them or rainbow trout have hybridized with them. The South Fork Flathead River subbasin is extremely unique for its size in that there are no brook trout or rainbow trout populations above Hungry Horse Dam. The large patch size, proximity to each other, and connectivity (10th and 12th field hydrologic unit code scale) of these populations makes conservation important, as throughout westslope cutthroat trout range, only small fragmented populations exist.[21, 22]

Lastly, the forest identified two 12th field hydrologic unit codes in each 8th field hydrologic unit code where storm-proofing would be targeted in the first decade of the plan. Reach scale data, barriers and road data were used to identify watershed for restoration priority while integrating terrestrial restoration priorities for grizzly bear, for example. Another example of multi-scale analysis at a project-level would be to look at habitat conditions and the extent and of intensity of a project proposal if the project proposes activities within RMZs. This type of project analysis considers four scales: (1) habitat conditions (percent fines) at the reach level; (2) bull trout status and habitat conditions in Wounded Buck (hydrologic unit code 12); (3) bull trout status in the South Fork Core (hydrologic unit codes 8) and (4) bull trout status in the Flathead Basin (hydrologic unit codes 6). The project analysis would consider the project impact and status of bull trout in the South Fork relative to the status of bull trout in the Flathead Basin.

Stormproofing prioritized Conservation Watershed Networks

During the past decade major winter storms, particularly 2011 on the forest and in adjacent Glacier National Park, caused flooding that damaged roads, campgrounds, and other infrastructure. Road networks can impair water quality, aquatic habitats, and aquatic species in a number of ways, often to a greater degree than any other activities conducted in forested environments.[23, 24, 25] Roads intercept

[17] Isaak, D., M. Young, D. Nagel, D. Horan and M. Groce. 2015. "The cold-water climate shield: Delineating refugia for preserving salmonid fishes through the 21st Century." *Global Change Biology* 21:2540–2553.
[18] Jones, L.A., C.C. Muhlfeld, L.A. Marshall, B.L. McGlynn and J.L. Kershner. 2014. "Estimating thermal regimes of bull trout and assessing the potential effects of climate warming on critical habitats." *River Research and Applications* 30: 204–216. doi: 10.1002/rra.2638.
[19] USDA. 1995. Inland Native Fish Strategy: Environmental Assessment—Decision Notice and Finding of No Significant Impact. "Interim strategies for managing fish-producing watersheds in eastern Oregon and Washington, Idaho, western Montana, and portions of Nevada." USDA, Forest Service, Intermountain, Northern, and Pacific Northwest Regions. 211 pp.
[20] USFWS. 2010. Endangered and threatened wildlife and plants; revised designation of critical habitat for bull trout in the coterminous United States; final rule. October 18, 2010. *Federal Register* 75:63898-64070.
[21] Rieman, B.E. and J.D. McIntyre. 1995. "Occurrence of bull trout in naturally fragmented habitat patches of varied size." *Transactions of the American Fisheries Society* 124 (3): 285–296.
[22] Shepard, B.B., B.E. May, and W. Urie. 2005. "Status and conservation of westslope cutthroat trout within the western United States." *North American Journal of Fisheries Management* 25 (4): 1426–1440.
[23] Gucinski, H., M.J. Furniss, R.R. Ziemer and M.H. Brookes. 2001. Forest roads: a synthesis of scientific information. General Technical Report PNW-509, USDA, Forest Service, Pacific Northwest Research Station, Portland, Oregon. 103 pp.

surface and subsurface flows, adding to the magnitude and flashiness of flood peaks and accelerating recession of flows.[26] Road networks can also lead to greater channel incision, increased sedimentation, reduced water quality, and increased stream habitat fragmentation

Increased winter flooding is expected to occur as climate warms on the Flathead National Forest. In addition to more frequent flooding, larger fall rain events and changes in timing and magnitude of runoff are all predicted to be influenced by climate change.[27, 28] The opportunity exists to stormproof prioritized sub-watersheds by adjusting the transportation network to be less exposed to anticipated changes.

Modern road location, design, construction, maintenance, and decommissioning practices can substantially reduce harmful interactions between roads and streams. Forest roads built decades ago were built with a focus on reducing construction cost and often did not employ modern practices. Also, maintenance budgets have not been able to meet road maintenance needs for decades. In addition, critical drainage components like culverts are nearing or have exceeded their life expectancy.

With regard to the aquatic environment, the Revised Plan addresses some of the expected effects of climate change by objectives focused on storm-proofing some of the most important sub-watersheds for at risk species, such as bull trout and westslope cutthroat. The focus area for this work is within the Conservation Watershed Network, as identified in appendix E, with an emphasis on the high priority sub-watersheds of hydrologic unit code (HUC) 12, shown in table C-3.

Table C-3. Conservation Watershed Network high priority sub-watersheds

HUC12 (numeric order)	Name
170102060311	Trail Creek
170102060404	Shorty Creek
170102060405	Upper Whale Creek
170102060406	Lower Whale Creek
170102070203	Granite Creek
170102070301	Middle Fork Flathead River-Bear Creek
170102090601	Sullivan Creek
170102090702	Wounded Buck Creek
170102110206	Lion Creek
170102110303	Goat Creek

[24] MacDonald, L.H. and J.D. Stednick. 2003. Forests and water: A state-of-the-art review for Colorado. Colorado Water Resources Research Institute Rep. No. 196. Fort Collins, Colorado. Colorado State University. 65 p.
[25] USDA. 2001. National Forest System road management strategy environmental assessment and civil rights analysis. USDA, Forest Service, Washington, DC.
[26] Jones, J.A. and G.E. Grant. 1996. Peak flow responses to clear-cutting and roads in small and large basins, western Cascades, Oregon. *Water Resources Research* 32: 959–974.
[27] Wu, H., J.S. Kimball, M.M. Elsner, N. Mantua, R.F. Adler and J. Stanford. 2012. Projected climate change impacts on the hydrology and temperature of Pacific Northwest Rivers, *Water Resour. Res*. 48, W11530. doi: 10.1029/2012WR012082.
[28] Stewart, I.T. 2009. "Changes in snowpack and snowmelt runoff for key mountain regions." *Hydrological Processes* 23(1): 78–94.

Stormproofing treatments are focused on infrastructure that would be retained. Treatments include, but are not limited to, the following examples:

- Out-sloping roads
- Adding cross drain and drainage dips at strategic locations
- Removing overburden on pipes on stored road segment in locations at risk of failure
- Storing road segments and removing pipes at higher risk of failure
- Re-aligning road segments off of floodplains and away from stream-sides
- Replacing undersized culverts with larger structures including bridges if needed.

Riparian management zones

During forest plan revision, Forest Service personnel created a forestwide riparian RMZ data layer that has been entered to the Forest's GIS data library for future reference. The wetlands were mapped using the National Hydrologic Datasets as well as local GIS databases, including those with existing and potential sites for *Howellia aquatilis* (see RMZ GIS metadata for more details). To create the RMZ layer, aquatic and wetland features were buffered according to specifications of Standard FW-STD-RMZ-01, using the ArcGIS buffer function. Wetland characteristics are confirmed at the project-level, to facilitate site-specific analysis and application of forest plan management direction.

In standard FW-STD-RMZ-01, RMZ delineation for category 3 features is specified as a minimum of 300 feet slope distance from the edge of the mapped wetland, pond or lake. These mapped wetlands provide key habitat for wildlife and contribute toward habitat connectivity objectives. Map B-09 displays these mapped wetland and ponds (including the 300 foot buffer), using the National Hydrologic Datasets and local databases as previously described. During project-level analysis, the wetlands displayed within this GIS layer are used to facilitate initial identification of wetlands where this standard may apply, with specific location and configuration of RMZs for these wetlands defined at the site-specific level. For wetlands that are not mapped on Map B-09, delineation of RMZs would at a minimum follow direction for category 4 features in FW-STD-RMZ-01.

RMZs are not suitable for timber production, but timber harvest may occur where it would be consistent with desired conditions, standards, guidelines, management areas and laws (e.g., streamside management zones). Preferred treatments promote desired ecosystem characteristics, integrity, and resilience of water, fish, wildlife, and soils. In many areas, diverse structure in RMZs are promoted through natural ecosystem processes such as wildfire, insects or disease. However, in areas where it is consistent with standards and guidelines, vegetation management activities (such as prescribed fire, precommercial or commercial thinning or small group selection) may be used to meet desired conditions, promote diversity or increase the long-term resilience of RMZs. For example, in areas where it is desirable to create larger old growth patch sizes or improve connectivity of existing old growth patches, precommercial thinning may occur to increase the diameter growth of retained trees. Small group selection harvest may be used to create small openings to increase tree species diversity (e.g., hardwood trees with a dense shrub understory), so that RMZs are not all of one age or composition, which would make them less susceptible to widespread loss of live trees at one time. Where it would not be detrimental to fish or water quality, daylight thinning may occur around individual hardwood trees to help withstand competition by conifers.

Threatened species, endangered species, wildlife species of conservation concern (SCC) associated with aquatic or riparian habitats

Black swift (SCC)

Possible strategies in support of FW-GDL-WL SCC-04 that may be used to reduce disturbance during nesting activities of the black swift include:

- Participating in cooperative efforts to survey waterfalls that provide known or potential breeding sites for black swifts to determine species presence and baseline habitat conditions, including canopy shading and water flow throughout the nesting season.
- Monitoring known nesting sites to identify any potential management issues.
- Timing activities that nesting swifts are not accustomed to (such as loud noise that may be associated with some types of trial maintenance) so that they do not occur within 500 feet of known nesting colonies during the nesting season.

Harlequin duck (SCC)

Possible strategies in support of FW-DC-WL SCC-01 and FW-GDL-WL SCC-04, to help protect habitat and reduce disturbance on nesting stream reaches during nesting season include the following:

- Participating in cooperative efforts to survey current, historic, and potential mountain streams with characteristics that can provide habitat for harlequin ducks.
- Monitoring presence of harlequin duck pairs and broods during the nesting and brood rearing seasons (For expanded details on these recommendations, see the work of Cassirer and others.[29]
- Maintaining a buffer of dense tree and shrub cover between nesting stream reach and potential source of disturbance (if available).
- Maintaining dense vegetation and/or high densities of down logs adjacent to stream reaches with known harlequin duck nesting sites to provide cover, protection from disturbance, and protection from predators.
- Managing watersheds around nesting stream reaches so that early season flows are not increased (which decrease reproductive success) and so that stream flows that support aquatic insects for forage are maintained.
- Avoiding building new roads in RMZs adjacent to nesting stream reaches.
- Evaluating existing roads near nesting stream reaches for decommissioning or placement into stored service.
- Retaining stream barriers if present between nesting stream reaches and downstream areas, as they may help to reduce competition or protect nesting harlequins from predatory fish.
- Assessing proposed mineral exploration and development in watersheds around nesting stream reaches for impacts to harlequin ducks and requiring provisions for harlequin ducks and their habitat needs in minerals management plans (including leasable, locatable, and salable minerals).

[29] Cassirer, E.F. and C.R. Groves. 1994. Ecology of Harlequin Ducks in Northern Idaho. Idaho Department of Fish and Game. Boise, Idaho. 63 pp.

- Minimizing human disturbance along nesting stream reaches during the early breeding season (May–June) and encouraging (either directly or indirectly) recreational boating, floating, or fishing activities to use streams other than harlequin duck breeding streams during this time period.
- Avoiding constructing new trails or campgrounds along breeding stream reaches.
- Educating the public and land managers about harlequin duck biology and potential disturbance issues.

Other wildlife associated with aquatic habitats, wetlands, and riparian management zones

Bald eagle nests and screening vegetation

Montana Fish Wildlife and Parks coordinates a cooperative effort to monitor bald eagle nesting territories, nest locations, and annual production. Many, but not all, bald eagle nests are in located in RMZs. As bald eagles are known to use the same very large nest trees and alternate nest trees for very long periods of time, it is important that they are protected from wildfire, insects, and disease. Thinning around very large potential or active bald eagle nest trees may be desirable to protect them from stand replacing wildfires, but if thinning occurs it is important to coordinate it with a wildlife biologist and to maintain visual buffers between nest trees and potential human disturbance. Work around nests is best accomplished in the non-nesting period (August 16th to January 31st unless it is not practical to do so.

Montana's Bald Eagle Management Plan[30] (or subsequent update) recommends to maintain visual screening between sources of human disturbance and known nests, roosts, and feeding areas where bald eagles concentrate unless topography, ecological characteristics, historical and proposed land use, human activity patterns, and the nesting pair's level of tolerance for disturbance indicate otherwise. Recommended activities for visual buffer maintenance and enhancement include: (1) managing forest and riparian habitats to protect and enhance important habitat components (e.g., perch trees and visual screening); (2) placing new construction (buildings, trails, boat launches/marinas, etc.) only in areas where visual buffers around nests can be retained; and (3) retaining a natural buffer around active nests, alternate nests, and large live trees and snags during fire protection activities that meet wildland-urban interface safety requirements and recommendations while providing visual security for bald eagles.

Nesting territories are identified in a statewide database maintained by Montana Fish, Wildlife and Parks. If projects are proposed in the vicinity of nest trees, the Flathead National Forest assesses the habitat and potential for disturbance through the National Environmental Policy Act process, considering plan components as well as visual screening recommendations on a site-specific basis.

Examples of potential strategies that support FW-GDL-WL SOI-04 include retention of dense, tall stands of trees (if available) between nests and timber harvest units, roads, or boat launches. If a visual buffer is not present, then the following strategies for maintaining a distance buffer may be used (Montana Bald Eagle Working Group,[31] or subsequent update):

- Potentially disturbing activities within one-half (0.5) mile of active and alternate nests (for territories occupied within the last 5 years) are best timed to avoid the nesting time period specified in the

[30] Montana Bald Eagle Working Group. 2010. Montana Bald Eagle Management Guidelines: An Addendum to Montana Bald Eagle Management Plan, 1994. C.A.M. Hammond (ed.). Montana Fish, Wildlife and Parks, Helena, Montana. 13 pp.
[31] Ibid.

guideline (although some activities may produce less disturbance and recommended distances might be decreased in areas where visual buffers obstruct the direct line of sight between activities and nests).

- In addition, in areas where sources of disturbance pre-date eagle occupancy, where eagles have developed a tolerance for routine human activities, or where activities similar to the proposed activity exist distance buffers may be reduced. Reductions to recommended distance buffers are best considered through consultation with a qualified biologist, taking into account site-specific plans.
- During nesting season, a distance of one-quarter (0.25) mile or 1,000 feet above nests is recommended for helicopters and aircraft, except when necessary for biologists to conduct bald eagle nest surveys. Coordination of bald eagle nest surveys among agencies/companies reduces duplicate surveying, and also decreases additional disruption of nesting activities.

In the absence of a visual buffer, recommended distance buffers for activities during the nesting season include the following:

- One-half (0.5) mile for:
  - Construction of new marinas or boat launches with routine use by six or more boats.
  - Any use of explosives or activities that produce extremely loud noise, such as blasting, use of jackhammers or gravel crushing equipment, shooting ranges, or fireworks.
  - Forest management activities that include harvesting and heavy truck traffic in areas that do not normally have that type of activity.
  - Construction of new, above ground power and utility lines.
- One-quarter (0.25) mile for:
  - Any construction of infrastructure such as roads and trails including dozer lines for fire management activities, except when specifically constructed to save a bald eagle nest from fire.
  - Forest management activities to including timber harvest layout, snag removal, prescribed fires, planting, and thinning.
  - Concentrated recreation activities including hiking, fishing, hunting, camping, rafting, wildlife watching, biking, and motorized activities including automobile use, off-road vehicle use, and boat or personal watercraft use that involves stopping (e.g., camping, anchoring fishing boats) or constant human use (e.g., popular hiking trails). Signage may be needed to inform people to avoid stopping in the buffer area during the nesting season.

Great blue heron nesting rookeries

Possible strategies in support of FW-DC-WL SOI-01 and FW-GDL-WL SOI-04, to help protect habitat and reduce disturbance during nesting season for great blue heron, include the following:

- Similar to bald eagles, development and retention of very large cottonwood trees near large rivers and lakes is important for great blue heron.
- During the nesting season, where cottonwood trees are actively used by nesting colonies of great-blue herons, a 300 foot buffer zone from the periphery of the colony is recommended when conducting projects that may cause disturbance to nesting birds (e.g., concentrated recreation activities that involve stopping, helicopter or fixed wing flights within 1,000 feet, blasting).

Common loon nesting territories

Nesting territories are identified in a statewide database maintained by Montana Fish, Wildlife and Parks. The Forest Service works cooperatively with common loon public interest groups, other state and federal agencies, the Montana Natural Heritage Program, and Montana Fish, Wildlife and Parks to monitor potential and known loon nesting lakes. At active common loon nest sites, nests could be protected a variety of ways, for example, through loon education personnel, shoreline signs, floating signs and/or nesting platforms, in cooperation with the Common Loon Working Group. If projects are proposed within 400 yards of a nest site that involve loud noise, boat use, walking, riding, or stopping by the nest site, the habitat and potential for disturbance can be assessed through the National Environmental Policy Act process, considering plan components as well as other possible strategies that address local concerns or risk factors, to ensure long-term availability of each nesting territory. Additional strategies that may be used in support of FW-DC-WL SOI-01, 04 and FW-GDL-WL SOI-04 are recommended by the Common Loon Working Group (see appendix C of the conservation plan,[32] or subsequent update) as follows:

- Identifying lakes where water fluctuation is a primary cause of nest failure and coordinate with local water control agencies to mitigate water fluctuations where possible. Otherwise, consider the use of floating islands.
- Recording locations of all current, past, and suspected nesting and nursery sites.
- Identifying location, type, and impacts of current and probable future disturbance on nesting and nursery habitat.
- Explaining and diagraming floating sign placement around known nest locations and the placement of onshore signs.
- Describing historic and current public issues, concerns, and conflicts (e.g., lakeside trails, float plane use, fishing pressure).
- Identifying the amount of information and education effort needed.
- Reducing impacts of existing and future shoreline development on lakes that provide quality loon habitat.
- Maintaining and enhancing mitigation efforts to minimize effects of shoreline disturbance on nesting loons.
- Having federal agencies, state agencies, and private landowners apply the Loon Conservation Plan and best management practices before choosing sites for recreation facilities, homes, or other developments.
- Implementing generic recommendations and considerations for the use of artificial nesting platforms and floating signs.

[32] Hammond, C.A.M. 2009. Conservation Plan for the Common Loon in Montana. Montana Department of Fish, Wildlife and Parks, Montana Common Loon Working Group. Kalispell, Montana.

Veery

The veery is found in valleys along major rivers and lakes where there are deciduous forests intermingled with patches of dense shrubs or a dense shrub understory. Most veery habitat occurs on other land ownerships, but where it does occur on the Flathead National Forest, possible strategies in support of veery habitat (FW-DC-RMZ-01) include the following:

- Allowing periodic flooding (including by beavers) to promote sprouting of hardwoods and growth of dense shrubs
- Locating small group selection harvest (generally less than 0.5 acre) in the outer half of RMZs where there is a higher probability for successful hardwood regeneration, provided doing so does not conflict with desired conditions for aquatic species.

Wildlife habitat connectivity in riparian management zones

Possible strategies that promote connectivity needs of wildlife within RMZs include the following:

- When trees in RMZs die, leaving a variety of them, in both size and number, onsite provides downed woody material and duff on the forest floor, which provides cover and habitat connectivity for small mammals, reptiles, and amphibians.
- When harvesting timber adjacent to RMZs, treatments can be designed to reduce the risk of excessive amounts of blowdown.
- If openings are created in RMZs (either through natural processes or through vegetation management treatments that are consistent with RMZ standards and guidelines), maintaining cover of live trees and shrubs in adjacent areas (if available) promotes connectivity until cover of shrubs and smaller trees is restored in RMZ openings.
- Retaining cover patches (if available), in saddles between stream headwaters provides animals protected movement options from watershed to watershed.

Terrestrial Vegetation

The following subsections describe potential management strategies and possible actions, at both the landscape and stand level, for plan components related to the terrestrial vegetation. These strategies and actions are intended to provide guidance for plan implementation, and represent possibilities, preferences or opportunities, rather than obligatory actions. Under an adaptive management approach, proposed strategies and actions are dynamic, i.e., changeable, augmentable, or replaceable, so as to be responsive to results of new research, practical experience, and other information and observations. In association with these strategies, refer also to appendix D for information on biophysical settings and species habitat associations.

Desired conditions — general information

The desired conditions (DC) in the plan for vegetation components describe, to the best of our ability, what is desired for maintaining ecosystem integrity, while contributing to social and economic sustainability (as required by the 2012 planning rule). Analysis of natural range of variation is the underpinning for the desired conditions, with integration of additional factors, such as habitat needs for at-risk wildlife species; existing or anticipated human use patterns; consideration of changing climate; and ecosystem services that may be desired or expected of the forest (such as reduction of fire hazard or production of forest products).

Desired conditions for vegetation should be viewed and interpreted from short-term (i.e., the "life of the plan," which is 15 years) and long-term perspectives. Vegetation change can be rapid (such as with fire) or slow and gradual (such as with succession). Ecological, social and economic sustainability concepts require a long-term perspective for appropriate interpretation and evaluation.

A number of desired conditions for vegetation characteristics are expressed, which range from forestwide to specific biophysical settings. Vegetation conditions anywhere within this range would be considered to meet the desired condition. Fluctuations in vegetation conditions over time are expected. Managing a particular vegetation characteristic at the upper, lower or mid-point of the desired range may be determined to be appropriate, as influenced by other ecological, social or economic objectives. Monitoring assists in evaluation of vegetation change over time, and supports an adaptive management approach to forest management (36 CFR 219.12).

Objectives — possible actions and strategies

Possible actions to achieve the objectives for terrestrial vegetation are exampled below. This list is not inclusive of all possible actions, but represent those most likely to positively contribute to the specific objective. Strategies could include the use of single methods or practices, or combinations of methods and practices. However, the specific actions chosen would depend on numerous factors, such as site-specific forest conditions and other management objectives for the area. Additionally, treatments may be designed to meet more than one objective, for example, planting western white pine seedlings would meet both objectives 01 and 02.

FW-OBJ-TE&V-01. Vegetation management treatments on 62,000 to 174,000 acres forestwide to maintain or move towards achieving desired conditions for coniferous forest types and associated wildlife species. Possible actions include the following:

- Using regeneration harvest methods, implementing even-aged, two-aged or uneven-aged silvicultural systems (e.g., clearcut, seed tree, shelterwood or group/single tree selection)
- Using intermediate harvest methods (e.g., commercial or precommercial thinning, sanitation or salvage cut)
- Planting conifers to reforest areas after harvest or fire
- Using mechanical methods (e.g., excavator scarification) or prescribed fire to prepare sites for reforestation
- Conducting post-fire salvage harvest or salvage after epidemic insect infestations
- Managing fire (i.e., prescribed fire and wildfire) to achieve desired vegetation structure, composition, pattern and function
- Conducting mechanical treatments including commercial and noncommercial treatments to alter forest structure and fuel loadings.
- Treating insects and disease using integrated pest management practices.

FW-OBJ-TE&V-02. Vegetation management treatments on 6,000 to 21,000 acres of forest to contribute to restoration of resistant western white pine and achieve desired conditions for this species presence across the landscape. Possible actions include the following:

- Pruning or daylight thinning western white pine to reduce incidence of blister rust
- Planting of rust-resistant white pine to reforest areas after harvest or fire

Management areas

General Forest MAs 6a, 6b, 6c

Vegetation management activities are expected to be readily visible and play a dominant role in affecting vegetation conditions across all the general forest management areas. This includes regeneration and intermediate harvest treatments, tree planting, non-commercial thinning, fuel reduction activities, cone collection, pruning, and prescribed fire. MA 6a is designated unsuitable for timber production because of the high level of other resource considerations or site limitations that would make it difficult to ensure a regulated timber harvest level. MAs 6b and 6c are suitable, with moderate and high intensity timber harvest levels respectively. As with MA 6a, suitability is related to the degree of other resource considerations expected within the management area, and associated limitations on both amount of area that might be treated at one time, or to the rate at which the area may be entered for treatment over a time period. Stand level treatment methods and prescriptions would be expected to be similar in MAs 6a, 6b, and 6c.

Focused Recreation MA 7

Most of the acres within MA 7 are designated suitable for timber production. The intensity of expected timber harvest is stated in the description under each of the MA 7 areas that are suitable for timber production. Some areas are moderate intensity (i.e., equivalent to MA 6b) and some are high intensity (i.e., equivalent to MA 6c). Expectations for vegetation management activities within these areas are the same as described in the General Forest MAs 6a, 6b and 6c, above.

MAs that are designated unsuitable for timber production

MAs that are designated unsuitable for timber production, but where timber harvest is allowable to meet desired vegetation conditions include MAs 2a and 2b – (the scenic and recreation segments of designated and eligible wild and scenic rivers) and MAs 5a, 5b, 5c, 5d (Backcountry). The vegetation desired conditions that are most likely to apply in these management areas include:

- FW-DC-TE&V- 01, 02, 03, 04. These desired conditions are associated with developing and maintaining resilient forests with composition, structure, and pattern of vegetative conditions that contribute to the habitat need of plant and animal species.
- FW-DC-TE&V- 08, 09, 10, 11, 12, 13, 14, 19. These desired conditions describe forest composition and structure (i.e., size classes, large trees, forest density) and pattern that would contribute to the overall goal of maintaining/achieving forest and ecosystem resilience.
- FW-DC-TE&V- 21, 22, 23; and FW-DC-FIRE- 03, 04, 05. These desired conditions describe the desired role of fire across the forest landscape, and its contribution towards creating desired ecological conditions.

Coniferous forest types

General strategies

The following strategies related to forest vegetation could be considered for application at a programmatic or project-level stage to support the maintenance or achievement of desired conditions, standards and guidelines for coniferous forests.

- Developing a set of integrated target stands for the Flathead National Forest provides a consistent basis for the development of site-specific vegetation treatment prescriptions. Such target stands could integrate elements of vegetation composition and structure with wildlife habitat, fire and fuels management, soil and water resources and socioeconomic aspects (e.g., recreation, scenic integrity, timber production). The desired conditions and other forest plan components provide a framework and footing for development of these target stands.
- Considering climate change when developing elements of site-specific silvicultural prescriptions, for example, in choosing species to plant and determining planting densities. For information on forest conditions and forest management strategies related to potential climate change that are relevant to landscape and stand level prescriptions on the Flathead National Forest, refer to documents produced by the Northern Rockies Adaptation Partnership (NRAP),[33] the Reforestation-Revegetation Climate Change Primer for the Northern Region (https://ems-team.usda.gov/sites/fs-r01-rrm/SitePages/Silviculture.aspx), and other publications as they are available.
    - Evaluating areas proposed for vegetation management activities for the presence of occupied or suitable habitat for threatened and endangered plant species, including conducting pre-field review and field surveys, provides opportunities for mitigation and protection to maintain occurrences and habitats that are important for species sustainability.
    - Completing effectiveness evaluations of fuel treatments helps to understand how hazardous fuels treatments affect wildfire behavior, fire severity and fire suppression effectiveness.
- Thinning in immature stands, where possible, improves individual tree and stand growth rates, and improves short- and long-term stand resilience. On the Flathead, these stands may be in sapling, small, or medium tree size classes. See additional discussion located under the Old Growth Forests and Old Growth Habitat section of this appendix.
- Choosing strategies that promote the increase of the following important species in stand and landscape level prescriptions, where treatment and site conditions are suitable:
    - Planting ponderosa pine, on the warm dry biophysical setting, where it is often needed to ensure its successful establishment.
    - Planting western larch, if a reliable seed source is not present especially on the warm moist and cool moist to mod dry biophysical settings, to ensure successful establishment. Thinning western larch in the sapling stage may also be needed to ensure continued presence and growth.
    - Creating suitable sites for rust-resistant western white pine, especially on the warm moist biophysical setting, and promoting establishment and growth through harvest, burning or mechanical site preparation; planting of rust-resistant seedlings; thinning; and pruning of young sapling trees.
    - Focusing on sites where western red cedar currently has, or has the potential to achieve, larger sizes and, possibly, late successional or old growth habitat in the future.
    - Using a variety of restoration treatments for whitebark pine e.g., planting, thinning, and fuel reduction in stands that contain phenotypically rust-resistant trees.

[33] Keane, R.E., M.F. Mahalovich, B. Bollenbacher and others. 2016. Effects of climatic variability and change on forest vegetation *In* J.E. Halofsky, D.L. Peterson and L. Hoang (eds.). Climate change vulnerability and adaptation in the Northern Rocky Mountains. Gen. Tech. Rep. RMRS-GTR-xxx. Fort Collins, Colorado: USDA, Forest Service, Rocky Mountain Research Station. In press, March 2016. http://adaptationpartners.org/nrap/index.php.

Strategies specific to biophysical setting

Warm dry biophysical setting

In the warm, dry biophysical setting, the following vegetation management strategies focus on maintaining or increasing representation of early seral, shade-intolerant, drought and fire tolerant, insect/disease resistant species. Specific activities may include timber harvest, prescribed fire, planting, precommercial thinning, and commercial thinning.

- Thinning young stands helps to encourage growth and vigor of trees, and develops future large diameter ponderosa pine, western larch and Douglas-fir. This creates forest compositions and structures better able to survive future fire, insects, disease, drought and other disturbances, and provides seed sources for future forest regeneration after disturbance.
- Designing treatments can be done in a way that favors the retention and increases the proportions of ponderosa pine and, on more mesic sites, the retention and increase of western larch.
- Reducing stand densities and inter-tree competition helps to increase resilience to drought that may be associated with future climates and meets desired conditions with respect to fire behavior.
- Trending toward an increase in the average patch size of early successional forest may be accomplished through regeneration harvest or prescribed burning.
- Timber harvest and prescribed fire can be designed to create a landscape mosaic with a variety of canopy cover classes, dense understory thickets of trees and shrubs, and gaps in the forest canopy. Understory thickets can be left in areas where they do not act as ladder fuels that carry fire into crowns of trees. Ponderosa pine and Douglas-fir live trees and snags, greater than 20 inches d.b.h., can be retained where available.

Key winter habitat areas for white-tailed deer have been identified for geographic areas in the Forest Plan (these areas may also be used in winter by elk or moose or in spring by mule deer). To implement GA-HH-DC-02, GA-MF-DC-06, GA-NF-DC-09, GA-SM-DC-05, GA-SF-DC-04, GA-SV-DC-05), in areas mapped as white-tailed deer and elk winter habitat by Montana Fish Wildlife and Parks (typically the warm-dry biophysical setting or warm-moist with ponderosa pine), the strategies described could be integrated with the needs of winter habitat for deer. However, stands intended to provide snow intercept cover during harsh winters need to retain sufficiently dense forest canopy. The density of trees needed to provide snow intercept cover varies according to tree species composition and elevation and is best determined on a site-specific basis. Examples of stand and landscape-level prescriptions and strategies that provide sufficient snow intercept cover include the following:

- In portions of the Swan Valley where the desired condition is to maintain snow intercept cover for big game, merchantable Douglas-fir trees of intermediate size may be harvested to reduce the stand basal area to 80 or less; creating parklike forests with Ponderosa pine and Douglas-fir in the uppermost canopy, to create a stand structure that is more resilient to drought and stand-replacing fire, while meeting the needs of deer and elk.
- Another possible strategy would apply in the Firefighter area, where elk now use higher elevations in winter due to flooding of Hungry Horse Reservoir. In this area, lodgepole pine stands provide snow interception. Because lodgepole has a relatively small crown, a higher density of trees would need to be retained within the stand. At the landscape scale, consideration could be given to both short- and long-term desired winter range habitat conditions. This may include strategically locating regeneration harvest areas (where conversion to more desired species, such as Douglas-fir may occur) among unharvested areas (that remain to provide snow intercept cover).

- Another consideration is the steepness of the slope and its aspect. In the Dry Park and Horse Ridge big game winter habitat area near the South Fork Flathead River, steep west-facing or south-facing slopes are used by wintering elk even though they have very little tree cover. These slopes receive more sun, even in winter, so not much snow accumulates. In these areas, it is important to avoid prescribed burning or slashing trees on benches where animals bed down.
- In all types of winter habitat, patches of dense trees in the understory, to provide wind protection, and arboreal lichens, for feeding, are desirable. Dense patches of small trees and shrubs could be retained in areas that are not adjacent to structures where it does not conflict with fire management desired conditions. Prescribed fire may also be used to promote an understory consisting of small patches of grasses and forbs, shrubs, and small trees.

Warm moist biophysical setting

Within the Flathead's warm-moist biophysical setting, vegetation treatment selections generally favor the retention and increase of western larch, rust-resistant western white pine, ponderosa pine, and cedar on more mesic sites. Specific activities could include timber harvest, prescribed fire, planting, precommercial thinning, and commercial thinning, consistent with big game winter range desired conditions. Example actions include:

- Promoting increase in presence of western white pine by planting in harvest units, or areas burned by fire, and thinning or pruning within existing sapling stands.
- Thinning young stands to encourage growth and vigor of trees, and developing future large diameter western larch, Douglas-fir, western white pine and ponderosa pine. These activities create forest compositions and structures better able to withstand fire, insects, disease, drought and other disturbances, as well as providing seed sources for future forest regeneration after disturbance.
- Conserving existing large live trees and snags, greater than 20 inches d.b.h., where available.
- Trending toward an increase in the average patch size of early successional forest, which may be accomplished through regeneration harvest or prescribed burning.
- Reducing stand densities and inter-tree competition to increase resilience to anticipated future climates and to meet desired conditions with respect to fire behavior.
- Maintaining overstory shade to protect understory trees, while reducing stand densities overall to promote tree growth and development into larger diameter future trees in cedar-hemlock sites, where it is desired to encourage presence of these species.
- Protecting existing old cedar groves by managing surrounding stands to lower the risk of high severity fire. Management activities may include reducing tree densities and downed woody material.

See also possible strategies for big game winter habitat in the Warm-dry Biophysical Setting section of this appendix (most winter habitat is located in warm-dry or warm-moist settings).

Cool moist-moderately dry biophysical setting

Within the Forest's cool-moist to moderately dry biophysical setting, vegetation treatment selections would generally favor the retention and increase of western larch and Douglas-fir, and of rust-resistant western white pine in the overstory on the more mesic and warm sites within this setting. Example actions include:

- Promoting increase in presence of western white pine by planting in harvest units or areas burned by fire, and thinning/pruning in existing sapling stands.
- Thinning young stands to encourage growth and vigor of trees and to develop future large diameter western larch, Douglas-fir, and western white pine in the upper canopy layers, while retaining sub-alpine fir and spruce in the understory to maintain/develop multi-story hare habitat. This forest structure may be more vulnerable to high severity fire and less resilient to drought, but provides important habitat conditions for the threatened Canada lynx. The presence of large diameter overstory trees of fire-tolerant, desired species compositions improves tree survival in moderate or mixed severity fires and provides a potential seed sources for post-fire regeneration. Promoting western larch may also reduce losses due to insects and disease.
- Conserving existing large live trees and snags greater than 20 inches d.b.h., where available.
- Reducing stand densities and inter-tree competition in the wildland-urban interface, or in the stem exclusion structural stage, to increase resilience to anticipated future climates and to meet desired conditions with respect to fire behavior. In other areas, increasing the presence of western larch, particularly as larger tree components and in overstory canopy layers, and in areas dominated by lodgepole pine, to promote species tolerant of insects, disease and fire and with the potential to provide high quality habitat for cavity nesting/denning species.
- Creating openings in areas of moderately to densely stocked mid-successional forest, particularly areas dominated by lodgepole pine to increase forest structure and species diversity. Regenerating fire tolerant species, especially western larch or western white pine (where suited).

Cold biophysical setting

Within the Flathead's cold biophysical setting, vegetation treatment strategies generally favor the retention and increase of whitebark pine. Possible strategies that may be used include the following:

- Identifying whitebark pine trees and stands that contain phenotypically resistant trees for cone collection, seed production for natural regeneration, and scion and pollen collection,.
- Reducing stand density and fuels by thinning of felling of trees, to improve stand resilience and lower fire hazard
- Conducting insect control activities, such as applying pheromones packets
- Thinning sapling or larger-sized whitebark pine stands
- Planting whitebark pine seedlings or seeds
- Conducting prescribed burning on sites that best support whitebark pine establishment and growth (either natural regeneration-seed caching by Clark's nutcracker, or by planting).

Live tree retention within regeneration harvest units

Clarifying information and potential management strategies that may be used to meet the live tree retention guideline FW-GDL-TE&V-11 are listed below.

- The primary intent of this guideline is to promote the development and emphasize the importance of the large live tree forest structural component in the ecosystems and forests of the Flathead National Forest. It is a key component contributing to maintenance/creation of forests that are resilient in light of future uncertainty and to habitats important for the long-term persistence of native plant and animal species. The secondary intent is to retain the trees that are selected for leaving under this guideline indefinitely (e.g., not removed in a subsequent harvest activity) to provide desired conditions over the

long term. In timber harvest areas, in the event that these retained trees fall over or are felled (e.g., for safety reasons), they would generally be left onsite to provide coarse woody debris habitat.

- Selection of leave tree species, sizes, amounts, distribution, and conditions is based on the multiple reasons and values associated with retention of live trees that are stated in both FW-DC-TE&V-13 and FW-GDL-TE&V-11 (e.g., improve forest resilience, future potential seed sources, wildlife habitat, etc.).
- Consideration of long-term forest conditions are as important as short-term when developing leave tree retention prescriptions. For example:
  - Leaving smaller diameter trees of desirable species and vigor that persist on the site indefinitely may be preferable to leaving larger size trees of less desirable species or condition, because of the long-term potential to achieve desired structural diversity and a very large (> 20 inch d.b.h.) tree component on the site in the future.
  - Potential for development of late successional or old growth forest.
  - The intent is not to leave sapling or small diameter (i.e., < 9 inches d.b.h.) trees in place of larger trees to meet the guideline; however, retention of smaller trees may be part of the prescription to meet other desired forest conditions.
- Prescriptions to meet this guideline may vary considerably. Site-specific conditions and project-level multiple resource objectives are expected to be integrated to determine leave tree density, patterns, species, sizes, conditions (i.e., growth and vigor), etc. Alternative prescriptions to this guideline may be developed and documented based on these site and project-specific factors.
- Examples of site-specific conditions and considerations that may influence the leave tree retention prescription include the following:
  - Influence on growth and development of newly regenerated trees, considering, for example, the shade intolerance of species such as western larch, ponderosa pine and western white pine. It is not desirable to leave densities of overstory trees that unduly inhibit growth and development of newly regenerated stands. Leaving scattered small groups or patches of leave trees may be an option.
  - Existing insect or disease conditions that would affect long-term persistence of live leave trees, or have undesirable effects to the regenerated stand. For example, trees heavily infected by dwarf mistletoe; root disease presence. Conversion to species that are less vulnerable to the insect or pathogen may be an option.
  - Logging, slash removal or site preparation methods may limit species, size, or distribution of leave trees. Operational limitations of logging methods may influence location or pattern of leave trees. Additionally, the potential for leave tree mortality (i.e., snag creation) with broadcast burning needs to be considered. If maintaining live leave trees on the site is deemed to be especially important, or if particular leave trees are of high value (i.e., very large diameter ponderosa pine) methods to increase probability of survival may be needed, for example, removing slash from the base of trees prior to burning.
  - Trees may be retained for reasons other than the primary intent of the guideline, for example: trees with decay, or in poor condition, may be desirable for future snag and downed wood habitat; trees may contribute to scenic integrity or other social benefits; trees may provide shade for newly regenerated seedlings; and understory trees that provide desired forest structures in the short or long term.

Old growth forests and old growth habitat

Old growth forest is defined by specific structural attributes and other characteristics as described in the Forest Service publication, *Old growth forest types of the Northern Region.*[34] Old growth habitat includes stands that meet the definitions for old growth forest, in addition to stands that may have some of the structural or other stand characteristics that provide habitat for wildlife species associated with old growth but do not fully meet definition for old growth forest. For example, old growth habitat may include stands that contain large diameter trees but these trees are younger than required to meet old growth forest definitions (refer also to the glossary).

Desired condition FW-DC-TE&V-15 – old growth forest

A primary function of this desired condition is to highlight the dynamic nature of this forest structure class and the importance of planning for long-term development of old growth forest, as much as protecting existing old growth forest. It is understood that old growth forest may be lost to fire, at times, and be gained through natural succession of vegetation. Forest plan direction for old growth forest acknowledges and supports the enhancement of the successional process towards old growth forest that could be achieved through management activities.

Desired conditions FW-DC-TE&V-11, 12, 13 – forest size classes and very large tree subgroup

In addition to the desired condition for old growth forest (FW-DC-TE&V-15, above), these desired conditions relate to forest and tree size classes are intended to contribute to the needs of wildlife species associated with old growth habitat. The very large tree size class desired conditions in FW-DC-TE&V -11 and -12 could be reasonably expected to correlate closely with old growth habitat. The very large tree subgroup described in FW-DC-TE&V-13 further addresses the retention and development of very large trees, which is expected to contribute to old growth habitat.

Guideline FW-GDL-TE&V-07

The key vegetation management direction in this guideline is to (1) increase the resilience of old growth forest to potential future disturbance, which may result in loss of old growth characteristics (e.g., high severity wildfire or epidemic insect outbreaks); (2) increase the size and shape of old growth forest patches so that there are portions 300 feet or more from early successional forest edge; and (3) promote the long-term (i.e., beyond the plan period) development of future old growth forest or old growth habitat. Guidance and potential strategies to achieve this guideline are presented in following subsections:

Landscape or watershed level

In areas where it is desirable to alter old growth forest conditions at the watershed level (e.g., the size, shape, structure and connectivity of old growth forest patches), a possible management strategy may include the following considerations:

- When planning timber harvest, retain stands adjacent to existing old growth forest stands that would provide future old growth in the shortest time frame possible. Selection of forest stands for

[34] Green P., J. Joy, D. Sirucek, W. Hann, A. Zack and B. Naumann. 1992. Old growth forest types of the Northern Region. Errata corrected 2005, 2007, 2008. USDA, Forest Service, Northern Region Document Number R-1 SES 4/92. Missoula, MT. 609 pp.

development of future old growth may be emphasized in watersheds where existing old growth forest or habitat acres are less than the desired conditions at the forestwide scale; where shape of old growth forest or habitat patches is largely linear and narrow; where individual patches are relatively small (e.g., average less than 100 acres), and/or where connectivity of patches is poor. Examples strategies to develop future old growth are listed under the following section, "Stand level."

- At the project level, assess old growth patch size by analyzing the amount of high contrast edge between old growth habitat and openings.
- Consider treatment of forest adjacent or near old growth stands to result in reduced fire hazard, alter potential fire spread or fire severity, or reduce potential insect or disease outbreak that may spread to old growth forest.

Stand level

Long term persistence of old growth forest on the Flathead National Forest is closely tied to forest plan components and guidance related to development of resilient forests, with particular focus on promoting presence of fire resistant, large diameter, long-lived trees. In other words, many of the desired conditions for vegetation characteristics, and the standards and guidelines developed to achieve those desired conditions, also contribute to the achievement of this direction related to old growth, including the following:

- Vegetation composition – desired increase of ponderosa pine, western larch, western white pine (long-lived, large diameter, resilient to fire)
- Forest size class – desired increase in large and very large size class
- Live tree retention guideline (refer to the discussion presented under the "Live tree retention within regeneration harvest units" section earlier in this appendix)
- Snag and downed woody material.

Any stand where current or potential tree growth, species composition, or other forest components are conducive to development of old growth forest or habitat over time may be considered for prescriptions to encourage that development. Example prescriptions include:

- Managing mature or late successional forests that do not meet the definition for old growth forest, but have characteristics of old growth that are important for wildlife (e.g., large live trees with heart rot for nesting and denning, medium-sized live trees to provide bird feeding perches, larger snags, favorable species composition, and diverse stand structures). These stands may be retained or may be treated to make them more resilient to fire and climate change. For example, timber harvest could occur within these stands to remove intermediate canopy trees and reduce ladder fuels or to reduce the basal area of remaining trees to make them more resistant to insect infestation and drought. Additional actions may include:
    - Retaining overstory trees and selectively thinning young understory trees in previously harvested stands that contain residual large trees. These may be past seedtree or shelterwood cuts.
    - Long-term retention of live leave trees within new harvest units, as well as in salvage units in burn areas. These may be healthy immature or mature trees with good growth rates, with good potential to achieve larger size classes over shorter time periods. They may be large trees with heartrot fungi, wounds, or broken tops that predispose them to dying in the future.
    - Retention of snags, especially large snags, both soft and hard, arranged as solitary trees or in small clumps. In areas that are lacking the minimum number of snags specified in the guidelines,

techniques to create nesting and denning habitat can be used such as girdling or topping, and/or artificial structures such as nest boxes/platforms may be installed.

- Leaving the largest live, diseased, or dead trees available in timber harvest units, to meet the needs of a larger number of wildlife species.
- Using modified thinning prescriptions in young stands of seedling/sapling or small tree sizes where species composition and stand structure are favorable for relatively rapid development of desirable future old growth structures. Treatment of the forest at the early successional stages can greatly influence composition, size, and other structural characteristics of the future forest. At the least, early treatments widen future options for managers to achieve desired ecological, social and economic outcomes for that stand
- Using prescribed fire, harvest, and/or thinning to create a small-patch mosaics of grassy openings, shrubs, dense patches of saplings, very large live trees, and large snags to address the maintenance or development of old growth forest or habitat, to restore historic stand structure, and to improve habitat for associated wildlife species within ponderosa pine stands. Snags could be arranged singly, as well as in clumps, to provide habitat for species such as flammulated owls, mountain bluebirds, pygmy nuthatches, and Williamson's sapsuckers.
- Protecting trees that have been retained in harvest units by using "wildlife tree" signs and/or clearing fuels beneath leave trees, if units would have slash treatment with prescribed fire.
- Clearing vegetation around the base of "legacy trees" (e.g., large, old western larch or ponderosa pine trees exceeding 25 inches d.b.h.) increases a legacy tree's resilience to climate change, fire and other disturbances.

Snags and downed wood

Desired condition FW-DC-TE&V-16, 17, 18 – key points

On lands suitable for timber production and within the wildland-urban interface, it is recognized that snag and down wood presence is generally more dependent on human actions than on natural disturbances. Expectations are for lower overall snag/down wood densities in these areas than in areas unsuitable for timber production or outside the wildland-urban interface, with greater emphasis on larger diameter material of desired species, to provide for desired distribution of important wildlife habitat. Of particular importance is the warm moist and warm dry settings, which are disproportionately located in wildland-urban interfaces and within lands suitable for timber production.

Additionally it is important to recognize opportunities to develop future snag habitat, of desired species and large sizes, by managing forests in the present to achieve desired composition, tree sizes, and forest densities.

Standards and guidelines (FW-STD-TE&V-05, 10)

Site-specific analysis may occur at the project level that supports an alternative prescription for snags or downed wood. The following factors may be considered in development of alternative prescriptions:

- Analyzing snag habitat at the broader scale than the harvest unit, and evaluating existing distribution, abundance, location and characteristics of snags within the larger landscape and/or project area, relative to snag availability and retention needs within harvest units.

  - Recognizes snags (and downed wood) are unevenly distributed/clumpy at the landscape scale, and snag characteristics also highly variable across the landscape.
  - Consider the proportion of area influenced by harvest activities relative to the proportion of area influenced primarily by natural disturbances.
  - Consider current disturbances within the project area or across the broader landscape that may be providing abundant snags of desired characteristics, either in the short term (i.e., fire) or longer term (i.e., root disease, dwarf mistletoe). This may result in more focus on retaining live trees to meet future snag needs and leaving high stumps to provide wildlife feeding habitat.
  - Consider snag characteristics (species, size, condition) within harvest units relative to availability of these characteristics across the landscape.
  - Consider achievement of snag retention standards across all units, rather than each unit individually. This approach allows for incorporating and retaining the naturally clumpy distribution of snags, leaving greater numbers of higher quality snags where they exist.
- Considering the long and short-term perspective: Snags are a relatively short-term component (most become downed wood within a few years or decades).
  - Consider role of live trees in the present that contribute in the far future to desired snag habitat (composition, size), especially in the event of natural disturbance, such as fire.
  - Promote larger trees of fire resistant species to meet multiple forest plan desired conditions, including future desirable snag/downed wood habitat (e.g., western larch, ponderosa pine, Douglas-fir, western white pine).
- Considering cone collection needs with creation of desired decayed trees/snag habitat. For example, retention of select western larch trees within units, anticipating that they may be topped for purposes of collecting cones, which may also create desirable snag habitat.
- Considering other resource desired conditions or associated plan components (social, economic) that may influence stand or landscape-level snag prescription including a desire to reduce fuels to lower probability of high severity fire (in the wildland-urban interface). Lower densities of smaller snags (i.e., <15 inch d.b.h.) and lower amounts of downed woody material may be determined an appropriate prescription for portions of the wildland-urban interface. Larger diameter snags and downed woody material may be determined appropriate to retain, due to their relatively low contribution to fire hazard levels and their desirable contribution to soil function and wildlife habitat needs.

Forest pattern, patch sizes

Analyses of the natural range of variation indicates wide ranges in size of early successional seedling/sapling forest patch sizes, which would be expected considering the predominance of moderate and high severity fire disturbance regimes (refer to the environmental impact statement planning record exhibits for details on this analysis). The proposed action includes components that address desired forest patterns and patch sizes, particularly related to early successional seedling/sapling dominated openings across the landscape to (FW-DC-TE&V-19).

Character of forest patches and patterns related to early successional forest openings changes relatively rapidly compared to mid and later successional forest conditions. This is because seedling/sapling stands transition relatively quickly into mid-successional stands, with larger trees and dense forest canopies. This may occur 30 to 40 years after the disturbance that established the new forest. Stands can remain in this mid-successional, closed canopy, densely forested condition for many decades, or centuries if not altered

by stand replacing disturbance. Both fire (prescribed and wildfire) and timber harvest can be possible management tools for maintaining and creating desired amount and distribution of young, early successional forest patches.

Application of the standard specifying maximum opening size for timber harvest (FW-STD-TIMB-07)

Background information

The National Forest Management Act (NFMA) is the foundation for this standard. The National Forest Management Act limits clearcutting and other even-aged harvest to situations where: "(iv) there are established according to geographic areas, forest types, or other suitable classifications the maximum size limits for areas to be cut in one harvest operation, including provision to exceed the established limits after appropriate public notice and review by the responsible Forest Service officer one level above the Forest Service officer who normally would approve the harvest proposal." (16 United States Code 1604(g)(3)(F)).

The 2012 planning rule (36 CFR part 219) and the associated guidance provided in Forest Service Handbook 1909.12, chapter 60, provide direction for the development of plan components related to timber production to ensure consistency with the Act. This direction includes specific requirements for development of plan components associated with size of created openings (Forest Service Handbook 1909.12, section 64.21).

The 2012 planning rule states that the plan, "must include standards limiting the maximum size for openings that may be cut in one harvest operation according to geographic areas, forest types or other suitable classifications," and within the forest types of the Flathead National Forest, this limit may not exceed 40 acres (36 CFR 219.11(d)(4)). This is the opening size limit under the 1986 Flathead Forest Plan. The 2012 planning rule provides for development of components that exceed opening size limits, where "larger harvest openings are necessary to help achieve desired ecological conditions" (36 CFR 219.11(d)(4)(i))." In addition, the 2012 rule (and the National Forest Management Act) provides for openings that exceed maximum limits in cases of "natural catastrophic conditions, such as fire, insect and disease attack, or windstorm" (36 CFR 219.11(d)(4)).

The standard FW-STD-TIMB-07 refers to the 40-acre maximum size that is stated in the 2012 planning rule and the Act and provides the new maximum opening sizes, consistent with the exceptions to the regulations, as also stated in the 2012 rule. This standard includes the particular conditions under which the larger size is permitted, including the desired conditions that the exception intends to achieve, as required by the 2012 rule. Openings up to this new maximum size do not need public review and Regional Office approval, as per the 2012 planning rule.

For development of the revised Flathead forest plan, analysis of natural range of variability in early successional forest conditions (e.g., openings) was conducted. Comparison to current size of openings was also done. This information was integrated with other resource and social considerations to derive the desired conditions for early successional forest openings, and the standard specifying maximum opening sizes for timber harvest. These considerations included the following:

- Warm dry and warm moist biophysical settings: Maximum opening size is placed at the lower end of the estimated natural range of variation, in consideration of where the majority of these sites are located, e.g., lower elevations, intermingled ownership, nearer to homes/communities, higher road concentrations, more easily accessible, big game winter range (warm dry).

- Cool moist-mod dry and cold biophysical setting: Maximum opening size is placed at lower end of the estimated natural range of variation. Current mean opening size is near the estimated natural range of variation mean due to recent fires. Most of the cool moist-mod dry setting is located in areas unsuitable for timber production and wildfire and prescribed fire is likely to play a dominant role in the future for creating large openings, rather than harvest. Essentially all of the cold biophysical setting is unsuitable for timber production, and wildfire/prescribed fire is expected to dominate in this setting.

Potential strategies

These strategies apply during project-level analysis, at both the landscape and stand level, to trend toward or maintain desired conditions for forest patterns and patch sizes and associated forest conditions (FW-DC-TE&V-03, 04, 19, FW-DC-ECOS TIMB-06)

- Trend towards creation of larger opening sizes across landscapes where analysis has indicated that the size and/or pattern of openings in not consistent with desired patterns or vegetation/habitat conditions. Larger openings have less edge per unit area, which is desirable for wildlife species that avoid edge habitats or experience greater mortality near edge habitats. Management strategies to create larger patch sizes across the landscape may include the following:
    - Retaining additional forest structural components within larger regeneration harvest areas to provide greater short and long-term structural diversity and provide a more visually pleasing landscape. This strategy could include leaving patches of uncut forest or individual/small groups of live trees distributed throughout the harvest openings and also may include retaining greater numbers of snags.
    - Considering scenery in project design (FW-GDL-SCN-03). To lessen the visual impact, larger harvest openings can have irregular shapes that are blended to the natural terrain. Retention of individual or patches of trees within the opening would also create a more visually pleasing appearance. Consideration for the natural patterns that might be produced by a mixed severity fire may be incorporated into the shape and size and design of openings. In this case, there would be an expectation of short-term visual impacts to achieve long-term benefits may be understood.
    - Locating new harvest openings immediately adjacent to existing patches of sapling size trees. This initially creates a larger patch of early successional forest, where trees are of the same cohort (i.e., ages are within 20 years of each other), while lessening potential concerns related to larger openings.
    - Considering the location of larger units. When determining where a larger opening might be created, consider factors such as: wildlife security (e.g., adjacency to open roads or viewpoints); visibility from areas with high level of public use; desired conditions related to potential fire behavior and fuel loadings; watershed conditions related to water yields; big game winter range desired conditions.
    - Considering desired conditions for development of future late successional and old growth forests. Larger patches of young, seedling/sapling forests can eventually develop into larger patches of old growth or late successional forest over time, which is a desired long term condition for the ecosystem (FW-DC-TE&V-15 and FW-DC-GDL-07).

Managing forest pattern to provide wildlife habitat connectivity

Because cover providing wildlife habitat connectivity changes due to a variety of processes (e.g., wildfire, insects, disease, timber harvest, prescribed fire), it is best assessed for vegetation management projects on

a site-specific basis—at a stand scale and at a 6th code hydrologic unit code (HUC) watershed scale. Site-specific analysis of forested connectivity looks at connections provided by and between areas of forests to maintain connectivity for wildlife species associated with forest interior conditions. An example of a method to accomplish this strategy would be to retain patches of trees with an average d.b.h. of at least 5 inches, which are shaped so that a portion of the patch is more than 325 feet from the edge (of a stand with an average d.b.h. of less than 5 inches). This location can be determined by taking the forest patch that is greater than 5 inches average d.b.h. and using the geographic information system (GIS) spatial buffer analysis tool to create an interior buffer of 325 feet while also paying special attention to providing forested connections in RMZs, in saddles along ridgelines, and also between old growth forest patches.

An example of a project analysis using this strategy is displayed in figure C-1 (A. Jacobs, USFS Wildlife Biologist). In this example, harvest units are designed so that green and brown patches (cover) are maintained that are at least 650 feet wide in between patches of yellow (not cover). In addition, special consideration is given to retaining late successional forest (dark green) between and adjacent to patches of brown (old growth) to increase the size of patches that have old growth habitat characteristics and to maintain its connectivity.

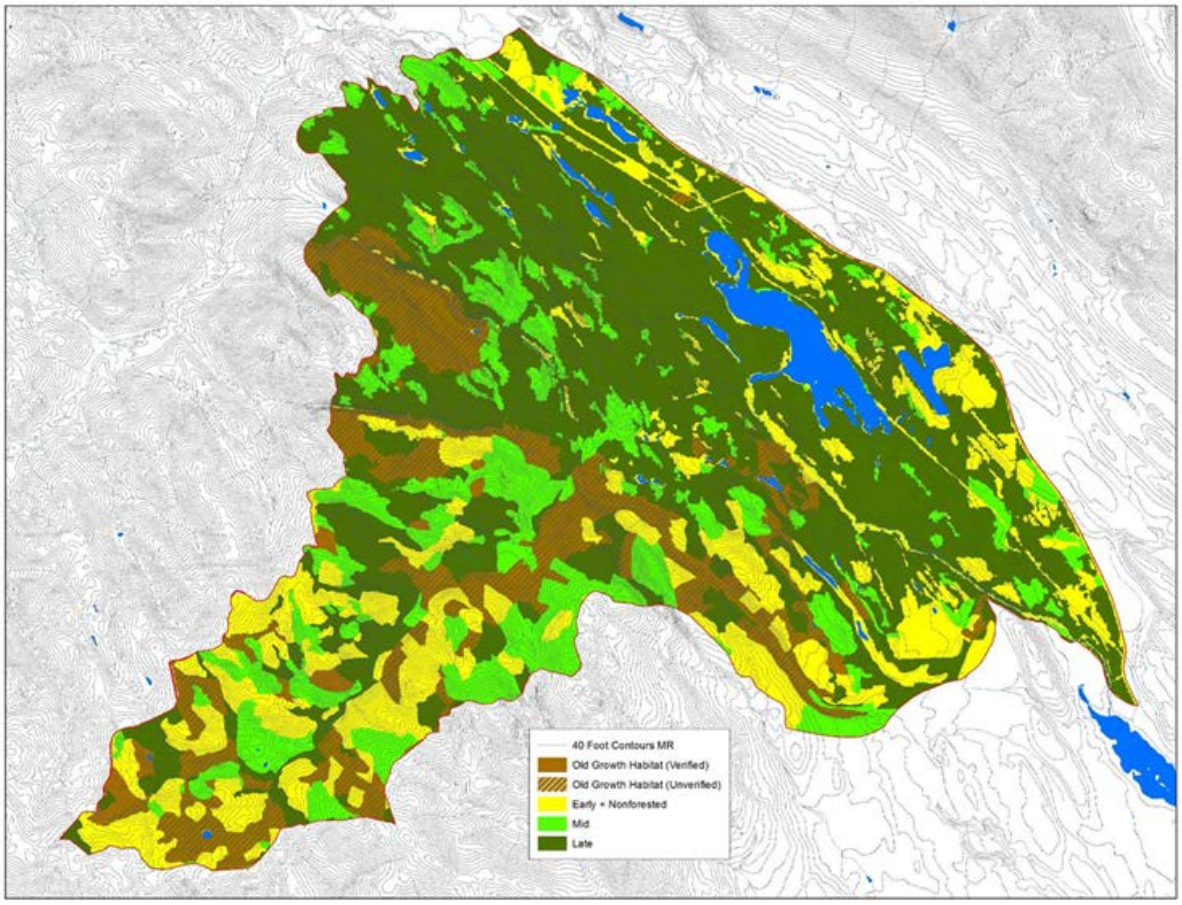

Figure C-1. Example of habitat connectivity analysis

In another example, for projects planned in portions of the Salish Mountains or Swan Valley geographic areas where sections under other land ownerships have been regenerated, unit location and treatment prescriptions could consider the long-term desired condition to create more “natural” forest patterns,

patch sizes, and shapes across the landscape, reducing the "checkerboard" pattern. A way to accomplish this strategy would be to create new, irregular shaped harvest openings adjacent to existing seedling/sapling stands that have a straight edge, to make the total opening blend in with the surrounding landscape.

Other wildlife connectivity considerations include the following:

- Coordinating with other agencies or landowners to identify practices that facilitate wildlife movement and reduce mortality, when highway or forest highway construction or reconstruction is proposed in linkage areas, as well as using the best available scientific information (e.g., Highway Mitigation for Wildlife in Northwest Montana[35]).
- Emphasizing key habitats such as riparian areas, to maintain connectivity across all lands.[36]
- Protecting and restoring ecological connectivity as a leading climate adaptation strategy for biodiversity. Conservation and riparian areas have been identified as key targets for these efforts.[37]

Burned forests

This section provides strategies for FW-DC-TE&V-24 and use of fire to maintain or increase forest diversity and resilience. Management area discussions and the "Fire" section of the proposed plan also provide direction on the desired role of wildfire as well as wildfire suppression.

- Assessment of salvage harvest in burned forests is best considered in a landscape context. In many areas of the forest, stand-replacing wildfires may kill trees over thousands of acres. Evaluating the entire area within the burn perimeter to determine the percentage of each management area contained within it provides important information. For example, if a large percentage of the wildfire area is within management areas that would not be accessed for salvage harvest, then more salvage harvest may be considered within management areas that are accessible.
- When wildfires occur, site-specific analysis can be used to address desired conditions to salvage dead trees for economic value, for future fire behavior, for social considerations such as spread of insects to adjacent private lands, and for desired ecological conditions.
- Several wildlife species are associated with burned forests. Black-backed woodpeckers are closely associated with intensively burned areas that have at least 50 percent canopy closure prior to wildfire. Following wildfire, use of burned areas by black-backed woodpeckers changes over time and they move from areas where trees have died immediately after fire, to areas where trees die slowly after fire, to unburned areas. The following example strategies benefit black-backed woodpeckers and could be used when considering post-fire salvage harvest of wildfire areas:

[35] Ament R., P. McGowen and M. McClure. 2014. Highway Mitigation for Wildlife in Northwest Montana. National Fish and Wildlife Foundation. http://largelandscapes.org/media/publications/Highway-Mitigation-Wildlife-NW-Montana.pdf.
[36] Haber, J. and P. Nelson. 2015. Planning for Connectivity, A guide to connecting and conserving wildlife within and beyond America's national forests. Ament, R., G. Costello, W. Francis and M. Salvo (contributors). The Center for Large Landscape Conservation, Defenders of Wildlife, Wildlands Network and Yellowstone to Yukon Conservation Initiative. 26 pp. http://www.defenders.org/publication/planning-connectivity
[37] Krosby, M., R. Norheim and D.M. Theobald. 2015. Riparian Climate-Corridors: Analysis Extension, Improvements, and Validation. Climate Impacts Group, University of Washington, Seattle. https://cig.uw.edu/publications/riparian-climate-corridors-analysis-extension-improvements-and-validation/

- For new fires that burn more than 250 acres at moderate to high severity, retain a range of snag species preferably with a minimum d.b.h. greater than 9 inches d.b.h. for nesting.
- Retain clumps of burned trees, including both nest trees and trees with high densities of wood-boring beetles for feeding, because food sources near nest trees appear to be limiting to black-backed woodpecker populations. In burn areas greater than 1000 acres in size, consider retaining larger patches at least 100 acres in size.
- Retain snags in the interior of the fire area, if possible, and where snags would not be susceptible to loss due to firewood cutting.
- In addition to dead trees, retain live trees that are scorched because they die over a longer period of time, helping to maintain higher populations of black-backed woodpeckers.

- Recognize the value of different snag tree species for wildlife:
  - Douglas-fir – high value feeding habitat, short longevity (i.e., lower value as nesting habitat)
  - Ponderosa pine – high value feeding habitat; value for nesting, though shorter longevity than western larch (especially important for flammulated owl habitat)
  - Western larch and western red cedar – high value for feeding and nesting, highest longevity. Case-hardened western larch snags are valuable for perching (flycatchers) and drumming (woodpeckers) and may last many decades, though they may not provide nesting habitat unless they eventually get some interior rot
  - Cottonwood, birch and aspen – high value nesting and feeding, even when small diameter, rot and tops break out but still of high value; high value for denning.
  - Lodgepole pine – high value for feeding
  - Englemann Spruce – short longevity, high value for feeding, large rootwads and boles high value for denning.

Non-coniferous plant communities

Potential strategies for FW-DC-TE&V-10 to maintain or increase the presence of hardwood trees and FW-OBJ-TE&V-03 for vegetation management treatments on 500 to 5,000 acres of forest to contribute to restoration of diverse native hardwood forest types:

Retaining hardwood trees to the degree possible within harvest units

Removing understory conifers in aspen or cottonwood plant communities, through cutting or understory trees or use of prescribed fire

- Root-cutting, burning, or cutting of hardwood trees less than 10 inches diameter breast height (d.b.h.) to promote suckering
- Allowing beavers to flood areas to maintain and regenerate hardwoods and other riparian areas.
- Planting hardwood seedlings and/or stems.
- Retaining vegetation adjacent to large cottonwood trees if needed to help prevent blowdown.
- Retaining cottonwood trees in largest size classes to provide nest sites for species such as Pileated woodpeckers or great blue herons and provide den sites for fishers and black bears.

Potential strategies for FW-OBJ-TE&V-04. Vegetation management treatments on 1,500 to 5,000 acres to promote persistence of grass/forb/shrub plant communities, focusing on key habitats for big game species to improve conditions for native plant establishment and growth and reduce non-native plants. Possible actions in cooperation with Montana Fish, Wildlife and Parks; counties, and non-government organizations, include the following:

- Slashing and/or managing fire (i.e., prescribed fire and wildfire) to maintain or create grass/forb/shrub openings and stimulate shrub sprouting
- Revegetating disturbed sites with native grass/forb/shrub species
- Treating invasive weeds, with biological, chemical, or mechanical means, as appropriate.

Threatened species, endangered species, and species of conservation concern associated with terrestrial habitats

The following subsections provide possible strategies for plant and wildlife species in this category (also see strategies identified under the Terrestrial Ecosystem and Vegetation Management, Fire Management, Watershed, Riparian Habitat, and Aquatic Species sections of this appendix).

Plants

Water howellia

Direction within the conservation strategy (second edition[38]) guides management actions related to *Howellia aquatillis* on NFS lands. This direction is necessary to ensure the long-term persistence of water howellia, and would be updated as needed with new information as available.

Whitebark pine

Whitebark pine habitat is present in most of the recommended wilderness areas, and is considered a key ecological component in these areas, providing an important contribution to sustaining the wilderness quality and character. This contribution includes habitat for wildlife species, scenic character, forest ecological resilience and health, maintenance of naturalness and natural processes, and trending forests towards natural range of variability for forest composition and structure.

The revised forest plan explicitly allows for implementation of restoration activities associated with whitebark pine and other ecological conditions so long as “the social and ecological characteristics that provide the basis for wilderness designation are maintained and protected.” The intent is to continue to allow for such activities as prescribed burning, planting and thinning of whitebark pine, insect and disease protection measures, fuel reduction around cone-collection trees, caging cones, and collection of seed and scion within recommended wilderness areas.

Site-specific environmental assessment and analysis is needed prior to applying activities related to restoration of whitebark pine. The publication, “A Range-Wide Restoration Strategy for Whitebark Pine”[39] includes considerations when proposing restoration activities within recommended wilderness

[38] USDA. 1997. Conservation strategy for *Howellia aquatilis* A. Gray, second edition, USDA, Northern Region, Flathead National Forest. 24 pp.
[39] *Ibid*

areas because of the need to maintain and protect the social and ecological characteristics providing the basis for wilderness designation. To provide additional support and documentation for restoration activities it is recommended that a white paper be developed that consolidates known information on whitebark pine specific to the Flathead National Forest. This paper may include information on:

- Conditions of whitebark pine on the Flathead National Forest, why it is in its current condition (human-caused introduction of exotic disease), ecological consequences
- Documentation of inventories, research, studies, professional and local knowledge, and publications or other information that supports the importance of restoration efforts for local populations
- Flathead National Forest whitebark pine restoration program goals, objectives, methods, strategies and priorities
- Present and future needs, expectations, and uncertainties.

Wildlife

Canada lynx habitat and/or critical habitat

This section provides possible strategies for FW-DC-TE&V-08, FW-DC-TE&V-19, FW-DC-WL-03, Appendix F VEG O2, O4, and S5.

The physical and biological conditions providing for Canada lynx and their critical habitat changes over time as a result of fire, forest succession, timber harvest and other vegetation management techniques that create a mosaic of structural stages and species compositions.

In modelled Canada lynx habitat, and outside the wildland-urban interface, the desired condition for each lynx analysis unit is to have interconnected areas of mature multi-story forests with Engelmann spruce and subalpine fir trees exceeding 1,000 stems per acre in the understory (less than 4 inches d.b.h.) and 280 stems per acre in the mid-story and overstory (greater than 4 inches d.b.h.)(Squires 2010). Young forests with extremely high densities (e.g., greater than 14,000 stems per acre) occur following wildfires, but are interspersed in a mosaic with stands of much lower densities that are developing a multi-storied stand structure. Down trees provide sites for denning. Branches of live trees and shrubs touch the snow surface in winter to provide food and cover for snowshoe hares. Where conditions allow, a habitat mosaic including long, linear patches of interconnected mature forest adjacent to dense young forests is desirable. Treatments are determined by site-specific analysis of potential vegetation types and current vegetation conditions at the stand and lynx analysis unit scales, in the context of the forest scale detailed in the DEIS.

At any given point in time, some forested stands in lynx habitat provide lynx habitat in a suitable condition and some would not. Lynx habitat may be in a temporarily unsuitable condition due to processes such as wildfire, insects or disease infestation, timber harvest, thinning, or prescribed burning. Timber harvest and prescribed burning may be used to create lynx habitat in a suitable condition in areas that currently do not have dense understory conditions, for example:

- Timber harvest methods may include regeneration harvest, group selection or intermediate harvest methods in the stem exclusion structural stage or in other forested stands that currently do not have a dense understory providing snowshoe hare habitat. Prescriptions may be designed to favor dense regrowth of coniferous tree and shrub species that provide food for snowshoe hares (table C-4).

Table C-4. Food plants used by snowshoe hares in the Western Rockies, Cascades and Intermountain West (source: table 2.1 Lynx Biology Team 2013)

Conifers	Shrubs	References
Abies lasiocarpa	*Amelanchier alnifolia*	Adams 1959 (MT)
Abies grandis	*Arctostaphylus uva-ursi*	Koehler 1990*a* (WA)
Larix occidentalis	*Ceanothus* spp.	Radwan & Campbell 1968 (WA)
Picea engelmannii	*Juniperus scopulorum*	Thomas et al. 1997 (WA)
Pinus contorta	*Mahonia repens*	Sullivan and Sullivan 1983 (BC)
Pinus monticola	*Paxistima myrsinites*	Borrecco 1976 (WA)
	Pteridium aquilinum	Black 1965 (OR)
Pinus ponderosa	*Rosa* spp.	Wirsing and Murray 2002 (ID)
Pseudotsuga menziesii	*Rubus* spp.	Zahratka 2004 (CO)
Thuja plicata	*Salix coulteri*	Zimmer 2004 (MT)
Tsuga heterophylla	*Shehperdia canadensis* *Spirea betulifolia* *Symphoricarpus albus* *Vaccinium* spp.	Ellsworth and Reynolds 2006

- Salvage harvest may be conducted in areas that do not have a dense live understory providing snowshoe hare habitat (e.g. stands of mature lodgepole pine trees that are killed by mountain pine beetle or stands where trees have been killed by stand-replacing wildfire).

Monitoring of areas recently burned by wildfire on the forest indicates that a continued adaptive management strategy may be desirable to promote lynx habitat conditions that are more sustainable in the face of expected future climates. If supported by the best available scientific information, and if approved by the regional level of the Forest Service and State level of the USFWS, the following strategies may be used:

- In some forested stands within lynx habitat that have been recently harvested or burned, precommercial thinning using modified methods may occur to promote development of future mature multi-storied winter snowshoe hare habitat in lynx analysis units where it is lacking, where stands that have regenerated from wildfire consist of extremely dense (14,000–50,000 stems per acre) lodgepole pine or western larch, or where there is an abundance of early stand initiation forest resulting from large areas burning at one time. The location, amount and type of precommercial thinning would be based upon an analysis of vegetation conditions at the lynx analysis unit scale, guided by the best available scientific information, and finalized through appropriate consultation.
- In dense lodgepole pine stands, techniques studied by Bull and others[40] may be used. Bull and others evaluated a variety of precommercial thinning techniques using telemetry locations from 87 snowshoe hares within lodgepole pine stands located in northeast Oregon. Treatments studied included stands thinned 4–10 years ago using traditional, even tree spacing (14 x 14 ft); stands thinned 20–25 years ago using traditional, even tree spacing (10 x 10 ft), and two alternative thinning methods where strips or patches of trees were thinned in a surrounding matrix of unthinned trees. Similar to other researchers, Bull found that forests recently thinned using traditional techniques

[40] Bull, E.L., T.W. Heater, A.A. Clark, J.F. Shepherd and A.K. Blumton. 2005. Influence of precommercial thinning on snowshoe hares. Research Paper PNW-562. USDA, Forest Service. Pacific Northwest Research Station. Portland, Oregon, 16 pp.

resulted in the lowest use by hares. The highest hare use of the five treatments was a technique Bull called "patch cuts," where small circular patches (10 meter, or 33 feet) of trees were thinned within a larger area of unthinned forest (at least 33–165 feet wide). This design is shown in figure C-2. Bull stated, "Of the thinning treatments, the highest numbers of trapped hares and the smallest home ranges occurred in the patch cuts (which had higher use than the unthinned forest control), whereas traditional methods of precommercial thinning lodgepole pine (recent thinning and old thinning) resulted in lowest numbers of snowshoe hares. In the short term, the patch cut appeared to provide the best habitat of those treatments investigated. The hare numbers that we found in patch cuts are characteristic of peak densities found in southern montane forests (1 to 2 hares/ha: Hodges 2000a *In* Bull and others[41]), and hare densities found in the other treatments were lower than these. Home ranges reported in this study were similar to the 12.4–28.8 acre home range size reported by numerous studies reviewed by Hodges (2000b *In* Bull and others[42]). The two new thinning regimes (patch and corridor cuts) were developed specifically to improve habitat for hares as compared to traditional thinning treatments, and we are not aware of these treatments being used elsewhere." Bull also found that cover provided by vegetation and coarse woody debris within 1 meter (3.3 ft) of the ground appeared to be important for hares, particularly in summer. Slash from the patch and corridor cuts provided both forage and dense hiding cover for a year after treatment. Coarse woody debris provided hiding cover at more than half the rest sites in summer, and created subnivean habitat at many of the rest sites in winter.

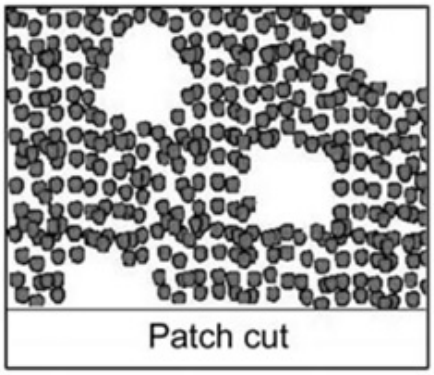

Figure C-2. Diagram of Bull's patch thinning technique

- The Flathead Forest may use other modified precommercial thinning techniques in areas where early stand initiation forests are abundant due to stand-replacing wildfire. The Forest has monitored these techniques and modelled changes in forest structure over long periods of time using the Forest Vegetation Simulator, which uses statistically reliable stand data collected in the field. The Forest simulated effects of "traditional" thinning techniques and "modified" techniques, where stands were thinned with the intent of specifically improving forest composition and structure to provide the kind of mature habitat hares and lynx need over the over the long-term. Figure C-3 and figure C-4 show simulated changes in structure and composition over time.

[41] Bull, E.L., T.W. Heater, A.A. Clark, J.F. Shepherd and A.K. Blumton. 2005. Influence of precommercial thinning on snowshoe hares, Research Paper PNW-562, USDA, Forest Service, Pacific Northwest Research Station. Portland, Oregon. 16 pp.
[42] Ibid.

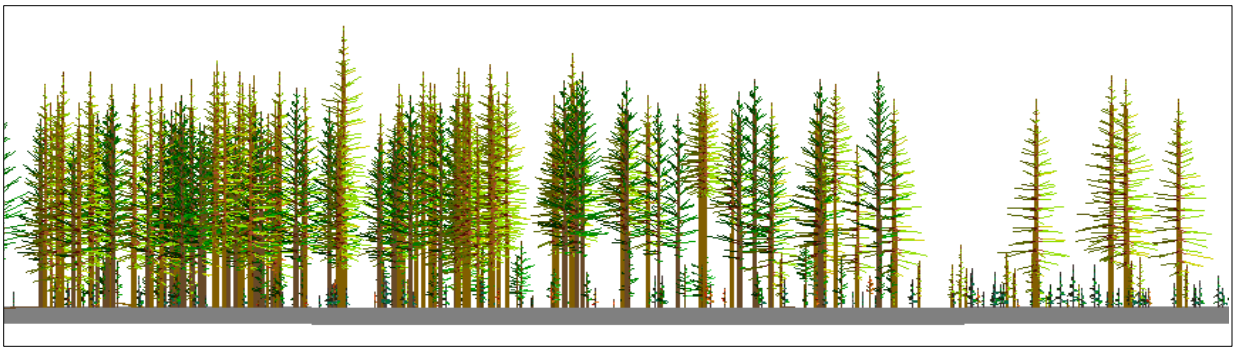

Figure C-3. Traditional thinning 20 years after harvest – 30 years later. All trees thinned to an average of 300 trees per acre–dense understory providing hare habitat lacking

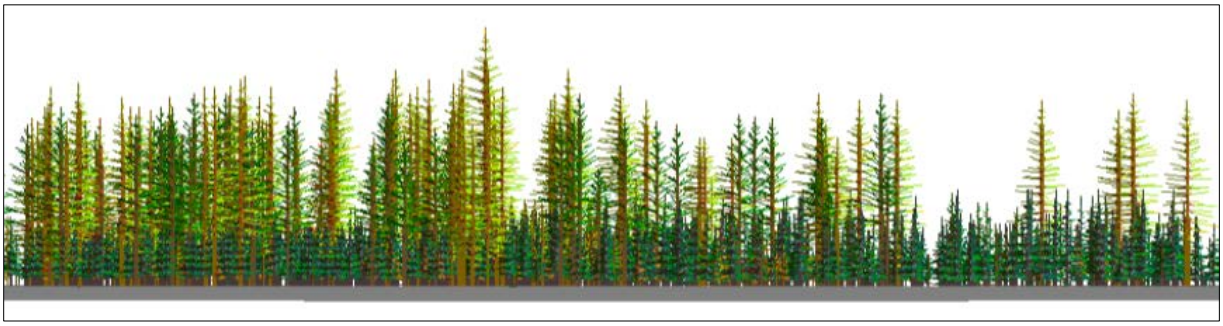

Figure C-4. Same forest stand as shown in the previous figure with modified precommercial thinning: 20 years after harvest – 30 years later. Western larch and Douglas fir canopy thinned to an average of 300 trees per acre, but smaller spruce and fir in the understory not thinned –dense understory providing hare habitat present

Vegetation management strategies could be used to promote future mature multi-story hare habitat, to increase resilience to anticipated future climates, and to meet desired conditions with respect to fire behavior so that infrastructure and existing areas of mature multi-story hare habitat may be protected. Methods to create mature multi-story hare habitat include modified thinning techniques in young (seedling/sapling) stands, which change the future forest structure and composition in ways that create winter snowshoe hare and lynx habitat (using appendix F, VEGS5 exception #1 and/or exception #3). Two examples of these modified thinning techniques follow:

- One example of a modified precommercial thinning prescription may occur in coniferous forest stands in the stand initiation structural stage, where there is Engelmann spruce and sub-alpine fir mixed with western larch and/or Douglas-fir. The taller trees (typically shade-intolerant species, such as western larch or Douglas-fir) may be thinned to a relatively wide spacing (i.e., 15 feet or more average spacing) and the shorter trees (typically shade-tolerant species, such as subalpine fir and Engelmann spruce) left unthinned. One way to implement this prescription is to require all trees below a certain height, such as 6 feet, to be retained, while thinning only the tree layer that is over 6 feet tall. This thinning method increases the growing space and sunlight received by all trees in the stand, allowing the subalpine fir and spruce to establish and flourish in lower canopy tree layers, while also developing an upper canopy of western larch and/or Douglas-fir with improved growth and vigor. This method promotes development of the stand into a mature multi-storied forest that can provide winter snowshoe hare and lynx habitat in the long-term. Field examinations of forest stands that were thinned using this method in the 1980s have shown that these stands developed a multi-storied stand structure in a shorter time frame than they would have without thinning. Lynx telemetry

data on the Flathead Forest shows that stands thinned in the 1980s are being used by Canada lynx in winter. Because western larch and Douglas-fir are adapted to surviving fire, if they reach a large enough size between wildfires (and sub-alpine fir or Engelmann spruce are not adapted to surviving fire), this strategy could be used to help maintain greater structural and species diversity over time, even if wildfires become more frequent. If species such as western larch are able to grow to large sizes and survive repeated fires, they can provide key habitat for a wide variety of bird species.

Grizzly bear habitat

This section provides strategies that apply to the primary conservation area for grizzly bears and are relevant to FW-DC-TE&V-01; FW-DC-TE&V-02; FW-DC-TE&V-04; FW-DC-TE&V-11; FW-DC-WL-01; FW-GDL-TE&V-01; FW-GDL-TE&V-02;

- Vegetation and fuels management activities may need to be restricted in time and space to reduce the potential for adverse disturbance or displacement of grizzly bears, as determined by an environmental analysis. For example, activities along main open roads may not disturb or displace grizzly bears because grizzlies may already be habituated to high levels of human activity in these areas. However, where grizzly bears are not used to high levels of human activity, activities could be completed during the denning period. If it is not feasible to complete activities during the denning time period, operations may be restricted in time and space to reduce significant disruptions of normal or expected grizzly activities. For example, logging is often restricted during the spring to favor the needs of grizzly bears during a key time period, when snow at upper elevations reduces availability of foraging habitat (typically April-June, but this varies due to elevation and snow melt conditions). In summer, when abundant habitat is available to grizzlies, operations such as timber harvest may not be restricted, but are subject to standards for temporary increases in motorized access due to projects (also see glossary). Other forest management activities such as precommercial thinning, burning, weed spraying, and road best management practices may need to be completed during the spring time period in order to meet objectives (especially if needed to prevent resource damage), but should otherwise be restricted in time or space. For example, springtime activities could be limited to only one portion of a bear management subunit, before moving to the next portion.
- Silvicultural treatments in forested cover can provide a mosaic of all successional stages over the long term, with a variety of stand structures and species compositions. Group selection cuts and irregularly shaped regeneration harvests, in which prescribed fire slash removal is used to mimic wildfire, are desirable for creating high grizzly food producing openings in some stand types and habitat types. In appropriate locations and habitat types, vegetation management activities can increase light available for berry-producing shrubs that bears use for food, increasing their berry production (also see the Special Forest Products strategy section in this appendix). Examples of berry-producing shrubs include, but are not limited to, huckleberries (*Vaccinium globulare, Vaccinium membranaceum*), serviceberries (*Amalanchier alnifolia*), mountain ash (*Sorbus scopulina*), and buffaloberry (*Shepherdia Canadensis*). Grizzly bear habitat enhancement through vegetation management is not recommended in or next to campgrounds and other developed sites frequented by people, because this may increase the risk of grizzly bear-human conflicts.
- Where there is an intent to promote growth of grizzly bear foods, desirable regeneration harvest and slash disposal methods may include options such as yarding methods designed to minimize soil disturbance, minimize weed invasion, and promote bear foods, where appropriate. Desirable regeneration harvest and slash disposal includes options such as:

  - Methods to minimize the distance to cover such as oblong or irregularly shaped harvest units or retention of one or more leave patches in units larger than 10 acres that would not be broadcast burned
  - Minimum soil scarification in habitat types where soil disturbance impedes the reestablishment of grizzly foods (consistent with management plans)
  - Slash disposal by broadcast burning or whole-tree yarding to maintain or improve foods for grizzly bear in suitable habitat types and terrain
  - Protection of hydric stream bottoms, wet meadows, marshes, and bogs from soil disturbance and excessive cover removal Sale Area Improvement Timber sale receipts, collected for post-sale area improvement (e.g., Knudsen-Vandenberg Act and other funds collected under stewardship contract projects) may be used, when practical, to enhance or restore the grizzly habitat quality of a logged area if it occurs in a desirable location, described above.
- Timber harvest unit layout may be designed to maintain cover along meadows and other open feeding sites, riparian areas, past harvest units that do not yet provide hiding cover, or known travel corridors as specified in an environmental assessment. Sometimes cover is maintained by natural topography or sometimes un-thinned strips or patches need to be retained within or adjacent to harvest units and precommercial thinning units if needed (e.g., to provide screening adjacent to open roads).
- If new trails are constructed or reconstructed in back-country areas where mountain bike use or motorized trail use is allowed, Montana Fish, Wildlife and Parks suggests the following considerations to reduce the risk of grizzly bear-human conflicts:
  - Using designs that facilitate maximum sight distance
  - Not incorporating banked corners that encourage mountain bikes or motorized trial bikes to corner at high speeds

As stated in FW-STD-IFS-03, in each bear management subunit within the NCDE PCA, temporary changes in the open motorized route density, total motorized route density and secure core shall be calculated for projects (as defined by “project (in grizzly bear habitat in the NCDE)” in the glossary).

The 10-year running average for open motorized route density, total motorized route density, and secure core numeric parameters shall not exceed the following limits per bear management subunit:

- 5 percent temporary increase in open motorized route density in each subunit (i.e., open motorized route density baseline plus 5 percent);
- 3 percent temporary increase in total motorized route density in each subunit (i.e., total motorized route density baseline plus 3 percent);
- 2 percent temporary decrease in secure core in each subunit (i.e., secure core baseline minus 2 percent).

Standard FW-STD-IFS-03 must be met, but has some project-specific flexibility in how it is met. Table C-5 and table C-6 show two examples of how temporary changes in open motorized route density, total motorized route density, and secure core could be implemented for a project.

Temporary increase for projects - hypothetical example #1

Example in table C-5: According to standard FW-STD-IFS-03, the 10-year running average for open motorized route density is allowed to increase by 5 percent. In the table C-5 example, it increases from 19 to 31 percent (12 percent net) for four years, or a 10-year running average of 4.8 percent (48 percent

divided by 10), so the standard is met. The 10-year running average for total motorized route density is allowed to increase by 3 percent. In the table C-6 example, it increases from 19 to 22 percent (3 percent net) for four years, or a 10-year running average of 1.2 percent (12 percent divided by 10), so the standard is met. The 10-year average for secure core is allowed to decrease by 2 percent. In the table C-5example, the net decrease in secure core is 5 percent per year for 4 years, or a 10-year running average of 2 percent (20 percent divided by 10), so the standard is met. In this hypothetical example of a 4-year project, the 10-year running average for core has reached the limit of 2 percent, so another project in this subunit would not be possible during the non-denning season, unless that project complied with administrative use levels for open motorized route density, total motorized route density, or secure core.

Temporary increase for projects - hypothetical example #2

Example in table C-6: Open motorized route density increases from 17 to 22 percent (5 percent net) for five years, or a 10-year running average of 2.5 percent (25 percent divided by 10), so the standard is met. In the table C-6 example, total motorized route density does not increase, so the standard is met. In the table C-6 example, the net decrease in secure core is 2 percent per year for 5 years, or a 10-year running average of 1 percent (10 percent divided by 10), so the standard is met. In this hypothetical example of a 5-year project, none of the 10-year running averages have reached their respective limits of 5, 3 or 2 percent.

Table C-5. Changes in values in a bear management subunit for open motorized route density, total motorized route density, and secure core for project in years 7 through 10

Variable	Baseline Value	Yr-1	Yr-2	Yr-3	Yr-4	Yr-5	Yr-6	Yr-7	Yr-8	Yr-9	Yr-10
OMRD[a]	19	19	19	19	19	19	19	31	31	31	31
TMRD[b]	19	19	19	19	19	19	19	22	22	22	22
Secure Core	68	68	68	68	68	68	68	63	63	63	63
Net change	–	0	0	0	0	0	0	+12% OMRD +3% TMRD -5% core	+12% OMRD +3% TMRD -5% core	+12% OMRD +3% TMRD -5% core	+12% OMRD +3% TMRD -5% core

a. Open motorized route density
b. Total motorized route density

Table C-6. Changes in values in a bear management subunit for open motorized route density, total motorized route density, and secure core for project in years 5 through 10

Variable	Baseline Value	Yr-1	Yr-2	Yr-3	Yr-4	Yr-5	Yr-6	Yr-7	Yr-8	Yr-9	Yr-10
OMRD[a]	17	17	17	17	17	17	22	22	22	22	22
TMRD[b]	18	18	18	18	18	18	18	18	18	18	18
Secure Core	60	60	60	60	60	60	58	58	58	58	58
Net change	–	0	0	0	0	0	+5% OMRD +0% TMRD -2% core	+5% OMRD +0% TMRD -2% core	+5% OMRD +0% TMRD -2% core	+5% OMRD +0% TMRD -2% core	+5% OMRD +0% TMRD -2% core

a. Open motorized route density
b. Total motorized route density

Fisher (SCC)

To implement FW-DC-WL SCC-01 and FW-GDL-WL SCC-03: In northern Idaho and west-central Montana, Sauder and Rachlow found that habitat selection by fishers at the landscape scale was best modeled using characteristics of both forest configuration and composition.[43] At the scale of 50–100 km^2 (12,355–24,710 acre) landscapes, fishers in northern Idaho and west-central Montana selected for home ranges with greater than 50 percent mature forest arranged in connected, complex shapes with few isolated patches, and open areas comprising less than 5 percent of the landscape. Jones and Garton[44] stated that preferred habitat patches should be linked by travel corridors of closed canopy forest and that riparian areas make excellent corridors provided they are large enough to enable fishers to avoid predation.

On the Flathead National Forest, fisher habitat as modelled by Olson and others[45] was displayed in the Flathead National Forest Assessment.[46] In contrast to north and central Idaho, there are very few areas with 12,355–24,710 acres of modelled fisher habitat in contiguous blocks. Intermingled land ownership, climate, and a history of fire play a primary role in this pattern on the Flathead National Forest. The largest areas of potential fisher habitat are in the portion of the warm-moist biophysical setting composed of mixed species, including very large western red cedar, western hemlock, western larch, western white pine, Douglas-fir, and grand-fir. If new vegetation management projects are proposed in the warm-moist biophysical setting (excluding ponderosa pine stands) an area that is 12,355–24,710 acres in size would be analyzed to see if it provides at least 50 percent mature forest. Alternatives could be designed to maintain mature forest arranged in connected, complex shapes as described in the previous paragraph. Meeting the standards for old growth, very large live trees, very large dead trees, woody material and riparian management zones would provide key ecosystem characteristics needed by fisher. Maintaining inter-connected cover between patches of old growth and adjacent to old growth where needed to increase old growth patch size (as described in the section on “forest pattern-wildlife habitat connectivity”) would also benefit fisher. Harvest of intermediate sized trees may be designed so that connections between patches are not severed. Young forests may be precommercially thinned, or mature forests may be commercially thinned, to create a small-patch mosaic and promote faster development of large trees (where it does not conflict with the needs of other species).

Flammulated owl (SCC)

Flammulated owls are associated with mature (>15 inch d.b.h.) and old-growth dry ponderosa pine/Douglas-fir stands and are absent from mesic ponderosa pine and Douglas-fir.[47] Management

[43] Sauder, J.D. and J.L. Rachlow. 2014. Both forest composition and configuration influence landscape-scale habitat selection by fishers (*Pekania pennanti*) in mixed coniferous forests of the Northern Rocky Mountains. *Forest Ecology and Management.* pp. 75–84.
[44] Jones, J.L. and E.O. Garton. 1994. Selection of successional stages by fisher in north central Idaho. S.W. Buskirk, A. Harestad, M. Raphael, R.A. Powell (eds.) *In*: Martens, Sables, and Fishers: Biology and Conservation, pp. 377–387. Ithaca, New York. Cornell University Press. p. 484.
[45] Olson, L.E., J.D. Sauder, N.M. Albrecht, R.S. Vinkey, S.A. Cushman and M.K. Schwartz. 2014. Modeling the effects of dispersal and patch size on predicted fisher (*Pekania* [Martes] *pennanti*) distribution in the U.S. Rocky Mountains. *Biological Conservation* 169: 89–98.
[46] USDA. 2014. Assessment of the Flathead National Forest, Part 1, Part 2, and Appendices A–E, USDA, Forest Service, Region 1. Flathead National Forest. April.
[47] Wright, V., S.J. Hejl and R.L. Hutto. 1997. Conservation implications of a multi-scale study of Flammulated owl (*Otus flammeolus*) habitat use in the northern Rocky Mountains, USA. J.R. Duncan, D.H. Johnson, T.H. Nicholls (editors). Biology and conservation of owls of the Northern Hemisphere: 2nd International symposium,

strategies to implement FW-DC-WL SCC-01 and to benefit flammulated owls promote the following conditions:[48, 49, 50]

- Clusters (of at least two patches) of mature and old growth forest approximately 35 to 40 acres in size with moderate, but not dense, tree canopy cover ranging from 35-65 percent, to provide nesting habitat
- Mid to large sized snags with cavities excavated by the Pileated woodpecker, Northern flicker, or Sapsucker
- Mature forest interspersed with grassy openings and an open forest floor for feeding
- Mixed conifer patches or dense patches of small Douglas-fir for roosting within mature stands, in close proximity to snags providing potential nest sites.

Wright (1996) found that flammulated owls were not present unless the larger landscape consisted of low canopy cover ponderosa pine and Douglas-fir forests, and then only where grassland or xeric shrubland openings were present at a home range scale. Wright found that flammulated owls were less abundant in ponderosa pine/Douglas-fir landscapes that were heavily logged, but that partial harvesting with snag retention may create the structure that is more suitable.

Clark's nutcracker (SCC)

To implement FW-DC-WL SCC-01: See sections in this appendix on whitebark pine and ponderosa pine.

Possible strategies for the Townsend's big-eared bat and other bat species

Possible strategies that may be used to implement FW-DC-TE&V-05, FW-DC-WL SCC-01 and FW-GDL-WL SCC-01, 02 include the following:

- Working cooperatively with researchers and educational caving clubs to inventory caves for bats, to improve knowledge of baseline conditions, while limiting disturbance to bats by coordinating and combining, when possible, scientific and management activities involving access to subterranean bat roosts, especially while bats are likely to be present.
- Working with Montana Fish Wildlife and Parks and other cooperators to monitor aquatic and riparian habitats for bats using mist-netting and/or acoustic surveys.
- Monitoring and reducing the spread of white-nose syndrome. Various methods may be used, for example, monitoring through partnering with individuals and organizations that utilize subterranean bat roosts to best conserve underground environments and their fauna and flora. Educating visitors and local communities about both white-nose syndrome and bat, cave, and other subterranean habitat

February 5-9, 1997. Winnipeg, Manitoba, Canada. General Technical Report NC-190. USDA, Forest Service, North Central Forest Experiment Station. St. Paul, Minnesota. 632 pp.

[48] Bull, E.L., A.L. Wright and M.G. Henjum. 1990. Nesting habitat of flammulated owls in Oregon. *Journal of Raptor Research*, 24: 52–55.

[49] McCallum, D.A. 1994. Chapter 4: Review of technical knowledge: Flammulated owls, *In*: Flammulated, Boreal, and Great Gray Owls in the United States: A Technical Conservation Assessment. General Technical Report RM-253, USDA, Forest Service. Rocky Mountain Forest and Range Experiment Station. Fort Collins, Colorado. p. 214.

[50] Wright, V. 1996. Multi-Scale Analysis of Flammulated Owl Habitat Use: Owl Distribution, Habitat Management, and Conservation. Master's thesis. Department of Biological Sciences, University of Montana. Missoula, Montana.

conservation. Educating the public and cave inventory personnel about proper decontamination techniques to reduce the risk of white-nose syndrome in bats.

- Bat surveys are best conducted before old buildings or bridges are demolished and before old mines are closed. These structures can be evaluated for the presence of bat species prior to closure and mitigated as needed, based upon the site-specific analysis.

All wildlife species

Potential strategies or approaches that may be used in the management of wildlife include the following:

- Cooperating in interagency, non-government organizations, and citizen science survey efforts for species associated with alpine-subalpine habitats (e.g., wolverine, white-tailed ptarmigan, gray-crowned rosy finch, pika, and hoary marmot) that may be susceptible to effects of climate change.
- In cooperation with Montana Fish Wildlife and Parks' objectives for each hunting district, coordinating elk security with hunter access through road management.
- Using a combination of GIS analysis techniques, available wildlife habitat models, and conducting field surveys to design site-specific vegetation treatments.
- Cooperating in continued citizen science efforts to monitor wildlife.

Non-native invasive plants

Potential strategies or approaches that may be used in the management of invasive plants include the following:

- Using guidance provided in the "Flathead National Forest Noxious and Invasive Weed Control" environmental assessment and decision notice (2001) ("weed control decision notice") for implementing Integrated Pest Management on the Forest.
- Excluding grazing when new invasive plant species infestations (specifically Priority 1a and 1b species on the Montana State Noxious Weeds List) are found in allotments until eradication of the infestation is complete. These economically damaging species include Dyer's woad, rush skeletonweed, yellow starthistle, etc.
- Prioritizing weed treatments to follow guidance in the weed control decision notice, using an adaptive strategy to determine where, when, and how to treat weeds/weed-infested sites. This strategy and its implementation include consideration of such factors as:
    - Weed category – potential invader, new invader, widespread invader
    - Relative invasive nature of the species and its potential to displace native vegetation
    - Relative ecological importance or rarity of the site that could be damaged by the presence of the weed
    - Potential for off-site movement of seeds
    - Determination of control method, which is dependent on the species and site
    - Site monitoring to determine the need to repeat or alter treatment
    - Available funding.
- Using weed management program strategies outlined in the weed control decision notice such as:

- Using education, both formal conservation education contacts (schools, campgrounds, etc) and informal (i.e., brochures, weed identification and prevention brochures).
- Providing continuing education for forest field personnel in weed identification
- Pursuing and coordinating cooperative multi-ownership weed control efforts, such as sharing resources and information, setting treatment priorities, and applying for and sharing grants.
- Using prevention efforts, for example, use of weed seed-free hay and straw by users of Flathead NFS lands, and for reseeding projects
- Using native plants to revegetate disturbed areas where appropriate
- Requiring, contractually in timber sale contracts, that off-road equipment be washed before entering and moving between sites on the forest.

Fire management and air quality

Fire management approaches are designed to restore fire-adapted landscapes and reduce risk to people, communities, and values. These approaches would also support the three objectives of the National Cohesive Wildland Fire Management Strategy; restore resilient landscapes, maintain fire adapted communities, and provide for effective, safe fire response.

Wildland fire and vegetation management strategies within the wildland-urban interface take a strategic approach for achievement of desired fuel conditions integrating, where feasible, desired conditions for wildlife habitat and other ecological values. Hazardous fuels reduction to mitigate the risk of wildfire to communities and important social values is emphasized in the wildland-urban interface.

Management approaches for unplanned ignitions

Potential strategies for fire management (unplanned ignitions, wildfire) could include risk assessment that can occur at multiple scales, both spatial and temporal. These assessments are grounded in experience and analyzed with data and models appropriate to the scale of analysis. The approach is to look at risk in three tiers, long-term (5–10 yrs), annual, and incident:

- Long-term - analyzing the existing conditions that change typically in the 5–10 year time frame, informing broad questions and decisions for programmatic risk assessments. Items may include Highly Values Resources and Assets (HVRA) such as structures, infrastructure, commercial timber, and wildlife habitat.
- Annual - analyzing factors such as seasonal weather, fuels condition, and drought impacts to inform decisions pre-season to identify areas that with reduced large fire/long-duration risk may have the opportunity for short-term fire management.
- Incident – when the ignition occurs utilizing the now known specific condition, location, etc., to specifically analyze the situation for incident risk assessments.

Utilization of this three tiered risk analysis would allow managers to make informed decisions that respond to our various desired conditions.

- Communicating and collaborating with appropriate agency leadership during fire incident management, for wildfires that affect identified areas of local, state or tribal importance, to identify and, to the extent practical, protect these values and minimize impacts to resources or areas of importance.

- Communicating with the Rocky Mountain Research Station, and consulting manual direction (Forest Service Manual 4063) and individual establishment records, for wildfire response when near or within research natural areas (MA 4a). While the natural process of fire is generally desired within research natural areas, effects to some plant communities, related directly to the fire or to suppression efforts, may be a consideration.

Management approaches for prescribed fires (planned ignitions)

Potential strategies that may be used to trend toward desired conditions and objectives for prescribed fire management include the following:

- Burning in autumn when grasses and shrubs have initiated dormancy to promote resprouting of species such as willows, serviceberry, and maple to provide food for wildlife species. At a landscape scale, retaining unburned areas over at least 50 percent of a winter range herd unit to provide forage for the upcoming winter.
- Using burning prescriptions that maintain the deep duff layer to promote survival of huckleberry plants, if present.
- Using burning prescriptions that are relatively hot to scarify the seed of redstem ceanothus, if present.
- Conducting education and outreach to communities.
- Supporting air quality-related monitoring activities and determining sensitivity indicators for the wilderness areas.
- Reviewing projects and management activities that may affect air quality-related values.

Recreation

Potential management strategies are those that assist in providing a range of recreation opportunities across the Forest while controlling visitor impacts to resources and other visitors; constructing, maintaining and controlling use of facilities and trails; and providing a positive visitor experience. Potential strategies include the following:

- Prioritizing reconstruction of campgrounds based on the Forest's recreation niche and the updated recreation site facility master planning document. Aligning and right sizing recreation infrastructure to complement regional and forest niche.
- Evaluating potential for new over-snow opportunities and evaluating areas for restricting over-snow opportunities.
- Developing a comprehensive river management plan for the Flathead Wild and Scenic River. Coordinating with appropriate State and Federal agencies when developing and implementing the plan.
- Completing a needs assessment to determine new outfitter, guide, and livery service on the Forest, outside designated wilderness.
- Evaluating the need and location for a hut to hut system on the forest. Work with partners on funding needs.
- Informing and educating users about Leave No Trace techniques for responsible, outdoor activities with minimal impacts on NFS lands.
- Integrating the recreational opportunity spectrum into project level designs and management decisions.

- Addressing dispersed campsites with erosion or sanitation issues that need rehabilitation, by prioritizing sites that protect or maintain wild and scenic river corridors, bull trout habitat, or that are located within the grizzly bear primary conservation area.
- Addressing developed campgrounds that need improvements, by prioritizing improvements that address accessibility, health and safety, type of use, and reduction of grizzly bear-human interaction.
- Integrating the scenic integrity objectives into project level designs and management decisions.
- Considering protection/maintenance of historic character, while meeting public needs, when identifying cabins to place on the National Reservation System.

Wilderness

Potential strategies for wilderness management include the following:

- Revising existing wilderness management plan for the Mission Mountains Wilderness and coordinating with the Confederate Salish Kootenai Tribe when revising.
- Developing limits of acceptable change plan through the public participation process.
- Implementing the National wilderness stewardship performance measures and wilderness character monitoring.

Other special designations

Research natural areas (MA 4a)

A major objective of the Forest Service's research natural area program is to maintain a representative array of all significant natural ecosystems as baseline areas for research and monitoring. The Flathead National Forest has six established research natural areas. The Region 1 Natural Areas Assessment[51] recommended new research national area targets for each forest based on plant community type and priority and its likelihood of occurring on a particular forest. Table C-7 and table C-8 display the as-yet-unfilled plant community type research natural area target recommendations and the associated priority ranking for the Flathead National Forest resulting from the Region 1 assessment.

Table C-7. Unfilled research natural area target recommendations for the forest and woodland class and priority ranking for assessments for the Flathead National Forest

Forest and Woodland	Priority Ranking
Abies grandis / Athyrium filix-femina	moderate
Abies lasiocarpa / Oplopanax horridum	high
Picea Lysichiton americanum	high
Pseudotsuga menziesii / Agropyron spicatum	moderate
Pseudotsuga menziesii / Cornus stolonifera	high
Pseudotsuga menziesii / Festuca idahoensis	high

[51] Chadde, S.W., S.F. Kimball and A.G. Evenden. 1996. Research Natural Areas of the Northern Region: Status and Needs Assessment. USDA Forest Service, Missoula, Montana (unpublished). 179 pp.

Forest and Woodland	Priority Ranking
Pseudotsuga menziesii / *Festuca scabrella*	high
Thuja plicata / *Athyrium filix-femina*	high

Table C-8. Unfilled research natural area target recommendations for the shrubland and herbaceous class and priority ranking for assessments for the Flathead National Forest

Shrubland and Herbaceous	Priority Ranking
Purshia tridentate / *Festuca scabrella*	high
Festuca scabrella / *Agropyron spicatum*	high
Festuca scabrella / *Festuca idahoensis*	high

Field inventories are needed to identify whether these plant community types occur and, if so, where they are located on the Flathead National Forest. As opportunities arise, inventories could be conducted and the process for establishing additional research natural areas could be pursued. Potential strategies to conduct inventories may include partnering with non-agency groups or organizations to locate and inventory the rare plant communities identified in the tables.

The overall approach for management of research natural areas is expressed by a cooperative relationship between the Forest Service and the Rocky Mountain Research Station (see the work of Evenden and others[52] for additional information on 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 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.

In the case of unplanned ignitions that occur in or near research natural areas, consider that natural process of fire is desirable in research natural areas, but may also have potential impacts on plant communities at risk. These impacts would generally be considered acceptable (unless the fire severity is considered outside natural range of variation), but it is recommended to consult research natural area establishment records, manual direction (i.e., Forest Service Manual 4063) and Rocky Mountain Research Station personnel for additional guidance with fire management.

Special areas (MA 3b)

Possible management approaches and strategies for special areas may include the following:

- Preparing establishment records for new special areas, which could include specific discussion about the features for which they were designated, management guidance, and other related documentation.

[52] Evenden, A.G., M. Moeur, J.S. Shelly, S.F. Kimball and C.A. Wellner. 2001. Research Natural Areas on National Forest System Lands in Idaho, Montana, Nevada, Utah, and Western Wyoming: A Guidebook for Scientists, Managers, and Educators. Gen. Tech. Rep. RMRS-GTR-69. USDA, Forest Service, Rocky Mountain Research Station. Ogden, Utah. 84 pp.

- Forest Service Manual 2372 provides direction for development, occupancy, and public use of Special Areas. Certain kinds of facilities and uses are allowed for interpretive purposes and public use or enjoyment, "up to a level that will insure protection of the special values for which the area was established." Occupancy and use are allowed "to the extent they neither interfere with the primary values for which the area was established nor negatively affect the visitor's experience."
- Evaluating vegetation management or other activities near special areas for potential impacts to plant species and communities, wildlife, hydrology and other associated qualities of the special area

Coram Experimental Forest (MA 4b)

The overall strategy to managing the Coram Experimental Forest is through the letter of agreement that was made, and entered into, by the Flathead National Forest and Rocky Mountain Research Station (latest update 2014). The agreement provides the operating plan, management guide, and defines the relationship between the Rocky Mountain Research Station and the Flathead National Forest regarding the Coram Experimental Forest. This agreement was prepared in accordance with the requirements and policies set forth in Forest Service Manual 4062, and specifically 4062.5 describing experimental forest management plans.

Infrastructure

The overall maintenance strategy for NFS roads is to efficiently maintain NFS roads and reduce the backlog of deferred maintenance. Specific elements of this strategy could include the following:

- Storing infrequently used roads for the long term.
- Reducing maintenance levels on low-use roads while maintaining road drainage features.
- Shifting roads with high residential access needs to non-Forest Service jurisdictions.
- Improving, closing, or decommissioning roads that have adverse impacts on aquatics, watersheds, wildlife.
- Applying dust abatement treatments during weather conditions that promote the binding of treatments to road surface materials.
- When placing road segments in intermittent stored service, at stream crossings consider:
    - Replacing or removing culverts or drainage structures that do not meet size or capacity requirements
        - If removing a culvert, excavating to the natural stream grade and natural side slopes, or the latter to a 1:1 ratio, whichever is less
    - Constructing armored overflow channels if culverts are retained
    - Stabilizing areas prone to erosion and/or cut and fill failure
- Completing a trails assessment that uses a systematic approach to define the Forest's desired and sustainable trail system.
- During project-level National Environmental Policy Act assessments, identifying forest system trails for mitigation measures to protect trail tread.
- Identifying the trail corridor and associated features for the Pacific Northwest National Scenic Trail Comprehensive Management Plan.
- Using the Travel Analysis Plan to inform project-level decisions.

Lands

The strategy for lands management could include the following elements:

- Adjusting land ownership through purchase, exchange or other authority, to protect resources and improve efficiency of management.
- Considering criteria such as the following (not presented in any particular order) when evaluating land adjustments:
  - Lands that can contribute to recovery of threatened or endangered species.
  - Lands important for wildlife connectivity and big game winter range.
  - Lands needed for the protection of important historical or cultural resources.
  - Lands that enhance recreation, public access, and protection of aesthetic values.
  - Lands that contain rivers with potential for Wild and Scenic designation.
  - Other environmentally sensitive lands.
  - Lands that reduce expenses and support logical and efficient management.
- Considering criteria such as the following (not presented in any particular order) when evaluating land adjustments for conveyance:
  - Lands and administrative buildings adjacent to communities that are chiefly valuable for non-NFS uses.
  - Lands with low resource value.
  - Inaccessible, isolated, or intermingled ownership parcels.
  - Lands with long-term, special use permits that are not consistent with national forest purposes and character.
  - Lands not logical or efficient to manage.
  - Lands eligible under the Small Tracts Act.
- Prioritizing NFS land boundary surveys to areas where trespass is most likely.
- Identifying areas generally suitable for utility corridors and communication sites.
- Authorizing and administering appropriate occupancy and use of NFS lands.

Special forest products

To lessen impacts on huckleberry plants, the following approaches may be considered:

- Within harvest units, using logging and site preparation methods that lessen mechanical disturbance to roots and root crowns of huckleberry plants.
- Leaving greater density of overstory trees (i.e., more than 20 mature trees per acre) within units on drier, more exposed aspects may improve conditions for huckleberry growth and berry production.

Minerals

The minerals strategy could include the following elements:

- Providing mineral materials such as gravel, rip-rap, and landscape rock for Forest Service, personal, interagency, and limited commercial sales in accordance with material source development and rehabilitation plans.
- Identifying, evaluating, mapping, inventorying, all known cave resources not previously designated as significant.
- Evaluating and mitigating geologic hazards associated with the location and construction of new facilities before they are approved, designed, and constructed.
- Managing caves to minimize evidence of human use and to protect cave resources. Partnerships and mutually-supported agreements could be used to specify schedules, party sizes, skills required, equipment, and handling. Pursuing funding and partnerships to manage cave resources.
- Inspecting minerals materials
- Responding to proposed minerals activities (both locatable and leasable) in a timely manner.

Livestock grazing

The general approach to grazing management implements resource management practices intended to maintain the health of occupied livestock grazing allotments and rangelands. Strategies for accomplishing this approach may include the following:

- Assessing and updating allotment management plans to ensure that sustainable stocking levels, forage utilization standards, mitigation measures, and appropriate grazing systems are used and that lands are still suitable for livestock grazing.
- Eliminating grazing allotments or pastures as they become vacant if there is no demand for grazing by potential permittees or if desired vegetation and aquatic conditions cannot be met.

Cultural resources and areas of tribal importance

The cultural resources strategy could include the following elements:

- Conducting surveys to identify sites, and follow-up actions necessary to protect, stabilize, or salvage sites.
- Using partnership arrangements to help preserve and interpret significant heritage resources.
- Guiding project planning and heritage preservation/interpretation efforts with knowledge and information gained through inventories, site evaluations, tribal consultation, and other sources.
- Developing and participating in national, regional, interregional, and interagency programmatic agreements and memoranda with the State Historic Preservation Office, the Advisory Council on Historic Preservation, and other partner agencies and Tribes.
- Stabilizing, rehabilitating, restoring, and caring for cultural resources.
- Conducting maintenance to historic facilities.
- Promoting heritage values through public education, outreach, and interpretative programs.
- Conducting scientific and historic research on cultural resources.

Conservation education

The conservation education strategy could include the following elements:

- Developing a formal, forestwide conservation education, interpretive, and visitor information strategic plan to guide program delivery, ensure coordinated and effective services, and build strong relationships with partners and communities.
- Using diverse methods and media for program delivery.

  Making best use of new technologies to help maintain audience relevancy in the areas of social media, web/internet presence, self-guided media using smart phones and other portable devices.