OLD GROWTH HABITAT and OLD GROWTH ASSOCIATED WILDLIFE SPECIES

Introduction

Old growth forests are typically distinguished by: (1) large trees for the species and site; (2) accumulations of large dead standing and fallen trees; (3) decay or breakage of tree tops, boles, or roots; (4) multiple canopy layers; (5) wide variation in tree size and spacing; and (6) canopy gaps and understory patchiness (Helms 1998). This extensive diversity provides habitat for many plant and animal species. Snags, downed logs, rotting wood, fungi, mosses, lichens, and green tree canopy are essential for innumerable species of wildlife and plants (Carey 1996). Closed-canopy forest reduces snow depths, insulates plants and animals from cold winds, and provides protection from predators. Open understories or patches of open canopy provide foraging opportunities for predatory species. Interior habitat shelters wildlife and plants from sun, heat, dryness, and wind; it also provides protection from some predators, competitors, and parasites. Despite their lack of interior habitat characteristics, old growth habitats along openings and roads are much more useful to old growth associated species than are early or mid-seral/structural stages.

Across any given landscape, old forests tend to achieve old growth characteristics at varying time scales and with a range of characteristics. "Old-Growth Forest Types of the Western Montana Zone" were used as the criteria to identify stands that may qualify as old growth habitat (Green et al. 1992). These types are described in the Flathead National Forest's Standardized Effects Analysis for Wildlife and Sensitive Plants and in Appendix C of the LRMP Amendment 21 Final Environmental Impact Statement (Exhibits Q-1, Q-2, and Q-3, and Q-11).

Amendment 21 to the Flathead National Forest's LRMP designated a list of 31 old growth associated wildlife species. See Exhibit Q-4 for a list of these species and their presence in the analysis area. These include sensitive wildlife species and Neotropical migrants that are "Birds of Conservation Concern" (Exhibits Rn-1). Amendment 21 also named sensitive wildlife species as Old Growth Management Indicator Species (OGMIS), seven of which represent the spectrum of old growth habitats on the Flathead National Forest (Exhibit Rg-2). The boreal owl is the only one of these seven species that is not covered in the sensitive, threatened, and endangered wildlife section of this EIS, so it will be discussed in this section. The Amendment 21 decision (USDA Forest Service 1999a) also deleted the marten, pileated woodpecker, and barred owl from the Forest's list of OGMIS. However, the Amendment 21 decision states "we will continue to evaluate the effects of project proposals on these species...as part of our NEPA analysis of site-specific proposed actions."

In the context of old growth forest stands, "the inherent capability of the land is defined by our understanding of forest succession, natural disturbance, and the resulting variability in forest composition and patterns" (Flathead LRMP Amendment 21 Record of Decision). In drier forest types, selection harvest or underburning can extend the life of large-tree habitat

components in existing old growth, consistent with native disturbance regimes (Camp, et al. 1996). These stands typically experienced a fluctuation of closed and open canopy and mid-story conditions over time. However, tree species typical of stand-replacement fire regimes generally can survive neither underburning nor exposure to intense winds. The pattern in these more moist, shadier sites alternated between closed-canopy forest and early seral structural stages. In essence, such older stands often had a much longer fire interval between stand-replacement fires, due to various combinations of physiography, topography, and chance. Older stands in stand-replacement fire regimes tend to be of considerable value as habitat for many species, such as boreal owls and Canada lynx. Stands exceeding average intervals for stand-replacement events often have a considerable amount of larger-diameter snag and downed wood habitat, as well as abundant fungi, mosses, and lichens. Following natural stand-replacement events, these stands would leave a legacy of large snags and downed logs, as long as "reburn" does not occur.

Many types of disturbances, such as timber harvest, road construction, blowdown, fire, or insect or disease outbreaks, can affect old growth habitat and old growth associated species. This is well illustrated by the pileated woodpecker, a "keystone" species that provides second-hand nesting structures for numerous old growth species such as boreal owls, kestrels, and flying squirrels (McClelland and McClelland 1999). A disturbance can reduce living tree canopy cover to levels below that needed by the pileated woodpecker's main food source, carpenter ants, forcing the pileated to forage and possibly nest elsewhere. Carpenter ants, which live mostly in standing and downed dead wood, can drastically reduce populations of species such as spruce budworm (Torgersen 1996), the most widely distributed and destructive defoliator of coniferous forests in Western North America.

Some effects are seen most clearly at the stand level and may benefit or hurt adversely affect old growth species. For example, opening the understory can have negative short-term effects on many old growth dependent species such as the pileated woodpecker, red-backed vole, or golden-crowned kinglet. Conversely, the resultant open-canopy forests tend to favor species such as the flammulated owl, Hammond's flycatcher, and various nuthatches. Opening the tree canopy can also result in new regeneration of shade-intolerant tree species such as western larch, which is most commonly used for nesting by the pileated woodpecker in this area.

Reducing downed wood and snags can remove habitat features that are essential or very important to many species, particularly marten and fisher (Witmer et al. 1998). Retaining the bulk of the largest material apparently decreases these effects, especially if distributed irregularly (Bull and Blumton 1999). Conversely, high amounts of downed woody material can slow or prevent regeneration of trees. In addition, accumulations of smaller logs and branches can substantially increase the probability of intense fire, which can remove all or most of the large living trees, snags, and other elements that define old growth.

Harvest or burning in stands immediately adjacent to old growth mostly has negative effects on old growth, but may have some positive effects. Harvesting or burning adjacent to old growth can remove the edge buffer, reducing the effective size of old growth stands by altering interior habitats (Russell and Jones 2001). Weather-related effects have been found to penetrate over 165 feet into a stand; the invasion of exotic plants and penetration by predators and nest parasites may extend 1500 feet or more (Lidicker and Koenig 1996). On

the other hand, adjacent management can accelerate regeneration and sometimes increase the diversity of future buffering canopy.

The occurrence of roads can cause substantial edge effects on forested stands, sometimes more than the harvest areas they access (Reed, et al. 1996; Bate and Wisdom, in prep.). Roads that are open to the public expose many important wildlife habitat features in old growth and other forested stands to loss through firewood gathering and increased fire risk.

Effects of disturbance also vary at the landscape level. Conversion from one stand condition to another can be detrimental to some old growth associated species if amounts of their preferred habitat are at or near threshold levels or dominated by linear patch shapes and limited interconnectedness (Keller and Anderson 1992). Reducing the block sizes of many later-seral/structural stage patches can further fragment existing and future old growth habitat (Richards et al. 2002). Depending on landscape position and extent, harvest or fire can remove forested cover that provides habitat linkages that appear to be "key components in metapopulation functioning" for numerous species (Lidicker and Koenig 1996, Witmer et al. 1998). Harvest or underburning of some late and mid seral/structural stage stands could accelerate the eventual creation of old growth in some areas (Camp, et al. 1996). The benefit of this approach depends on the degree of risk from natural disturbances if left untreated.

Effects on old growth habitat and old growth associated species relate directly to four issues discussed in Chapter 1. These are Issue #1, "Wildlife Security"; Issue #2, "Effects on existing old growth habitat and on late-seral/structural stage forests"; Issue #3, "Landscape dynamics—Connectivity"; and Issue #4, "Landscape dynamics—Seral/structural stage patch size and shapes." The issue indicators used involve: acres of harvest or fire in different types of old growth; the formation of high-contrast edge; road construction and road use effects; amounts, and spatial distribution of old growth and of late-seral/structural stage patches; and forested connectivity. These issues were instrumental in the development of Alternative D (Exhibit E-2).

Differences Between the DEIS and FEIS

This Old Growth Habitat section of the FEIS differs from the same section in the DEIS primarily in that analysis for the new Alternative F was included. Additional literature was used in the analysis (Green *et al*. 1992; McClelland and McClelland 1999; Witmer et al. 1998; Bull and Blumton 1999; Lesica 1996). A number of points were corrected, clarified, or explained in greater detail in the FEIS:

- Clarification of the role of disturbance in old growth habitat.
- Description of the process for determining which stands function as old growth habitat.
- The spatial separation of old growth habitat in the Logan Creek Analysis Area.
- Comparison of existing old growth habitat compared to historical range of variability for old growth habitat.
- Clarification in the amount of old growth habitat that would be felled for road construction and its consistency with Amendment 21 of the Forest Plan.

- New information and corrections in the amount of treatment in mature stands progressing towards old growth status.
- Correction in the amount of abrupt edge along old growth habitat that would be created with implementation of Alternative D.
- Correction in the list of units that would sever wildlife connectivity and/or be located adjacent to old growth habitat (specifically, Unit 23A was dropped from this list).
- New tables of roads to be rehabilitated and reclaimed.

Information Sources

The assessment of current conditions and the analysis of effects on old growth habitat was done by overlaying hard copy and GIS layers of old growth habitat, late-seral/structural stage stands, and formerly designated OGMIS habitat with layers showing locations of proposed vegetation manipulation and roads. All stands across the analysis area were screened for old growth characteristics. Field surveys were done for a) every stand which appeared to be close to the minimum criteria, b) areas that were not predicted to be old growth or close to old-growth via queries but which appeared to be on aerial photographs, or c) older stands with largely Douglas-fir overstories and high amounts of mortality caused by Douglas-fir beetles (Exhibits E-2, Q-1, Q-2, Q-3, Q-6, and Q-11). Stand-specific information about old growth habitat is found or referenced in Exhibit Q-11, including a narrative about ground-truthing and selection of old growth habitat areas. Maps are in Exhibit Q-12. Vegetation manipulation in old growth habitat is displayed in Exhibit Q-6; high-contrast edge effects in Exhibit Q-10; road construction effects in Exhibit Q-15; old growth patch and perimeter metrics in Exhibit Q-7; and Connectivity conditions and effects in Exhibits Rg-7 and Rg-9. Effects specific to former Old Growth Management Indicator Species habitats are shown in Exhibit Q-9, with boreal owl habitat considered effectively the same as that of both OGMIS. Population viability concerns at the Flathead National Forest and larger scales are assessed in Exhibit Rg-1. Exhibit Q-13 details ways in which the various alternatives do or do not comply with Flathead LRMP Amendment 21. See also the sections on "Vegetation" and "Snags and Downed Woody Material Wildlife Habitat" in this chapter for more information about effects on understory vegetation, noxious weeds, snags, and downed logs.

Analysis Area

The analysis area for the old growth habitat, old growth associated species, and Old Growth Management Indicator Species is the Logan Creek watershed down to the confluence with Good Creek, but excluding the Griffin and Sheppard drainages (Exhibit Q-12). This area is the same as the Logan Geographic Unit used for the Logan Creek Ecosystem Analysis at the Watershed Scale. At approximately 61,266 acres (96 square miles), it is large enough to include the home range of numerous wildlife species that use old growth habitats and to represent the effects of fires, natural tree mortality, timber harvest, and firewood cutting across the landscape. It is sufficiently large to evaluate the ability of the habitat to support populations of wildlife and plant species using old growth habitats, but small enough to not obscure the effects of the alternatives. Old growth habitat attributes are well distributed across this area.

All of the actions proposed in the alternatives are contained within this area. An assessment at multiple scales was also conducted to address cumulative effects and population viability concerns (Exhibit Rg-1).

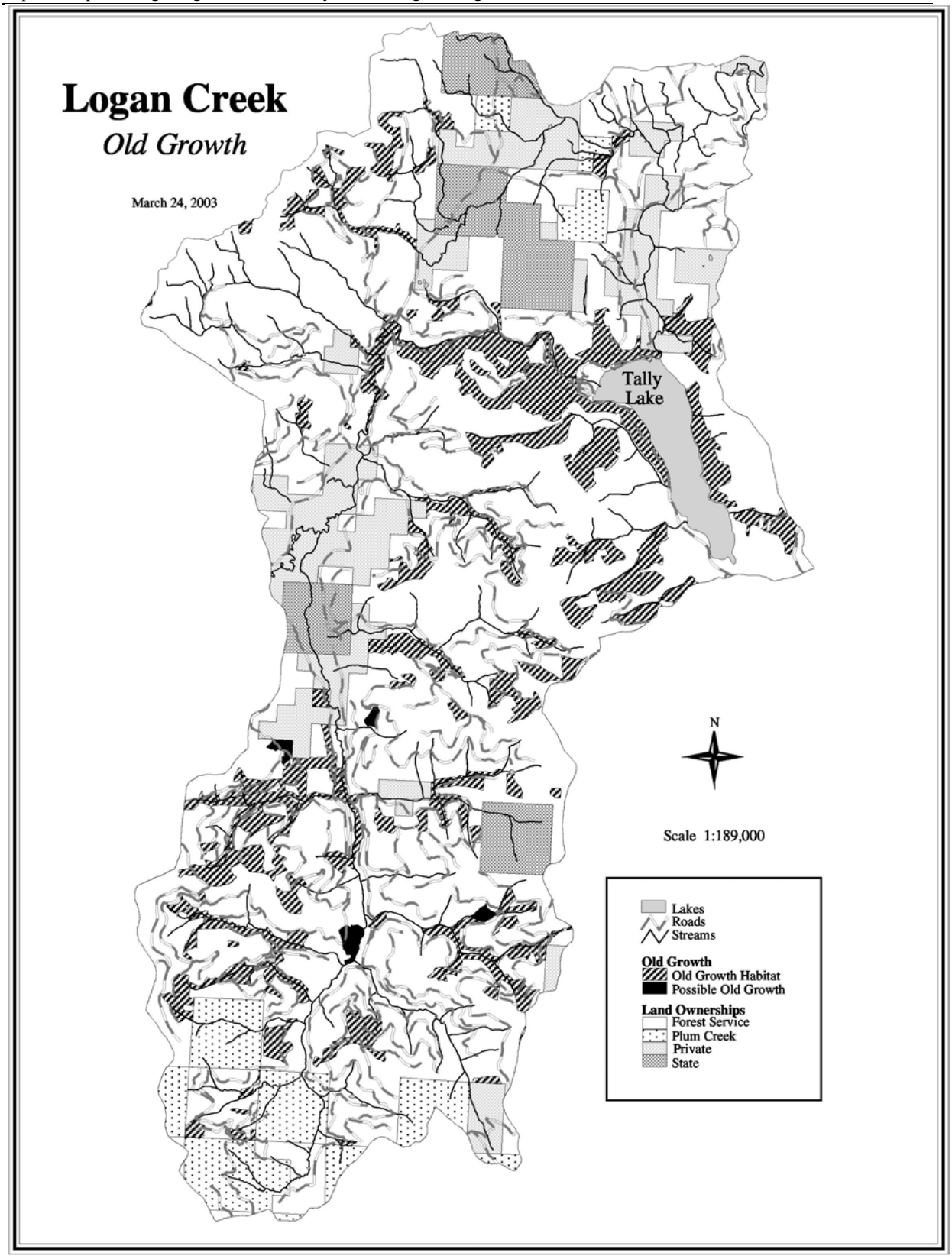
Affected Environment

Across the Interior Columbia River Basin (Quigley, et al. 1996), old forests have declined by 27 to 60 percent over that past 100 years and large residual trees and snags have decreased by 20 percent. Fire exclusion and timber harvest have altered the structure and composition of forests throughout the Basin, resulting in a 60 percent increase in susceptibility to insects, disease, and stand-replacing fires. These changes have contributed to declining habitat conditions for numerous species of wildlife associated with old growth forests. This same trend was found for all subbasins across the Flathead National Forest, despite their relatively high level of ecological integrity (Quigley, et al. 1996). In the Stillwater Subbasin, the departure of current conditions from reference (historical) conditions is not as severe as many subbasins within the Flathead National Forest (USDA 1999a). For more information about old growth habitat conditions within the Flathead National Forest, see the *Final Environmental Impact Statement* for the Flathead's LRMP Amendment 21 (USDA 1999) and Exhibit Rg-1. Also see the reporting done for Forest Plan Monitoring Items 68 and 69, on file at the Flathead National Forest Supervisor's Office.

Natural and human-caused changes in the past century have had a dramatic effect on old growth habitat in the Logan Creek area (Exhibits O-1 through O-16, P-2, Q-8, and Rg-1). Large areas are dominated by doghair lodgepole stands borne of large stand-replacement fires. Twenty-five years of regeneration harvesting altered the spatial distribution of old forested habitats as well as their internal integrity and forested connectivity. Although most old growth stands are adjacent to others, most of the old growth habitat patches are fragmented and include a considerable amount of edge (Figure 3-9 and Exhibits Q-10 and Q-12). Very few patches are further than 0.2 miles from other old growth habitat. However, large intact areas of old growth occur west and northwest of Tally Lake, mostly in LRMP Management Area 2C.

Much of the current old growth habitat has large numbers of trees now infested with Douglas-fir beetles. Enough mortality is occurring in the large Douglas-fir trees that it is very likely that stands are continuing to pass out of old growth status**,** no longer having enough large live trees to meet criteria for identifying a stand as old growth habitat (Green et al. 1992) (See the Direct and Indirect Effects of the No-Action Alternative in the Vegetation Section of this document and Exhibits Q-3 and Q-6). These conditions are typical of old growth habitat conditions across the Salish Mountains.

Figure 3-9. Current Old Growth Habitat. In the Logan Creek Analysis Area, 17% of National Forest System land capable of producing old growth is currently functioning as old growth habitat.



Currently, 7894 to 8066 acres of USFS lands appear to be old growth habitat (Exhibits Q-5 and Q-12). This is 14 percent of all ownerships and 17 percent of the USFS land base capable of producing old growth habitat in the analysis area and within the 75 percent range around the historic range of variability for old growth habitat (Exhibit Q-8). Close to 18,000 acres of USFS land are also in a late seral/structural stage (Exhibit Q-5) but lack old growth features such as sufficient representation of large trees or decay. The opportunity to achieve old growth conditions in the near future is limited in over half of the National Forest System lands in the Logan Creek Analysis Area due to recent timber harvest, high densities of sapling or pole-sized trees, or considerable amount of recent mortality in the large trees (Exhibit Rd-5). See the Vegetation section of this chapter for more information about stands containing larger trees and other features typical of old growth habitat.

The amounts and spatial distribution of old growth habitat and other late seral/structural stage stands have varied over time and space. A comparison based on ecological sub-region data suggests the amount of old growth habitat in the Logan Creek area is high relative to the historical range of variability for old growth habitat for this area (Exhibit Q-8).

The amount of edge between forested and early-seral/structural stage stands across the drainage is extensive (Exhibit Q-12). Currently, there are 152 separate patches of old growth habitat, averaging 53 acres in size (Exhibit Q-7). Nine of these patches are over 0.2 miles from other old growth habitat. Primarily due to past logging activity, most of the existing old growth forest stands across the Logan Creek area are abutted by "high contrast edge" (Exhibit Q-10). This is due to recent timber harvest and to wetlands and rocky areas. Numerous, widely scattered regeneration harvest units are adjacent to many of the old growth patches. This has reduced the "interior integrity" of these stands, reducing (though not negating) their value as old growth habitat. The largest spherically shaped area of old growth habitat is only about 250 acres (Exhibit Q-7).

The disturbance history of the past 10 to 60 years may not have provided the spatial distribution and percentage of forest stand ages typical of natural processes (Exhibit P-10). Dense understories and mid-story canopies are largely the result of 60 years of effective fire suppression, increasing the risk of stand-replacing fire in old growth habitat. Structures and processes typically provided by fire appear to be inadequately represented for some species. In addition, late seral/structural stage habitat for old growth dependent species may be less than desired in terms of amount, shape, size, distribution, and connectivity. The trend in harvesting late-seral/structural stage forests has slowed considerably, but fuel accumulation and insects and disease have accelerated.

Forested connections between old growth patches have been narrowed or severed by past timber harvest (Exhibits Rg-7 and Rg-9). Some forested linkages are less than 650 feet wide; many are less than 300 feet wide (Exhibits Rg-7 and Rg-9). These widths are important because effective corridors should be wide enough to "contain a band of habitat unscathed by edge effects" relevant to species that rarely venture out of their preferred habitats (Lidicker and Koenig 1996 and Exhibit Q-17). Only one small old growth patch is completely isolated from other forested habitat, but several are much narrower than 300 feet where they are adjacent to seedling or sapling stands (Exhibit Q-12). Landscape-wide data based on ecological sub-region data metrics for connectivity appear to be illustrative of the local trend (Exhibit

Q-8). Mean and median distances between patches of younger stands have decreased. Patches of older forests invariably have become farther apart.

Scattered across the area are several large patches of early-seral/structural stage habitat that require travels of up to 0.8 miles to cross in some directions (Exhibit Rg-9). In the past, stand-replacing fires left mosaics of habitats affected by various fire severities. In mixed-severity fire regime areas, the forested cover patches themselves probably were much more persistent, as most stands may have functioned as forested cover despite fairly frequent underburns. Connectivity cover was most persistent along riparian zones in both fire regimes.

Numerous wildlife species make use of old growth habitat in the Logan Creek area. Exhibits Q-4 and Q-16 display occupation by old growth associated species and provides more information about these species' habitat components, population trends, and risk factors. Before the LRMP Amendment 21 decision of January 1999 (Exhibit Q-4), Old Growth Management Indicator Species (OGMIS) habitat was designated throughout this area. The three species formerly listed as OGMIS occur in the analysis area. Of these, barred owl and pileated woodpecker reproduction has been detected, as well as that of boreal owls. Monitoring results and other sightings suggest that all four of these species are relatively common throughout the area (Exhibit Q-16). Distributed across the analysis area, 12,188 acres were formerly designated to meet the habitat needs of pileated woodpeckers and barred owls; for marten, 2385 acres were designated, although most of these overlapped with pileated woodpecker/barred owl habitat (Exhibits Q-9, Q-18, Rd-9, and Rg-3).

Additional information about the ability of components of old growth to provide habitat for wildlife species can be found in other sections of this chapter such as “Vegetation”; “Snags and Downed Woody Material Wildlife Habitat”; and “Sensitive, Threatened, and Endangered Wildlife Species.”

Environmental Consequences

Direct and Indirect Effects

Alternative A – No Action

No timber salvage or rehabilitation actions are proposed with this alternative, which leaves existing old growth habitat plus other developing stands across the analysis area to continue with relatively natural processes. In the Logan Creek area, about 5500 acres of forests are known to have recent infestations of Douglas-fir bark beetle and in some cases Douglas-fir root rot. In some of these stands, so many of the large trees may die that the stands no longer function as old growth habitat. About 172 acres are old growth habitat that may not function as old growth habitat in the near future (Exhibits Q-3 and Q-7).

Across the landscape, the risk of fire would increase as dead trees fall and new understory growth contributes fine fuels. Indirectly, taking no action to reduce fuels would increase the potential for stand-replacing fires to occur, which could result in large areas of decreased suitability or unsuitable old growth habitat. The level of effects would depend on the size and

intensity of such a wildland fire. Downed logs, shading from snags, and lack of seed sources may delay the regeneration of new trees in some stands. Shade-tolerant tree species would likely dominate, with little or no potential for regeneration of western larch, which is preferred by numerous wildlife species for nesting. However, deadfall and snags are an extremely valuable element of old growth habitat, with no known upper limit of quantity and requiring many years to create. Areas with a substantial amount of new deadfall provide structural diversity and downfall trees. However, intact forests are much more effective in sheltering wildlife and plants from edge effects than are blowndown areas.

This alternative sustains habitat for viable populations of old growth associated species over the short term. This array of effects would have positive aspects for some species and negative ones for others, depending on the intensity of the effects, as well as on varying spatial and temporal scales. Refer to the Vegetation and Fire and Fuels sections of this chapter for more information.

Alternative B – The Proposed Action

Harvest or Underburning in Mature Stands and Existing Old Growth Habitat

Vegetation manipulation is proposed within seven stands that currently qualify as old growth habitat (Table 3-61). Hand-slashing and underburning in three of these stands (Unit 200) would be expected to maintain and extend the duration of old growth habitat characteristics. Four stands in six units (54 acres) would have regeneration or intermediate harvest, but this would be implemented only if these stands no longer meet the minimum definitions in "Old-Growth Forest Types of the Western Montana Zone" (Exhibit Q-1). These stands are shown as "Possible Old Growth" on Figure 3-9. Harvest in these stands is proposed for 2004 and 2005. Due to the low numbers of large, windfirm trees, regeneration harvest or no action are the only options in Units 32, 32A, 124A, 136, and 136A. See also Exhibits E-2 and Q-6.

Unit 127A in the Pike Creek drainage would require skid trails or skyline corridors through a patch of old growth habitat between the proposed unit and Road 9583. This would remove some structural elements of old growth habitat from this part of stands 82402026 and 82402031, which span the road. It is possible these 23 acres would not function as old growth habitat after this occurred.

Construction of Proposed System Road 18 would require harvest of one acre of old growth habitat near North Fork Evers Creek. This is further discussed below in the old growth habitat effects section on "Road Construction, Rehabilitation, Reclamation, and Public Use."

Table 3-61. Proposed Action Vegetation Manipulation in Areas that Currently Appear to be Old Growth Habitat, but which would be Manipulated Only if the Stands are No Longer Old Growth (Exhibits E-2, Q-6).

Unit #; Stand	Old Growth Status *	Sizeclass **; Cover type; PVG; Fire regime; Elevation: Aspect; Slope	Prescription and Retention level ***
# 32 (9 of 123 acres) and # 32A (all 10 acres); 82401023	Possible/ uncertain	MLRS; Western Larch; Cool Moist PVG; Stand-replacing: 5000 feet; NE aspect; 30% slope	Shelterwood with reserves; MDR
#67 (5 of 39 acres); 82302134	Possible/ uncertain	MHRS; Subalpine Fir; Cool Moist PVG; Mixed-severity; 4800 feet; S aspect; 10% slope	Commercial thin; HDR;
#124A (7 of 48 acres); 82402046	Possible/ uncertain	MULT; Douglas-fir; Warm PVG; Mixed-severity; 4400 feet; E aspect; 38% slope	Shelterwood with reserves; MDR
#136 (1 of 10 acres); 82301105	Possible/ uncertain	MHRS; Douglas-fir; Warm PVG; Mixed-severity; 4500 feet; SW aspect; 23% slope	Shelterwood with reserves; MDR
#136A (22 of 31 acres); 82301105	Possible/ uncertain	MHRS; Douglas-fir; Warm PVG; Mixed-severity; 4500 feet; SW aspect; 23% slope	Shelterwood with reserves; MDR
#200 (127 of 169 acres); 81101073, 81101076, 81101078	Current/ certain	MLRS and MHRS; Douglas-fir; Warm PVG; Mixed-severity; 3400 to 3500 feet; SE, S, and SW aspect; 30 to 34% slope	Underburn: HDR

* Possible/uncertain = Old Growth Status is uncertain due to progressing mortality from Douglas-fir beetles.
** MHRS = Mature High Risk Sawtimber, MLRS = Mature Low Risk Sawtimber, MULT = Multi-storied.
*** MDR = Moderate Dispersed Retention, HDR = Heavy Dispersed Retention.

Alternative B (and all other action alternatives) would move numerous pole-sized and mature stands toward old growth habitat by reducing fuels while retaining most or all of the larger windfirm and fire-resistant trees. However, regeneration harvest (Light Dispersed Retention and Moderate Dispersed Retention) in Alternative B would occur in 4928 acres of mature forests, which would reduce these habitats by 16 percent across the analysis area (Exhibit Q-14). Many of these stands appear to not be progressing toward old growth habitat, as they currently exhibit considerable mortality from insects or disease, and/or high levels of recent blowdown (Rd-5). Some mature stands that would be regenerated currently exhibit relatively little of this mortality. Harvesting these stands would delay future old growth recruitment and would not contribute toward providing habitat for numerous species in both the short and long term.

Patch Size and Shape, New High-contrast Edge, and Forested Connectivity

Alternative B would increase the size of early seral patches (P-10). The acreage of the largest late-seral/structural patch would be cut into three pieces by Units 28A, 48, 112A, and 135. Several additional units would substantially decrease the continuity of relatively contiguous areas of late-seral/structural forest, most notably units 3, 14, 18, 20, 27, 42, 47, 47A, 52, 53, 53A, 64, 65, 91, 107, 127, and 135. The average size of late-seral/structural stage patches drops which is a continuation of the trend since 1940 toward the substantial reduction in the size of late-seral/structural patches across the analysis area. These factors indicate that interior habitat loss would continue, while the proposal attempts to move overall landscape patterns in the direction indicated by reference conditions. Old growth patch sizes (and

distribution) would not change, as the four stands that appear to be old growth now but which have quite a bit of bark beetle activity would not be harvested if they are still in old growth condition.

New high-contrast edge would be created when stands adjacent to old growth habitat are converted from late or mid-seral/structural stage to the early seral/structural stage. Alternative B would have regeneration harvest directly adjacent to a total of 11.7 miles of old growth habitat, as shown in Table 3-62. The units involved are 4, 11, 14, 15, 17, 17A, 18, 19A, 20, 30, 31A, 32, 32A, 33, 35, 38A, 48, 50, 55A, 76A, 76B, 81, 82, 91, 101, 110, 114, 117, 126A, 127, 127A, 129, 134, and 135. This would cause the loss of a variety of habitat features along the edge, amounting to 427 acres of habitat alteration in old growth, as well as the loss of buffering value.

Table 3-62. New High-contrast Edge (Regeneration Harvest) along Old Growth Habitat (Exhibit Q-10). Acres are derived by multiplying linear distance by 300-foot depth (Exhibit Q-17).

Type of New High-contrast Edge along Old Growth Habitat	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
Immediately adjacent to old growth habitat	11.7 miles = 427 ac	3.6 miles = 129 ac	0.0 miles = 0 ac	9.8 miles = 356 ac	0.0 miles = 0 ac
Across from Roads	1.2 miles = 42 ac	0.9 miles = 33 ac	0.6 miles = 21 ac	0.8 miles = 28 ac	0.5 miles = 18 ac

An additional 1.2 miles of new early seral/structural stage edge (Units 31A, 36A, 50, 65, 75, 100, 127, 131, and 136) would be created along old growth habitat but across preexisting roads, which already provide some edge effects. Tree planting and removal of dead and downed trees would accelerate redevelopment of future buffering habitat. All or many windfirm live trees and snags would be left, maintaining available current canopy cover and habitat features such as future nesting trees. Regeneration harvest would also occur adjacent to another 6.0 miles of old growth, but new edge would not be created in the adjacent old growth in these cases because existing heavy tree mortality in the proposed units has already created the edge (Exhibit Q-10). Edge effects due to new road construction are discussed below.

Alternative B would sever or narrow forested connections in numerous places that appear to serve as wildlife travel corridors between important habitat such as riparian forests and ridge-lines (Exhibits Rg-7 and Rg-9). These connections are needed for travel from one patch of old growth habitat to another. Forested cover would not be maintained in 33 sites where the harvest units are located such that they would sever major or substantially narrow travel connections until the stands regained an overstory (Table 3-63). These are all or parts of Units 1, 9, 10, 18, 27, 31A, 32A, 42, 47A, 48, 48A, 49, 50, 52, 53, 53A, 63, 64, 65, 66A, 69, 72, 91, 101, 101A, 107, 110, 112A, 115, 127, and 135.

Dozens of other connections would also be severed or narrowed, given the highly fragmented nature of the analysis area at present. Five of these (Units 48, 48A, 49, 50, and 135) are on ridges, along which many animals would be expected to travel to reach the main creek bottoms such as Logan Creek. Forested riparian connectivity would be reduced to less than 300 feet wide by three units (47A, 72, and 112A). Leaving larger-diameter snag and downed-wood

"legacy material" as required by the Forest Plan's Amendment 21 would improve the ability for recovering stands to provide connectivity.

Table 3-63. Connectivity Effects, expressed as number of occurrences (Exhibit Rg-9).

Alternative	Severs Forested Connection		Narrows Riparian Connectivity to less than 300 feet
	Along Major Ridgeline	Other Major Connection	
A (No Action)	0	0	0
B (Proposed)	5	25	3
C	0	16	1
D	3	8	1
E	5	24	3
F	0	2	0

Road Construction, Rehabilitation, Reclamation, and Public Use

One new system road in the Proposed Action would bisect old growth habitat, causing a loss of old growth habitat and/or interior integrity (Exhibit Q-15). Proposed System Road 18 bisects close to 1300 feet of existing old growth stands 81102081 and 81102082 near North Fork Evers Creek. This would require the harvest of one acre of old growth habitat, although the road was located to minimize impacts to old growth to the extent feasible (Exhibit Q-15). This and nearby proposed roads also would allow regeneration harvest adjacent to over 1.25 miles of the edge of these old growth stands, as discussed above for "New High-Contrast Edge."

An indirect effect of construction of proposed Roads 18 and 22 would be to enable some of the road construction and timber harvest in the adjacent Good Creek drainage, as disclosed in the Good Creek Resource Management Project Record of Decision (March 2000). Two roads in the Good Creek drainage (18 and 22) would bisect or abut about 800 feet of old growth habitat. About 40% of old growth stand 81201020 (near Johnson Peak) would then be within 600 feet of a permanent road (Exhibit Q-15). These roads would allow harvest, also included in the Good Creek ROD, adjacent to over 50 percent of the edge of this old growth stand.

Road rehabilitation and road reclamation would have negative and positive effects on old growth habitat (Tables 3-73b and 3-73c). Alternative B would rehabilitate and haul logs through or adjacent to old growth habitat over about 1.2 miles of existing bermed Roads 2904 and 2913. Approximately 4.8 miles of road reclamation would occur in or adjacent to old growth habitat. The greatest effect of this would be the felling of snags and other trees deemed to be hazardous along the road corridors and the cutting of logs that have fallen across the roads. Road reclamation would remove all trees and logs in the roadbed, although design criteria would require leaving the logs intact wherever possible and replacing them across the roadway as reclamation is completed (Exhibit Q-15). Future roadwork and access would not be expected to occur in old growth along these reclaimed roads.

Table 3-64. Road Rehabilitation in or adjacent to Old Growth Habitat (Exhibit Q-15), in Feet.

Road #	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
2904	3330	1250	1250	3330	3330
2913	3200	3200	0	1600	1600
Total	6530 feet (1.24 miles)	4450 feet (0.84 miles)	1250 feet (0.24 miles)	4930 feet (0.93 miles)	4930 feet (0.93 miles)

Table 3-65. Road Reclamation in or adjacent to Old Growth Habitat (Exhibit Q-15), in Feet.

Road #	Alt. B	Alt. C	Alt. D	Alt. E	Alt. F
313Y	3250	3250	3250	0	0
313	1920	1920	1920	1920	1920
313V	940	940	940	940	940
9763D	490	490	490	490	490
313T	1710	1710	1710	1710	1710
2886	0	0	0	820	820
2886B	3570	3570	3570	3570	3570
9583	2870	2870	2870	2870	2870
313N	1510	1510	1510	1510	1510
2913	7870	7870	7870	1480	1480
10360	1200	1200	1200	1200	1200
Total	25,330 feet (4.80 miles)	25,330 feet (4.80 miles)	25,330 feet (4.80 miles)	16,510 feet (3.13 miles)	16,510 feet (3.13 miles)

Alternative B would protect dead wood habitat features by a yearlong-gated closure to public motorized access of Road 2909 and reclamation of Roads 9537 and 10436. This would also make old growth dependent species less accessible to trapping and other disturbance. However, snags and downed logs would remain vulnerable to firewood cutting in 827 acres across the analysis area (Exhibits Rd-1 and Rg-8). This is 93 acres of additional protection than in the No Action Alternative. The effect would be felt to the greatest extent in the Taylor Creek drainage, where an extensive network of roads transects old growth habitat. Monitoring of short-term road opening in 1998 revealed many large snags can be protected from firewood cutting through tree paint and metal signs, but old growth habitat components may still be reduced. Roads constructed would not be open to public motorized use. See the "Snag and Downed Woody Material Wildlife Habitat" in this chapter for additional information.

Effects on Former Old Growth Management Indicator Species

In all action alternatives, 14 to 16 percent of the formerly designated marten denning habitat and 6 to 10 percent of the marten feeding habitat would be regenerated (Table 3-66). Most of the effect would be in the Highland Meadows area, where 209 to 220 acres of denning habitat (Units 6, 7A, and 11) and 19 to 49 acres of feeding habitat (Units 10 and 11) would be regeneration harvested. Most of the remainder of the denning habitat in this block would have hand-piling and pile-burning. Due to the terrain and amount of larger-diameter wood, this area would retain sufficient downed wood and understory trees to remain denning habitat.

The other formerly designated marten block that would be affected is in the Reid Creek drainage, where Units 38 and 38A of Alternatives B, C, D, and E would regenerate up to 15 acres of denning habitat. All action alternatives would regenerate 38 acres of feeding habitat (Unit 109) and commercially thin 118 acres of denning habitat (Units 39, 39A, and 39B).

From 0.5 to 0.7 miles of temporary road would be built through formerly designated marten habitat, although the bulk of this habitat is proposed for regeneration. According to previous standards (LRMP Implementation Note #2), both of these marten habitat blocks would no longer be functional for marten and the species that were under its Management Indicator Species "umbrella."

For this analysis, boreal owl habitat was considered to be the same as that of all three former OGMIS, the barred owl, pileated woodpecker, and marten.

Table 3-66. Effects on Formerly Designated Feeding and Denning Habitat for the Marten (former OGMIS as of LRMP Amendment 21), in acres (Exhibit Q-9).

	Alternative B		Alternative C		Alternative D		Alternative E		Alternative F	
Prescription	Feed	Den	Feed	Den	Feed	Den	Feed	Den	Feed	Den
Regeneration Harvest	87	240	51	237	60	212	87	234	60	213
Commercial thin or sanitation salvage	0	118	0	118	13	118	0	123	13	118
TOTAL ACRES	87	358	51	355	73	330	87	357	73	331
Temporary Road Construction (Miles)	0.0	0.5	0.0	0.5	0.0	0.5	0.2	0.5	0.2	0.5

All of the areas formerly designated for pileated woodpecker and barred owl habitat would have some regeneration harvest (Table 3-67). The greatest effect would be in the Round Meadow, Cyclone Creek, and Taylor Creek areas, all of which would lose about half of their nesting habitat, making those acres unusable for pileated woodpecker and barred owl nesting for at least 50 years. This would be due to Units 1, 14, 112A, 115, and 135. In the North Fork of Evers Creek drainage, Unit 106 would regenerate formerly designated nesting habitat that is a central link between the two halves of a nesting core. Altogether, 411 acres of nesting habitat would be regenerated, which is 11 percent of the acreage that had been designated.

Other regeneration harvest would be scattered across the analysis area in 24 percent of the formerly designated feeding habitat, with up to 280 acres of this in an individual habitat block. From 2.7 to 3.4 miles of temporary road would be built through formerly designated pileated woodpecker habitat, although the bulk of this habitat is proposed for regeneration.

In most of these areas, there appears to be a sufficient amount of other feeding habitat within the home range. According to previous standards, pileated woodpecker/barred owl habitat blocks in the Round Meadow, Cyclone Creek, Taylor Creek, North Fork of Evers Creek, Reid Creek, and Tally Lake Campground areas would no longer be functional for pileated woodpecker or barred owl and the species that were under their Management Indicator Species "umbrella."

Table 3-67. Effects on Formerly Designated Feeding and Nesting Habitat for the Pileated Woodpecker/Barred Owl (former OGMIS as of LRMP Amendment 21), in acres (Exhibit Q-9).

Prescription	Alternative B		Alternative C		Alternative D		Alternative E		Alternative F	
	Feed	Nest	Feed	Nest	Feed	Nest	Feed	Nest	Feed	Nest
Regeneration (harvest or burn)	2042	411	1190	121	1745	411	1745	411	1405	142
Underburn	148	156	148	156	148	156	148	156	148	156
Commercial thin or sanitation salvage	446	31	476	31	626	31	626	31	733	156
TOTAL ACRES	2636	598	1814	308	2519	598	2519	598	2286	718
System Road Construction (Miles)	1.7	0.0	1.7	0.0	1.7	0.0	1.7	0.0	1.7	0.0
Temporary Road Construction (Miles)	1.7	0.0	1.0	0.0	1.5	0.0	1.5	0.0	1.5	0.0

Alternative C – Wildlife Security

Harvest or Underburning in Mature Stands and Existing Old Growth Habitat

Vegetation manipulation is proposed in existing old growth stands as described above in Table 3-61 under the Proposed Action, except that Units 32, 32A, and 136 were dropped from Alternative C. The regeneration or intermediate harvest in these 34 acres would be implemented only if these stands no longer meet the minimum definitions in "Old-Growth Forest Types of the Western Montana Zone" (Exhibit Q-1). Harvest in these stands is proposed for 2004 and 2005. Unit 127A, which would require skid trails or skyline corridors through a patch of old growth habitat, was also dropped from this alternative. Proposed System Road 18 was also dropped, avoiding the harvest of one acre of old growth habitat during road construction.

By retaining most of the larger windfirm and fire-resistant trees, this alternative would move numerous mid-seral/structural stands toward old growth habitat. However, regeneration harvest would occur in 2637 acres of mature forests, which would reduce these habitats by 9 percent across the analysis area. The development of Alternative C did not include an attempt to avoid effects on mature stands that appear to be progressing toward old growth habitat.

Patch Size and Shape, New High-contrast Edge, and Forested Connectivity

Alternative C is closest to the existing condition in terms of maintaining late-seral patches (Exhibit P-10), as an artifact of avoiding regeneration harvest in elk security areas. This alternative would increase the size of early seral patches. The largest late-seral/structural patch would be reduced by about 20 percent by Unit 28. A few additional units would substantially decrease the continuity of relatively contiguous areas of late-seral/structural forest, most notably units 27, 53A, and 107. Like Alternatives D and F, the average size of late-seral/structural stage patches would remain relatively high. These factors indicate

interior habitat loss would continue while the proposal attempts to move overall landscape patterns in the direction indicated by reference conditions.

Alternative C would have regeneration harvest directly adjacent to 3.6 miles of old growth habitat as shown in Table 3-62. The units involved are 4, 11, 15, 20, 30, 31A, 48, 76A, 100, 101, 124, and 129. An additional 0.9 miles of new early seral/structural stage (Units 31A, 36A, 75, and 136) would be created along old growth habitat but across preexisting roads. See Alternative B, above, for a further discussion of this type of effect. Edge effects due to new road construction are discussed below.

This alternative would sever or narrow forested connections in numerous places that appear to serve as important wildlife travel corridors (Exhibits Rg-7 and Rg-9). Forested cover would not be maintained in 16 sites where harvest units would sever major travel connections until the stands regained an overstory (Table 3-63, above). These are all or parts of Units 1, 9, 10, 18, 27, 31A, 53, 53A, 63, 64, 69, 72, 101, 101A, 107, and 126A. In four of these units, site conditions would allow modification of harvest and site preparation prescriptions to retain the connectivity value of major linkages. Forested riparian connectivity would be narrowed in one location (Unit 72). Dropping units or, wherever possible, increasing retention levels to Heavy Dispersed Retention in response to big game concerns partially alleviated this concern. Other effects on connectivity would be as discussed for Alternative B, above.

Road Construction, Rehabilitation, Reclamation, and Public Use

Units 17, 17A, and 19 were dropped from this alternative to avoid effects on big game habitat. This made the construction of proposed System Roads 18 and 22 unnecessary and uneconomical, thus avoiding numerous effects on an old growth stand near Johnson Peak in both the Good Creek and Logan Creek drainages. As shown in Tables 3-73b and 3-73c, this alternative would rehabilitate and haul logs through old growth habitat over about 0.8 miles of existing bermed Roads 2904 and 2913, and approximately 4.8 miles of road reclamation would occur in or adjacent to old growth habitat. This would remove all trees and logs in the road bed, although design criteria would require leaving the logs intact wherever possible and replacing them across the roadway. See Exhibit Q-15 for more information. Vulnerability to snag and downed log loss in old growth habitat would be as described above for the Proposed Action.

Effects on Former Old Growth Management Indicator Species

Most of the areas formerly designated for pileated woodpecker and barred owl habitat would have some regeneration harvest (Table 3-67). Although 121 acres of nesting habitat would be regenerated, making those acres unusable for pileated woodpecker nesting for at least 50 years, the pieces are small and scattered and make up three percent of the acreage that had been designated. Other regeneration harvest would be scattered across the analysis area in 14 percent of the formerly designated feeding habitat, with up to 280 acres of this in an individual habitat block. In most of these areas, there appears to be a sufficient amount of other feeding habitat within the home range. According to previous standards, pileated woodpecker/barred owl habitat blocks in the Reid Creek and Tally Lake Campground areas would no longer be functional for pileated woodpecker or barred owl and the species that were under

their Management Indicator Species "umbrella." For marten, effects are as described under Alternative B and in Table 3-66.

Alternative D – Old Growth and Connectivity

Harvest or Underburning in Mature Stands and Existing Old Growth Habitat

Vegetation manipulation is proposed within existing old growth stands as described in Table 3-61 under the Proposed Action (Alternative B), except that Unit 32A was dropped from Alternative D. The regeneration or intermediate harvest in these 44 acres would be implemented only if these stands no longer meet the minimum definitions in "Old-Growth Forest Types of the Western Montana Zone" (Exhibit Q-1). Unit 127A was reshaped in this alternative so that it would no longer require skid trails or skyline corridors through an adjacent patch of old growth habitat. Proposed System Road 18 was also dropped, avoiding the harvest of one acre of old growth habitat during road construction.

By retaining most of the larger windfirm and fire-resistant trees, this alternative would move numerous mid-seral/structural stands toward old growth habitat. However, regeneration harvest would occur in 2892 acres of mature forests, which would reduce these habitats by 10 percent across the analysis area. The development of Alternative D involved the avoidance of effects on mature stands that appear to be progressing toward old growth habitat (Exhibit E-2).

Patch Size and Shape, New High-contrast Edge, and Forested Connectivity

Alternative D would increase the size of early seral patches (Exhibit P-10). In this alternative, most of the units were dropped or altered where late-seral/structural stage patch size was a concern (Exhibit E-2), but the acreage of the largest late-seral/structural patch would still be cut nearly in half by Units 28A and 48. Several additional units would substantially decrease the continuity of relatively contiguous areas of late-seral/structural forest, most notably units 27, 48, 48A, 52, 107, and 108. These were not dropped from this alternative because of urban interface concerns, or high levels of Douglas-fir or lodgepole pine mortality. Like Alternatives C and F, the average size of late-seral/structural stage patches would remain relatively high.

Alternative D would create no new high-contrast edge along old growth habitat (Table 3-62). During alternative development, all units that would have had this effect were considered for a heavier retention level. Where this was not possible, units were dropped or unit boundaries were pulled back 300 feet from old growth stand boundaries, unless the new edge has already formed due to blowdown or is rapidly forming due to extensive Douglas-fir root rot (Exhibits E-2 and Q-10).

An additional 0.9 miles of new early seral/structural stage (Units 50, 75, 127, 131, and 136) would be created along old growth habitat but across preexisting roads, which already impose some edge effects. See Alternative B, above, for a further discussion of the effects. Edge effects due to new road construction are discussed below.

The forested connectivity issue was incorporated into the design of Alternative D by dropping all or parts of 15 units and altering the silvicultural prescription of an additional six units. Forested cover would not be maintained in 12 sites where the harvest units are located such that they would sever major or substantially narrow travel connections until the stands re-gained an overstory (Table 3-63). These are all or parts of Units 27, 48, 48A, 50, 52, 63, 66A, 101, 101A, 107, 112A, and 126A. These were not dropped from this alternative because of wildland-urban interface fire concerns (Unit 27 only), or due to high levels of Douglas-fir or lodgepole pine mortality. Numerous other connections would also be severed or narrowed, given the highly fragmented nature of the analysis area at present. Three of these (Units 48, 48A, and 50) are on ridges, along which many animals would be expected to travel to reach the main creek bottoms such as Logan Creek. Forested riparian connectivity would be reduced to less than 300 feet wide by Unit 112A, which has very heavy Douglas-fir mortality. In most areas, a reasonable alternative forested route would remain. Leaving an additional amount of the larger diameter snag and downed-wood "legacy material" than required by the Forest Plan's Amendment 21 would further improve the ability for recovering stands to provide connectivity. Other effects on connectivity would be as discussed for Alternative B, above.

Road Construction, Rehabilitation, Reclamation, and Public Use

Units 17, 17A, and 19 were dropped from this alternative, in part to avoid effects on old growth habitat. This made the construction of proposed System Roads 18 and 22 unnecessary and uneconomical, thus avoiding numerous effects on old growth stands near Johnson Peak in both the Good Creek and Logan Creek drainages. As shown in Tables 3-73b and 3-73c, this alternative would rehabilitate and haul logs through old growth habitat over about 0.2 miles of existing bermed Road 2904, and approximately 4.8 miles of road reclamation would occur in or adjacent to old growth habitat. This would remove all trees and logs in the road bed, although design criteria would require leaving the logs intact wherever possible and replacing them across the roadway. See Exhibit Q-15 for more information. Vulnerability to snag and downed log loss in old growth habitat would be as described above for the Proposed Action.

Effects on Former Old Growth Management Indicator Species

All of the areas formerly designated for pileated woodpecker and barred owl habitat would have some regeneration harvest (Table 3-67). The greatest effect would be in the Taylor Creek area, which would lose about half its nesting habitat, making those acres unusable for pileated woodpecker nesting for at least 50 years. This would be due to Units 112A and 135. In the North Fork of Evers Creek drainage, Unit 106 would regenerate formerly designated nesting habitat that is a central link between the two halves of a nesting core. Altogether, 203 acres of nesting habitat would be regenerated, which is 6 percent of the acreage that had been designated. Other regeneration harvest would be scattered across the analysis area in 16 percent of the formerly designated feeding habitat, with up to 160 acres of this in an individ-ual habitat block. In most of these areas, there appears to be a sufficient amount of other feeding habitat within the home range. According to previous standards, pileated wood-pecker/barred owl habitat blocks in the Round Meadow, Taylor Creek, and North Fork of Evers Creek areas would no longer be functional for pileated woodpecker or barred owl and the species that were under their Management Indicator Species "umbrella." For marten, effects are as described under Alternative B and in Table 3-66.

Alternative E – Soil and Water

Harvest or Underburning in Mature Stands and Existing Old Growth Habitat

Vegetation manipulation is proposed within existing old growth stands as described in Table 3-61 under the Proposed Action. The regeneration or intermediate harvest would be implemented only if these stands no longer meet the minimum definitions in "Old-Growth Forest Types of the Western Montana Zone" (Exhibit Q-1). Unit 127A was reshaped in this alternative and would no longer require skid trails or skyline corridors through a patch of old growth habitat. Construction of Proposed System Roads 2 and 18 would require harvest of one acre of old growth habitat near North Fork Evers Creek, as discussed above for Alternative B, as well as an additional 0.1 acre near Reid Creek.

By retaining most of the larger windfirm and fire-resistant trees, this alternative would move numerous mid-seral/structural stands toward old growth habitat. However, regeneration harvest would occur in 4410 acres of mature forests, which would reduce these habitats by 15 percent across the analysis area. The development of Alternative E did not include an attempt to avoid effects on mature stands that appear to be progressing toward old growth habitat.

Patch Size and Shape, New High-contrast Edge, and Forested Connectivity

Alternative E would increase the size of early seral patches (Exhibit P-10). The acreage of the largest late-seral/structural patch would be cut into three pieces by Units 48, 112A, and 135. Several additional units would substantially decrease the continuity of relatively contiguous areas of late-seral/structural forest, most notably units 27, 47A, 52, 53A, 64, 65, 107, 127, and 135. The average size of late-seral/structural stage patches drops nearly as much as in the Proposed Action, a continuation of the trend since 1940 toward the substantial reduction in the size of late-seral/structural patches across the analysis area.

This alternative would have regeneration harvest directly adjacent to 9.8 miles of old growth habitat as shown in Table 3-62. The units involved are 4, 11, 14, 15, 17, 17A, 18, 19A, 20, 30, 31A, 32A, 33, 35, 38A, 48, 50, 55A, 76A, 76B, 81, 91, 101, 110, 114, 117, 124, 126A, 127, 134, and 135. An additional 0.8 miles of new early seral/structural stage (Units 31A, 50, 110, 127, 131, and 136) would be created along old growth habitat but across pre-existing roads. See Alternative B, above, for a further discussion of the effects. Edge effects due to new road construction are discussed below.

Alternative E would sever or narrow forested connections as described above for Alternative B (Table 3-63), except for the dropping of half of Unit 91, which is not along a ridgeline or riparian corridor.

Road Construction, Rehabilitation, Reclamation, and Public Use

Effects on old growth from proposed System Roads 18 and 22 would be as discussed in Alternative B, including indirect road construction and harvest effects on old growth habitat in the Good Creek drainage.

Alternative E differs from Alternative B in that Alternative E would relocate about 0.4 miles of existing bermed Road 2913 to address hydrologic concerns. This would include reclamation of about 0.3 miles of road (Proposed System Road 2) that is currently within a narrow, isolated patch of old growth habitat (Stand 81901126). The new location would be mostly in the sapling and pole-sized stands north of the old growth. However, 100 to 150 feet of new road would be constructed within the old growth stand to connect the new road construction with the remaining segment of Road 2913 inside the old growth stand. This would require felling about 0.1 acre of old growth habitat, although the road was located to minimize impacts to old growth to the extent feasible. See Table 3-65 for a list of roads to be reclaimed with Alternative E that pass through or adjacent to old growth habitat.

This alternative would rehabilitate and haul logs through or adjacent to old growth habitat over about 0.9 miles of existing bermed Roads 2913 and 2904 and approximately 3.1 miles of road reclamation would occur in or adjacent to old growth habitat, as shown in Tables 3-73b and 3-73c. This would remove all trees and logs in the road bed, although design criteria would require leaving the logs intact wherever possible and replacing them across the roadway. See Exhibit Q-15 for more information. Vulnerability to snag and downed log loss in old growth habitat would be as described above for the Proposed Action.

Effects on Former Old Growth Management Indicator Species

All of the areas formerly designated for pileated woodpecker and barred owl habitat would have some regeneration harvest (Table 3-67). The greatest effect would be in the Round Meadow, Cyclone Creek, and Taylor Creek areas, all of which would lose about half of their nesting habitat, making those acres unusable for pileated woodpecker nesting for at least 50 years. This would be due to Units 1, 14, 112A, 115, and 135. In the North Fork of Evers Creek drainage, Unit 106 would regenerate formerly designated nesting habitat that is a central link between the two halves of a nesting core. Altogether, 411 acres of nesting habitat would be regenerated, which is 11 percent of the acreage that had been designated. Other regeneration harvest would be scattered across the analysis area in 20 percent of the formerly designated feeding habitat, with up to 230 acres of this in an individual habitat block. In most of these areas, there appears to be a sufficient amount of other feeding habitat within the home range. According to previous standards, pileated woodpecker/barred owl habitat blocks in the Round Meadow, Cyclone Creek, Taylor Creek, North Fork of Evers Creek, and Tally Lake Campground areas would no longer be functional for pileated woodpecker or barred owl and the species that were under their Management Indicator Species "umbrella." For marten, effects are as described under Alternative B and in Table 3-66.

Alternative F – Preferred

Harvest or Underburning in Mature Stands and Existing Old Growth Habitat

Vegetation manipulation is proposed within existing old growth stands as described in Table 3-61 under the Proposed Action (Alternative B), except that Unit 32A was dropped from Alternative F. The regeneration or intermediate harvest would be implemented in these 44 acres only if these stands no longer meet the minimum definitions in "Old-Growth Forest Types of the Western Montana Zone" (Exhibit Q-1). Unit 127A was reshaped in this alternative so that it would no longer require skid trails or skyline corridors through an adjacent

patch of old growth habitat. Construction of Proposed System Roads 2 and 18 would require harvest of one acre of old growth habitat near North Fork Evers Creek, as discussed above for Alternative B, as well as an additional 0.1 acre near Reid Creek.

By retaining most of the larger windfirm and fire-resistant trees, this alternative would move numerous mid-seral/structural stands toward old growth habitat. However, regeneration harvest would occur in 4063 acres of mature forests, which would reduce these habitats by 13 percent across the analysis area. The development of Alternative F involved attempting to avoid effects on mature stands that appear to be progressing toward old growth habitat.

Patch Size and Shape, New High-contrast Edge, and Forested Connectivity

Alternative F would increase the size of early seral patches (Exhibit P-10). In this alternative, most of the units were dropped or altered where late-seral/structural stage patch size was a concern (Exhibit E-2), but the acreage of the largest late-seral/structural patch would still be cut nearly in half by Units 28A and 48. Several additional units would substantially decrease the continuity of relatively contiguous areas of late-seral/structural forest, most notably units 48, 48A, 52, 107, and 108. These were not dropped from this alternative because of urban interface concerns, or high levels of Douglas-fir or lodgepole pine mortality. Like Alternatives C and D, the average size of late-seral/structural stage patches would remain relatively high.

Alternative F would create no new high-contrast edge along old growth habitat (Table 3-62). During alternative development, all units that would have had this effect were considered for a heavier retention level. Where this was not possible, units were dropped or unit boundaries were pulled back 300 feet from old growth stand boundaries, unless the new edge has already formed due to blowdown or is rapidly forming due to extensive Douglas-fir root rot (Exhibits E-2 and Q-10).

An additional 0.8 miles of new early seral/structural stage (Units 127, 131, and 136) would be created along old growth habitat but across preexisting roads, which already impose some edge effects. See Alternative B, above, for a further discussion of the effects. Edge effects due to new road construction are discussed below.

The forested connectivity issue was incorporated into the design of Alternative F by dropping all or parts of 10 units and altering the shape or silvicultural prescription of an additional 23 units. Forested cover would not be maintained in two sites where the harvest units are located such that they would sever major or substantially narrow travel connections until the stands regained an overstory (Table 3-63). These are all or parts of Units 53, 53A, and 127. Other units that would appear to sever connectivity were not dropped from this alternative due to high levels of Douglas-fir or lodgepole pine mortality. Numerous other connections would also be severed or narrowed, given the highly fragmented nature of the analysis area at present. None of these are on ridges, nor would forested riparian connectivity be reduced to less than 300 feet wide. In most areas, a reasonable alternative forested route would remain. Leaving an additional amount of the larger diameter snag and downed-wood "legacy material" than required by the Forest Plan's Amendment 21 would further improve the ability for recovering stands to provide connectivity. Other effects on connectivity would be as discussed for Alternative B, above.

Road Construction, Rehabilitation, Reclamation, and Public Use

Road construction and road rehabilitation effects would be as in Alternative E (Tables 3-73b and 3-73c; Exhibit Q-15). Vulnerability to snag and downed log loss in old growth habitat would be as described above for Alternative B (Exhibits Rd-1 and Rg-8).

Effects on Former Old Growth Management Indicator Species

All of the areas formerly designated for pileated woodpecker and barred owl habitat would have some regeneration harvest (Table 3-67). The greatest effect would be in the Taylor Creek area, which would lose about one third of its nesting habitat, making those acres unusable for pileated woodpecker nesting for at least 50 years. This would be due to Units 112A and 135. In the North Fork of Evers Creek drainage, Unit 106 would regenerate formerly designated nesting habitat that is a central link between the two halves of a nesting core. Altogether, 142 acres of nesting habitat would be regenerated, which is 4 percent of the acreage that had been designated. Other regeneration harvest would be scattered across the analysis area in 16 percent of the formerly designated feeding habitat, with up to 180 acres of this in an individual habitat block. In most of these areas, there appears to be a sufficient amount of other feeding habitat within the home range. According to previous standards, pileated woodpecker/barred owl habitat blocks in the Taylor Creek and North Fork of Evers Creek areas would no longer be functional for pileated woodpecker or barred owl and the species that were under their Management Indicator Species "umbrella."

For marten, effects in the Highland Meadows area are as described under Alternative B. The formerly designated habitat area in the Reid Creek drainage would remain functional. See also Table 3-66.

Cumulative Effects

Timber harvest patterns across the Interior Columbia River basin of eastern Washington and Oregon, Idaho, and western Montana have caused an increase in fragmentation of forested lands and a loss of connectivity within and between blocks of habitat. This has isolated some wildlife habitats and reduced the ability of some wildlife populations to move across the landscape, resulting in long-term loss of genetic interchange (Lesica 1996, U.S. Forest Service and Bureau of Land Management 1996 and 1997).

Past fires, timber harvest, salvage, and conversion to agriculture on national forest, corporate, and private lands across the analysis area have resulted in a complex matrix of forested interior habitat, edge, ecotones, and openings in various stages of succession. Past regeneration harvest across varying ownerships converted former old growth into stands of seedlings, saplings, or pasture for livestock (Exhibit Q-8). Other timber harvest removed all or most of the larger trees from numerous stands, especially in the lower elevations. In many Forest Service stands, some of the larger trees were left, largely to provide seed sources or shelter for regenerating tree seedlings. After harvest, however, the tree densities and amounts of standing and downed dead wood were typically much less than would be left by natural processes, and the large live trees were often later removed. In many places across the analysis area,

past timber harvest and roading created a substantial amount of "edge effect," where sun, wind, predators, competitors, etc., can penetrate further into what was previously interior forest. Douglas-fir beetle trapping has been used recently in parts of the analysis area in an effort to reduce mortality to old large trees.

No vegetation management activities are planned on national forest lands in the analysis area in addition to those proposed in the action alternatives. Timber harvest and road construction in the adjacent Good Creek drainage is expected to continue under the 2000 Good Creek Resource Management Project Record of Decision. As discussed above, the extent of the effects of the Good Creek Project on old growth wildlife would in part depend on which alternative is selected in the Logan Creek Ecosystem Project.

Firewood cutting along open roads has further decreased snags and downed logs vital for many species using old growth habitats. Across the analysis area, open roads facilitate access for firewood cutters, decreasing the snags and downed woody material important for many wildlife and plants using old growth habitat. Current open road management leaves 827 acres of old growth habitat and 4794 acres of other stands vulnerable to firewood cutting along open roads across the analysis area (Exhibits Rd-1 and Rg-8). Recent road reclamation and closures across the Sheppard and Griffin drainages have enhanced wildlife security levels across the Logan watershed.

Other cumulative effects on wildlife using old growth habitats are varied. Fire suppression efforts may have contributed to increased understory growth and denser mid-canopy trees (Lesica 1996), making foraging more difficult for species such as flammulated owls and northern goshawks. This has also increased the risk of stand-replacing fire in old growth forests. In 2000, the Elk Mountain Fire and two much smaller fires burned in about 80 acres in the Sheppard drainage. The Little Wolf Fire of 1994 burned over 10,000 acres of the Tally Lake District, immediately west of the analysis area. Post-fire salvage and spruce beetle control actions reduced the number of potential black-backed woodpecker home ranges created by this fire. Fire-killed trees and insect populations are now falling, further reducing the quality of this habitat for the black-backed woodpecker.

Probably due to trapping, lynx were extremely scarce in the first half of the century in Montana, with specimen records restricted to two western counties. The analysis area is part of MDFWP's Region 1, which now has an annual trapping quota of one lynx and one fisher. There have been no reports of wildlife feeding on calves or other livestock and no predator control efforts are anticipated.

Recreation activities are limited and may include hunting, hiking, camping, and cycling. Human settlement occurs on most of the private lands, and subdivision continues to increase. A reasonably foreseeable action would be measures to control tansy ragwort and other weed species, which would not be expected to affect old growth habitats or the species using them.

Overall, it appears the potential habitat in which old growth associated species feed, breed, and otherwise persist in the Logan Creek area has been reduced over the past few decades (Exhibit Q-8). The affected environment described above has been shaped by past and present cumulative effects. These effects would be cumulative to those discussed above for

each alternative. For more information, see the "Vegetation," "Water Resources," "Fire and Fuels," and "Soil" sections in this chapter.

REGULATORY FRAMEWORK AND CONSISTENCY

The National Forest Management Act (NFMA) requires forest plans "preserve and enhance the diversity of plant and animal communities" and that forests will manage for maintenance of "viable populations of existing native and desired non-native vertebrate species."

Amendment 21 to the Flathead National Forest Plan (LRMP) was signed in January 1999. It has a goal to "maintain and recruit old growth forests to an amount and distribution that is within the 75 percent range around the median of the historical range of variability. Where current conditions are below this amount, actively manage to recruit additional old growth." Another goal is to "ensure that Forest Service actions do not contribute to the loss of viability of native species."

Objectives in Amendment 21 are multifaceted and far-reaching. For species associated with old growth forests, there are objectives to "maintain ecological processes and provide for natural patch size distribution" and to "manage landscape patterns to develop larger old growth patch sizes where needed to satisfy wildlife habitat requirements." Across the landscape, "sufficient retention of forest structure (large diameter live trees, snags, and coarse woody debris)" should be left to provide for future wildlife movement through the matrix surrounding old growth forests.

Standards given in Amendment 21 include managing for wildlife dependent on old growth by protecting old growth forest consistent with the Vegetation Standard Section H6. Vegetation management within old growth shall be limited to actions necessary to:

(1) "maintain or restore old growth composition and structure consistent with native succession and disturbance regimes"; or to
(2) "reduce risks to sustaining old growth composition and structure."

To the extent feasible, such vegetation management within old growth "shall retain old growth composition and structure consistent with native disturbance and succession regimes." For example, in warm- moist and cool-moist Potential Vegetation Groups, "large multistory or single-story conditions and shade intolerant species such as western larch, western white pine, ponderosa pine, and Douglas-fir" are to be maintained or restored. On these sites, the standard is to "reduce tree density and the proportion of shade tolerant species such as grand fir and subalpine fir in areas where fire exclusion has altered stand composition and structure." Vegetation Standard Section H6 also states that "road construction associated with vegetation management actions shall avoid or minimize impacts to old growth to the extent feasible."

At the landscape level, there is a standard to "prescribe landscape treatments that protect old growth forests from disturbances that threaten old growth composition and structure." This standard also states "treatments within existing old growth may be appropriate where current insect and disease conditions pose a major and immediate threat to other stands." Sufficient

mid-seral/structural stage stands are to be maintained to allow for recruitment of old growth within the historical range of variability, emphasizing old growth development "in stands that are most likely to persist under native disturbance regimes, and that provide a patch size and pattern most advantageous to old growth associated wildlife species."

Another standard states vegetation treatments should be modified "as needed to meet habitat needs of old growth associated species." If needed to "satisfy wildlife habitat requirements, limit associated human disturbance, or reduce excessive mortality risk," the timing, extent, and intensity of vegetation treatments should be modified. Dead and defective trees and downed logs are to be retained as described in the section below on "Snag and Downed Woody Material Wildlife Habitat." Road construction associated with vegetation management actions "shall avoid or minimize impacts to old growth to the extent feasible."

The Flathead LRMP Amendment 21 named all sensitive wildlife species as Management Indicator Species, seven of which represent the spectrum of old growth habitats on the Flathead National Forest (Exhibit Rg-2). These are the bald eagle, flammulated owl, boreal owl, black-backed woodpecker, fisher, Canada lynx, and northern goshawk. Conditions favorable to these species would generally also benefit other old-growth associated species found within the analysis area, such as brown creepers, Townsend's warblers, winter wrens, and northern flying squirrels, all of which are considered under the umbrella of MIS evaluation. The Flathead National Forest formerly used the pileated woodpecker, barred owl, and marten as Management Indicator Species (MIS) to represent species dependent on old growth stand characteristics. Amendment 21 replaced these by designating all sensitive wildlife species as Management Indicator Species and by developing a list of old growth associated species (Exhibits Q-4 and Rg-2).

Alternative A is expected to sustain habitat for old growth associated species over the short term, but it includes no active recruitment of old growth, nor protection of old growth stands from insect, disease, or stand-replacement fire.

Road construction in Alternatives B, E, and F would impact one acre of old growth habitat in the Logan Creek drainage as well as some of the old growth in the adjacent Good Creek drainage. The roads were located to minimize impacts to old growth to the extent feasible.

Alternatives B, C, and E actively recruit future old growth in many areas, yet these alternatives also would regenerate some late-seral/structural stage stands that currently do not exhibit evidence of habitat loss due to insects, disease, blowdown, or high fuel hazard, and that provide a patch size and pattern advantageous to old growth associated wildlife species. Cumulative effects on old growth habitat and on old growth associated species include increased fragmentation, reduced older forest patch sizes, increased high-contrast edge, reduced availability of interior habitat, and decreased forested connectivity. These effects would reduce the ability to provide for the habitat needs of old growth associated species during the 30 or 40 years following implementation of these alternatives.

Implementation of all alternatives would comply with the standards contained in the Forest Plan related to old growth. However, Alternatives A, B, C, and E would not respond as well as Alternatives D and F to the objectives and overall goals of old growth management on the Flathead National Forest. See Exhibit Q-13 for more information.