Forest Vegetation

Introduction

This section describes the analysis area and the environmental consequences of implementing the alternatives on forestland vegetation. This analysis incorporates by reference the Cooney McKay Silviculture Report (Project File Exhibit G-1), and the Meadow Smith Silviculture Report (Project File Exhibit G-2).

During the last few centuries, fire and human activities were the predominant agents influencing the development of forests in the Swan Valley. Throughout time, forest communities are replaced with or without disturbance as cohorts of trees establish and persist on site. “A “cohort of trees” is an age class of trees that is distinctively different from other age classes in a particular forest stand. For instance, a stand with two distinct age classes may have a 200+ year old overstory cohort, and an 80-year old understory cohort.

Old forest communities take a long time to develop the structure and composition to function as habitat for various plants and animals. Different forests are created through different disturbance and recovery processes. Historically, old ponderosa pine and western larch forests were open grown due to a high frequency of ground fires. Individual trees and small groups of trees were generally killed, and the new cohorts were established, creating a mosaic pattern of multi-age trees across the landscape. Every once in awhile a more severe fire would reset the forest and start the forest anew with the majority of the forest being a new cohort of ponderosa pine, western larch, Douglas-fir and lodgepole pine.

Studies of the Swan Valley ponderosa pine-western larch-Douglas-fir forests have revealed several important consequences resulting from past management practices. Since the early 1900s, interruption of frequent fire cycles and logging has led to changes in the historic vegetative composition and pattern of the valley bottomland forests. The intermingled ownership pattern and respective land management has fragmented the forest ecosystem and the disturbance-recovery regimes in the lower elevations. In summary, the Swan Valley once supported expanses of open grown mature ponderosa pine and western larch forests; and today these forests exist as smaller isolated cohort of trees within stands of closed canopy Douglas-fir forests.

Analysis Area

Spatial Bounds

The spatial bounds for this project consist of the Cooney McKay Project Area boundary (Meadow-Smith Grizzly Bear Subunit). The Cooney McKay Project boundary is sufficient in size to analyze the direct and indirect effects given the percent probable change in vegetation characteristics at this scale. Cumulative effects can be determined sufficiently at this scale, as at a larger scale (District) the change would be unnoticeable.

Temporal Bounds

Treatment activities are planned to take 2 to 3 seasons and would likely begin in 2010. The effects of the proposed treatments are anticipated to last 15 to 20 years. After this time forest succession would have advanced sufficiently in the treated areas to create a forest vegetation condition similar to the pretreatment condition in stands treated with intermediate treatments. Young advanced regeneration producing ladder fuels 10 to 15 feet in height in the understory; surface fuels accumulating from leaf litter/branch fall and other subsequent tree mortality; and crowns of mature trees would have begun to form a more closed canopy condition. For regeneration treatments, effects would last for a full rotation (100 years) as the stands move from an open canopy through stand development successional processes to a mature stand.

Affected Environment

Refer to the Upper Swan Valley Landscape Assessment (Project File Exhibit Q-4), prepared by the Swan Ecosystem Center, which provides a broad-scale view of existing and historic vegetation conditions within the Upper Swan Valley. This analysis also incorporates by reference the Meadow Smith Silviculture Report and Analysis (Project File Exhibit G-2).

Historic Condition

Fire History - Historic observations and recent studies from the Swan Valley reveal a dynamic landscape influenced by fire. Ponderosa pine forests are generally associated with warm-dry sites. In the Swan Valley, ponderosa pine trees exist on cool-moist sites (spruce and subalpine fir series) along with western larch. Fires either caused by Native American people or lightning strikes were frequent enough to maintain large areas of multi-aged ponderosa pine, western larch and Douglas-fir on these moist upland sites (Barrett and Arno, 1982). These forests were generally expanses of large diameter older trees widely spaced among patches or groups of more crowded younger trees (Freedman and Habeck, 1985).

Native Americans used fire to manipulate the vegetation, especially on the lower elevation in major valley bottoms (Barrett and Arno, 1982). Fall was the preferred ignition time, as the fires were lit when the people traveled to their wintering homes. The use of fire achieved many benefits such as clearing woody vegetation to provide better travel routes, and improving sites for grasses and forbs to feed domestic stock and ungulates. On certain sites, fires favored plants gathered for food or medicine.

Ownership and Management - Most of the private lands were derived from the Forest Homestead Act of 1906. From these initial withholdings, lands were sold or exchanged amongst family members and later arrivals. Private non-industrial lands are residences, pastures/hay fields, or small wood lots and occupy the central portion of the valley along the Swan River and Montana State Highway 83.

In 1864, the federal government granted land to Great Northern Railroad for rail right-of-way development. This action and later land exchanges resulted in the checkerboard ownership pattern that characterizes the Swan Valley. The granted lands are now managed by Plum Creek Timber Company. Their management objective is to secure a profit for their shareholders while sustaining a forested environment over time. In general, large areas are treated at the same time to maintain low unit logging costs. Large diameter trees or trees past their productive period are removed to allow the residual trees to grow and new cohorts to establish the site.

Timber management on NFS lands in the Swan Valley is similar to timber management across the nation. Timber management on NFS lands changed over time since the establishment of the Forest Reserves. Societal values in the form of laws and regulations establish the policies that govern the forestry practices on NFS lands. More recently, local public collaborative efforts are assisting the focus of resource management.

Records for the various early-century activities conducted in valley bottomland forests are not extensive. Timber sales were small in 1898 when the first Forest Rangers were assigned to administer Forest Reserve lands along the Swan Valley (then part of the Lewis and Clark Forest Reserve). Timber was purchased primarily for fuel wood, house logs, and other homestead improvements.

Fire suppression efforts started in the early 1930s precluded fire from being an active agent on the landscape. Fire hardened snags were apparently numerous on the landscape, a result of the crown fires that were prevalent during the 1850-1889 period. Many of the snags were sawed down during the 1960s and 1970s to reduce fire ignition sources on NFS lands. Effective fire control has allowed many of the mature stands with large ponderosa pine and western larch to become densely stocked with understory growth of shade-tolerant species like Douglas-fir, spruce, grand fir, and subalpine fir. The multiple layers of shade-tolerant species have resulted in an increase of woody biomass, both down and standing, and an increase in tree shading.

After World War II, the American society demanded affordable housing. Commercial harvest in the 1960s removed mostly large diameter ponderosa pine, western larch and Douglas-fir. To provide for inexpensive building material, the forest management practice of the time was expanded regeneration cuts.

The NFMA (1976) looked more closely at forest management practices as a whole and set some new requirements for the nation. Regeneration treatments should be less than 40 acres unless certain conditions warranted larger openings, and regeneration treatments should reasonably assure adequate stocking in five years. These policies led to smaller units of regeneration with artificial planting and more intermediate harvest treatments.

The 1970s Multiple Use Plans and the current Forest Plan designated white-tailed deer winter range as the key resource managed in the lower elevation forestlands. Timber harvest was the dominant management activity on the winter range from 1960 to 1990. During this, time silvicultural methods progressed from clear-cuts for forage production to methods to retain thermal cover. Regeneration treatments featured Douglas-fir as the preferred species for thermal and hiding cover. In the later 1980s, a common practice was to leave the seed trees and shelterwood trees after the new cohorts were established. Individual selection and group selection in Douglas-fir forest communities was also done to retain a forest canopy. In the 1990s, salvage logging of down trees was the dominant or only timber harvest activity. These treatments mostly removed pockets of larger diameter uprooted and broken stemmed ponderosa pine, western larch and Douglas-fir.

Harvest History - NFS lands and Plum Creek Timber Company total approximately 31,868 acres within the project area. Past harvest associated with these ownerships is displayed below in Table 3-8 Since the 1950s, approximately 39 percent of the project area has been regeneration harvested, and 6 percent intermediate harvested.

TABLE 3-8.
PAST HARVEST ACTIVITIES (ALL OWNERSHIPS)

Acres by Harvest Type	1950s	1960s	1970s	1980s	1990s	2000s	Total
National Forest Service*							
Regeneration	39	1,680	738	870	0	0	3,327
Intermediate	0	26	72	783	562	0	1,443
Plum Creek Timber Company**							
Regeneration	0	0	383	4528	3721	487	9,119
Total Acres	**39**	**1,706**	**1,193**	**6,181**	**4,283**	**4,363**	**13,889**

*21,800 Acres of NFS Lands
**10,068 Acres of Plum Creek Timber Company Lands

Stands that were regeneration harvested from 1950 to 1979 are fully stocked pole stands, ranging from 15 to 35 feet tall, 500 to 2,000+ trees per acre, and 27 to 57 years of age. Stands that were regeneration harvested in the 1980s are fully stocked transitional sapling/pole stands, ranging from 10 to 15 feet tall, 400 to 1,500+ trees per acre, and 18 to 27 years of age. Stands that were regeneration harvested in the 1990s are fully stocked transitional seedling/sapling stands, ranging from 3 to 11 feet tall, 400 to 1,500+ trees per acre, and 8 to 17 years of age. Regeneration harvest stands since 2000 are initiating stocking, comprised of seedlings ranging from 1 to 3 feet tall, 150 to 1,500+ trees per acre, and 1 to 7 years of age. Intermediate harvested stands retain the existing structure, typically having a range of age and size classes. Overall density of these stands is less than unmanaged stands, with more growing space available for the residual stand.

Existing Forest Conditions

Landscape Level - A mix of forest conditions exist within the project area, which are largely due to elevation/topographical changes. As one moves west to east across the project area these forest condition changes can be characterized as warm-moist valley bottomlands to the west, then moderately warm benches, then cool-moist mid-slopes or foothills, and finally cold-steep uplands to the east. More information about these mixed forest conditions can be found in the Upper Swan Valley Landscape Assessment (Project File Exhibit Q-4)

The warm-moist valley bottoms include the undulating flat lands of the valley floor with its many wetlands. This is a warm moist habitat that is mostly forested with a large diversity of conifer and deciduous tree species. Openings in the forest are numerous, largely due to human settlement. These areas contain a mix of western larch, western white pine, lodgepole pine, Douglas-fir, ponderosa pine, Engelmann spruce, grand fir and subalpine fir on the more well drained sites. The neighboring riparian zones are bordered with cottonwood, birch and aspen. Historically, disturbances in this area included primarily low and mixed severity fire, and occasionally high severity fire. High intensity winds have also occurred at intervals and caused extensive blowdown.

The moderately warm benches to the east include a pattern of riparian and potholes along its entire length, with ponderosa pine and western larch growing mostly on the drier areas. It is a mixture of forest types with deciduous species and Engelmann spruce around the wetlands and along riparian areas, and mixed stands of lodgepole pine, grand fir, subalpine fir, Douglas-fir and western red cedar. Historically, these tended to be open grown stands, where fire disturbances tended to be of low

severity to mixed severity. A number of these historically open stands are now crowded with younger trees, mostly Douglas-fir and lodgepole pine, increasing the risk for intense fires that might kill the large, older ponderosa pine, western larch, and Douglas-fir.

The cool-moist mid-slopes or foothills to the east include a transition between the moderately warm benches to the west and the cold-steep uplands to the east. Tree species in this area include Douglas-fir, lodgepole pine, western larch, western white pine, Engelmann spruce, grand fir, western red cedar and subalpine fir. Historically, disturbances in this area included a combination of low, mixed, and high severity fires. High severity winds causing blowdown have also occurred in the area causing increased insect problems.

The cold-steep uplands form a narrow band between the barren rocky ridges and peaks on the Swan Range and the more heavily forested areas on the lower slopes. Vegetation is scattered and clumped across the landscape. Trees and shrubs develop in areas where there is soil. Tree species include whitebark pine, Engelmann spruce, lodgepole pine, mountain hemlock, and subalpine fir. Historically, disturbances in this area included a combination of mixed and high severity fires. Fires tended to be less frequent, and usually occurred during dry periods, and were the result of lower elevation fires carrying into the higher elevations.

The Swan Valley bottomland historically had a mixed-severity fire regime (Long, 1998). The establishment of Swan Valley ponderosa pine-western larch forests can be traced back to the early 1600s through fire history studies largely based on tree ring and fire scar analyses (Arno et. al, 1995, 1997). Investigations done to date provide enough clues over a representative area of the valley to appreciate the role of fire and its effect on forest successional patterns. Research in present day sites indicates that ponderosa pine and western larch were established and able to develop into mature and old growth forests (late-seral stage) through successive cycles of mixed-severity fires on cool, moist sites (Freedman and Habeck, 1985; Habeck, 1990; Arno, 1999; Barrett, 1998).

The fires that left their mark in the period from 1601-1889 occurred from 17 to 30 years apart (Arno et. al., 1995, 1997). Diverse patterns of vegetation were left on the landscape because of different fire behavior in various positions on the landscape and the recovery mechanisms of various species. Once the fire frequencies were set in motion, the forests that succeeded in the lower elevations were largely adapted to low intensity ground fires. Large areas of open grown ponderosa pine-western larch-Douglas-fir upland burned, leaving patches of thickets missed by the ground fires. Periodically, some fires would kill groups of older western larch and ponderosa pine. These trees were replaced with a new cohort of ponderosa pine, western larch, Douglas-fir and lodgepole pine.

In comparison, the fires which burned through the lower elevation forests from 1850 to 1889 benefited the establishment of lodgepole pine in a well-distributed pattern. Fires during this era were apparently lethal and of stand replacement intensity in the Swan Valley (Arno et. al., 1995, 1997). Large fires with stand replacement intensity were uncommon in the ponderosa pine-western larch-Douglas-fir forest, but are suspected to have occurred at 170 to 350 year intervals. It appears that ponderosa pine-western larch-Douglas-fir stands that experienced these intense fires were largely replaced by seral species. Fire exclusion over the last 70 years has allowed groups of nearly pure lodgepole pine to develop to maturity and form a major tree component in the overstory today.

It is apparent in the literature and research in this area that late-seral stage forests, especially ponderosa pine-western larch, are under-represented and not within their historic average. The open grown shade-intolerant forests exist as small fragmented stands dominated by shade-tolerant

Douglas-fir and true firs. Their risk of loss from insects, diseases and fire is rated high. Commercial harvest, residential development, and fire suppression have contributed to the loss of the mature and ponderosa pine-western larch old growth forests during the last 70 years.

Stand Level - The majority of the stands proposed for treatment have an overstory of large diameter ponderosa pine and/or western larch. These trees are the remnants from past disturbances. The understories are dominated by lodgepole pine and Douglas-fir, ranging from sapling/pole size to small to medium sawtimber size classes. The understories are typically dense, with multiple canopy layers. Regeneration of ponderosa pine and western larch is rare, with the understories dominated by Douglas-fir and lodgepole pine. These understories are competing with and provide ladder fuels and fuel loadings that have the potential to support stand replacing fires. Competition for moisture is reducing the vigor and resilience of the dominant overstory trees, resulting in poor growth, increased susceptibility to insects and disease, and increasing mortality.

A. Forest Composition

Forest cover types include ponderosa pine, western larch, Douglas-fir, lodgepole pine, and subalpine fir-spruce. The early seral stage stands are mostly ponderosa pine, Douglas-fir, and lodgepole pine forest type. The mid seral stage stands are mostly lodgepole pine and Douglas-fir forest types. The late seral stage stands are mostly Douglas-fir and subalpine fir forest types. Table 3-9 displays the dominant forest types, divided into three separate seral stages.

TABLE 3-9.
ACRES BY FOREST TYPE

Forest Type	Early Seral Stage	Mid Seral Stage	Late Seral Stage	Total Acres/Percentage
Ponderosa pine	2,751	324	741	3,816/13%
Western larch	554	212	568	1,334/5%
Douglas-fir	4,979	3,055	4,431	12,465/43%
Lodgepole pine	2,249	3,316	1,739	7,304/26%
Subalpine fir-spruce	91	1,073	2,574	3,738/13%

B. Forest Structure

To describe the distribution of forest structure, stands were grouped by stand size class, into one of five categories (seral stage) summarized in Table 3-10.

General rule sets were developed from the specific structure categories and applied to other ownerships. The forest type and structure for non-federal lands was first photo interpolated then validated by personal communication with PCTC and Montana Department of Natural Resources and Conservation (MDNRC) personnel (Project File Exhibit G-13).

TABLE 3-10.
FOREST STRUCTURE WITHIN THE ANALYSIS AREA (ALL OWNERSHIPS)

Forest Structure	Description	Acres	Percent Of Analysis Area
Early-seral	Includes non-stocked, seedling, and sapling stand size classes.	10,624	28%
Mid-seral	Includes immature pole, mature high-risk pole, mature low-risk pole and immature saw stand size classes.	7,980	21%
Late-seral	Includes mature low- and high-risk saw timber and multiple stand size classes.	10,053	26%
Noncommercial Forest	Wetlands, ponds, and other non- commercial forestland.	9,501	25%

C. Insects and Disease

Insect and disease conditions are endemic in the project area, with minor levels of mortality, primarily in lodgepole pine and Douglas-fir. Mountain pine beetle infestations occurred in the lodgepole pine in 1980 and 1981 and again between 1986 and 1989. Mortality levels were high in some localities, but not excessive across the project area as a whole, primarily due to the relatively young age and small size of the lodgepole pine. Mortality was limited to the patches and individual larger lodgepole pine trees, which were attacked and killed. These trees are now mostly on the ground, contributing to fuel loadings in a discontinuous pattern in the stands affected. Individual trees and small groups of trees within many stands continue to be killed by mountain pine beetle, increasing fuel loading throughout the area.

The lodgepole pine stands in the area are now mature and at the age of high risk for mountain pine beetle attack. The larger lodgepole pine is most vulnerable to attack, due to its thicker phloem, which provides more favorable beetle habitat. The dense, small diameter and low vigor lodgepole is less vulnerable to beetle attack and mortality, though in periods of high epidemic population levels of beetles, these smaller trees can also be killed in large numbers.

Many of the larger Douglas-fir trees throughout the analysis area are being affected by root rot, with individual trees and small groups of trees being killed. This condition is widespread throughout the analysis area, and is most prevalent on the upper slopes where site conditions are less productive. Trees susceptible to root rot are primarily Douglas-fir, and typically the larger diameter trees are affected first, spreading to younger trees that are nearby with overlapping root systems. Root rot weakens the defense mechanisms of affected trees, which increases the risk of insect infestation, primarily by bark beetles. This risk is increasing in the area.

Environmental Consequences

Alternative 1 – No Action
Direct and Indirect Effects

No actions would occur under this alternative, allowing the processes of vegetation succession to continue. Traditional roadside fuelwood cutting/gathering by local residents would continue to occur,

primarily adjacent to open roads, as well as some Christmas tree cutting, also more or less along or near open roadsides.

Forest composition would continue to reflect the existing condition, with Douglas-fir and lodgepole pine dominating, and ponderosa pine-western larch a minor component at the landscape level. As these stands continue to age, the ponderosa pine and western larch would continue to decline, leading to reductions in this forest type in the future. Regeneration of ponderosa pine and western larch would be inhibited due to the increased shading within the stands, and lack of disturbance. Increases in the percentage of Douglas-fir would occur over time, as this species regenerates well under closed canopy conditions, and lack of disturbance.

Surface fuels would continue to accumulate, since natural decomposition and cycling of nutrients is a slow process in Northern Rockies ecosystems. Increasing insect or disease-related mortality would add to the existing fuel load accumulation. Natural fuels would accumulate faster than they are recycled, increasing the natural fuels hazard near private lands.

With these changes in natural forest succession, the likelihood of a major fire event occurring in the future becomes more probable, although it is not possible to predict precisely when this might occur. The likelihood of trees of all sizes (especially the larger, more mature trees) to withstand the effects of a major fire event lessens as stand density and fuel loading increases. The high fire resiliency of once open canopy/open grown forests would be lost. The overall dense stand conditions and accumulating fuels in the project area show many similarities to the Crazy Horse Fire area, prior to 2003.

Forest structure would continue to be dominated by densely stocked forested stands, and tree density would increase in stands less densely stocked, as ingrowth of shade-tolerant species would continue to fill in available growing sites. Multi-storied development of stands would continue, with understory trees maturing and growing into the mid to upper crown classes, while new ingrowth would occur in the lower crown classes. This would create a more continuous and uninterrupted ladder fuel complex from forest floor into the overstory canopy. Interlocking of tree crowns would become more continuous, and at all levels. This increasing stand density would put greater stress on trees, especially during droughty periods. Densely stocked and stressed trees become increasingly susceptible to insect infestations (such as bark beetles) and disease infections (such as root disease).

The resiliency of stands currently identified as old growth (Units 18-95, 18-97, 25-7, 25-72 and 30-11) would continue to decline, as competition stress continues to weaken the large overstory trees. These trees are more susceptible to competition stresses due to age, and do not compete well with younger understory vegetation. Regeneration of ponderosa pine and western larch would continue to be limited due to the amount of shading present, and the lack of disturbance to provide a seed bed. The ponderosa pine and western larch forest communities would not be resistant to major disturbances. The distribution and pattern of the late-seral forest communities would promote a lethal fire regime. Some low intensity fires would stay on the ground, however it is more likely these ground fires would burn the understory trees and ultimately reach into the overstory canopy. Fires started on upland sites would progress into the riparian area. The uniform arrangement of heavy fuels on the landscape would lead to large areas impacted by a fire event.

Endemic populations of insect and disease would remain at their current observed levels in the short-term, however the potential for increased activity would increase as stands continue to decline in

vigor and resilience. Tree damage, such as windthrow, stem and branch breakage and abrasion, etc., is expected to remain at its current natural levels.

Alternatives 2, 3 and 4
Direct and Indirect Effects

The effects of the proposed treatments are similar between alternatives, varying only in the numbers of acres treated by alternative. The following discussion addresses the vegetation effects of the treatments, with the corresponding acres of each treatment identified in Table 3-11 Treatment Summary by Alternative. Descriptions of each treatment type are found in the Chapter 2 and in Appendix C of this document.

TABLE 3-11.
TREATMENT SUMMARY BY ALTERNATIVE

	Alternative 2		Alternative 3		Alternative 4	
Commercial Harvest Treatment Acres						
	Acres	**MBF**	**Acres**	**MBF**	**Acres**	**MBF**
Commercial Thin	561	2,608	561	2,608	550	2,575
Old Growth Maintenance	119	715	0	0	119	715
Seed Tree	79	339	79	339	14	42
Salvage	69	345	69	345	69	345
Thin From Below	93	93	93	93	93	93
Total Acres/Volume	**921**	**4,100**	**802**	**3,385**	**845**	**3,770**
Non-Commercial Treatment Acres						
Thin From Below – Non-Commercial	50		50		50	
Pre-Commercial Thin	105		105		105	
Ecosystem Burning	1,833		1,833		1,833	
Total Acres of Commercial and Non-Commercial Treatments	**2,909**		**2,790**		**2,833**	
Hand Planting	79		79		79	
Restoration Planting	48		48		48	
Logging System Acres						
Cable	4		4		4	
Tractor	756		637		691	
Forwarder	110		110		110	
Cable/Tractor	51		51		40	
Hand	50		50		50	
Total Logging System Acres	**971**		**852**		**895**	
Fuels Treatment Acres						
Grapple Pile/Burn/Chipping	887		768		845	
Hand Pile/Lop and Scatter	155		155		155	
Underburn	34		34		0	
Ecosystem Burning	1,833		1,833		1,833	
Total Acres of Fuel Treatment	**2,909**		**2,790**		**2,833**	

A. Intermediate Treatments

Commercial Thin, Salvage, Thin From Below, Pre-Commercial Thin - These treatments are intended to reduce stand density, widen the distance between tree crowns, remove understory trees that act as ladder fuels, and shift forest composition towards ponderosa pine and western larch. Treatments would focus on removing the smaller and less vigorous trees first, leaving the larger, healthier trees with best form. Ponderosa pine, western larch and Douglas-fir would be favored for leave trees in the mixed species type. These trees are the most wind-firm, fire-resistant, insect and disease resistant, and longer-lived species in the area. Lodgepole pine would be left where no favored species are available, or where the condition of other species is very poor. Cedar, western hemlock, grand fir, spruce, and subalpine fir in good condition may also be selected for leave trees in limited situations to provide for a diversity of species and forest structure.

In intermediate treatments, crown spacing of the trees would vary from about 10 feet apart up to 30 feet apart overall. The wider leave tree spacing would be applied mostly in those units where wind-firm, mixed species are the dominant type. These mixed species stands tend to include longer-lived species, which develop larger bole and crown diameters in thinned stand conditions. The narrower leave tree spacing would be applied in those units where less wind-firm, lodgepole pine species are dominant. Lodgepole pine tends to be shorter-lived, with smaller overall bole and crown diameter development. This is an average across the treated units, which takes into account the natural stand variability and allows for the selection and grouping of desirable leave trees.

Non-merchantable, understory ponderosa pine, western larch, Douglas-fir, and other species would be left either as individuals or in patches in openings where they do act as ladder fuels to mature residual trees within mixed species stands. Leaving a portion of the understory trees provides for some structural diversity while helping to break up site distances. Leaving some patches would not negate the overall hazardous fuel treatment since they would be left well distributed across the treatment area. Lodgepole pine stands tend to be single-storied, with either minor or a well-dispersed scattering of understory trees. So there are fewer opportunities to leave patches of understory trees in lodgepole pine dominated stands.

In all units, coarse woody down material would be left on-site to provide for nutrient cycling, micro-siting, soil development, and for wildlife habitat, among the many other beneficial purposes (See Design Criteria, Table 2-14). The larger diameters would be the preferred sizes to leave on site, since they decompose more slowly and so provide slow nutrient release and longer ground surface structural characteristics; are not extreme fire carriers (i.e. they burn slowly), and so do not create a hazardous fuels situation which supports a fast moving surface fire.

Recently dead trees (snags) are not in high numbers in any of the proposed treatment areas. Where they naturally occur they would be left on-site as identified in the features common to all action alternatives.

Old Growth Maintenance - Treatments within old growth Units 18-95, 18-97, 25-7, 25-72 and 30-11 are designed to retain the large ponderosa pine, western larch or other large trees and to reduce the fuel loading within these stands through the removal of understory trees and reduction of surface fuels. Such treatments would be consistent with Amendment 21 of the Flathead National Forest Plan which allows for vegetative treatments which maintain or enhance the intrinsic characteristics of old growth stands. The intent of these treatments is to assure that these late-seral forest communities will persist as multi-age, open grown forests featuring large diameter ponderosa pine and western larch

by reducing competition for resources, and remove ladder fuels and fuel loadings that have the potential to contribute towards increased fire severity. Future treatments with the introduction of fire will provide the disturbance necessary to initiate another age class of ponderosa pine and western larch through natural regeneration.

After vegetation treatment the large diameter, ponderosa pine and western larch will be free to grow in these stands. In the surrounding area, overstory trees left on regeneration treatments in the 1980s are standing and are in good condition. This same response is expected in these stands. Small patches where shade-tolerant trees are dominant will be untreated and will provide a mosaic pattern on the landscape. These lower montane forests will provide the diversity of a fire-dependent forest community across the landscape.

The major processes that influenced the development of these forests are applied through management practices. Frequent underburns in the ponderosa pine-western larch forest communities are considered essential to manage ponderosa pine and western larch communities that evolved with a mixed-severity fire regime. Periodic fires would replicate the historic fire process on the landscape and maintain open forest canopies, retain seral species compositions and patterns, recycle nutrients, and retain fire-adapted understory vegetation. The potential for a major fire event will decrease due to the reduction in the arrangement of fuels. The large diameter ponderosa pine and western larch will be at a lower risk of loss due to increased growing space, less competition, and protection from potential fire damage.

Vegetation diversity will trend towards fire-adapted plants. The ponderosa pine and western larch will cast their seed and the new generation will have room to grow. Ponderosa pine and western larch are long-lived species and will persist in this multi-aged forest. The fire-dependent plant species will become more vigorous. Increasing the distribution and pattern of large prescribed burn areas will promote diversity and growth of browse species, and dispersed ungulate use. The natural and artificial regeneration in these expanded forage areas will have less animal damage than isolated small openings. Please refer to Chapter 2 and Appendix C for more specific descriptions of Intermediate Harvest Treatments.

B. Regeneration Treatments

Seed Tree, Hand Planting (Includes Restoration Planting)- These units were identified for regeneration harvest due to the lack of sufficient large diameter ponderosa pine and western larch overstory trees to maintain sufficient canopy closure. The understories of these stands are primarily lodgepole pine and/or Douglas-fir, with minor components of other species. The presence of western larch and ponderosa pine indicate the potential for these sites to support these species. These treatments would retain all ponderosa pine and western larch, removing all Douglas-fir, lodgepole and other species. Overstory tree numbers would be variable, from 3 to 15 trees per acre, depending on the site and existing overstory condition. Public input and additional field reconnaissance during the scoping phase of this project resulted in 5 units, originally proposed as Seed Tree units, being dropped from all alternatives, based on their existing old-growth characteristics. These stands are not dominated by dry site larch or ponderosa pine, and contain a high proportion of moist site species, such as grand-fir and Douglas-fir, with sufficient size and in sufficient numbers to be considered old growth. For these reasons, these units were dropped from consideration under the action alternatives. Deletion of these stands also eliminated the need to consider any opening greater than 40 acres in size.

Fuels reduction and site preparation treatments would reduce fuels and prepare the units for planting of western larch and ponderosa pine to promote and increase the amount of western larch and ponderosa pine in the analysis area. Natural regeneration of Douglas-fir and lodgepole pine would occur over time, lending to species diversity, but would be a minor component within the stands. Coarse woody debris and snag features common to all action alternatives would be implemented. Please refer to Chapter 2 and Appendix C for more specific descriptions of Regeneration Harvest Treatments.

Restoration Planting - Approximately 48 acres would be planted with ponderosa pine and western larch in units that have been previously harvested, but have insufficient regeneration to meet desired stocking levels.

C. Ecosystem Burning

These treatments would not change the basic existing composition or structure of the stands, but would reduce the density of shrubs and small conifers encroaching into meadows and shrublands. These treatments are similar to historic disturbance occurrences, creating conditions to maintain the fire-adapted processes and functions of these sites.

D. Forest Composition

The intermediate treatments would reduce competition between trees, increasing availability of light and moisture to remaining trees. This would maintain or improve the vigor and growth of the leave trees. In the mixed species stands, these improved growing conditions have the potential to result in increases in growth rate and thus size of individual trees over time. This is because the ponderosa pine, western larch and Douglas-fir are still immature, and have fuller, larger crowns and greater capacity to respond to the improved conditions. Removing most or all of the lodgepole pine from some of these mixed species stands would increase the proportion of ponderosa pine, western larch and Douglas-fir dominated forests as well.

Thinning in the lodgepole pine dominated forests would also maintain or improve growth and vigor in some stands that were dense to begin with, where crown ratios have not been too severely reduced by crowding. However, lodgepole pine matures earlier than other species, and growth has peaked in these 80+ year old stands being treated. Large gains in tree size and vigor are not expected. Reduced stocking would reduce risks to mountain pine beetle infestations. Stands would continue to be dominated by lodgepole pine.

Regeneration harvests in **Alternatives 2 and 3** would convert approximately 40 acres of Douglas-fir and 28 acres of lodgepole pine through the Seed Tree harvest method, planting to ponderosa pine-western larch. **Alternative 4** would convert approximately 14 acres of Douglas-fir to ponderosa pine-western larch through the Seed Tree harvest method. These changes in forest type would not measurably alter the existing percentages of forest composition; however all of the intermediate treatments proposed would shift existing stand compositions towards a greater percentage of ponderosa pine and western larch through the reduction of the other species.

E. Forest Structure

Regeneration harvest treatments would convert the multi-storied, mixed species stands to primarily two-storied, more open grown forests. This is a substantially different structure than exists across most of the untreated landscape, and adds to the structural diversity of the area. The lodgepole

stands are currently mostly single storied and would remain so after treatment, though with reduced stocking. The open canopy/open grown forest condition that is targeted for the mixed species stands is a common, “natural” condition in these forest types, where periodic low and mixed severity fire reduced understory development. Because of the high productivity and abundance of moisture and nutrients, these sites are capable of supporting abundant tree and other plant growth, developing into dense, closed canopy forests over a relatively short period, in the absence of periodic disturbance events such as fire. Ponderosa pine, western larch, and Douglas-fir are dominant seral species on these sites, and they are fire tolerant when older and larger.

Alternatives 2 and 3 would convert approximately 46 acres of late-seral, and 31 acres of mid-seral stands; **Alternative 4** would convert 14 acres of late-seral to early seral through Seed Tree treatments. These changes would not measurably alter the existing percentages of forest structure within the analysis area. These treatments are focused in stands where the ponderosa pine and western larch are currently a minor component of the stand, primarily scattered remnant trees that are declining in health and vigor due to competition. The intent of these treatments is to promote regeneration of western larch and ponderosa pine to increase the amount of these species across the landscape.

F. Insects and Disease

Because of the increased tree vigor expected in the mixed species stands; these treatments would also increase the residual stand components ability to resist future insect or disease influences. These treatments will not prevent future insect activity; however they will reduce the level of mortality and subsequent fuel loading that may occur. Endemic levels (typical of natural background levels) of insects would continue to occur, with variations in populations resulting from climatic variations.

Treatments in lodgepole pine dominated stands are expected to result in only minor increases in tree vigor or growth. As with the larch and Douglas-fir, where lodgepole pine does respond to the increased light and moisture, the somewhat improved tree vigor would provide some increased resistance to future insect attacks or disease. More open stand conditions also tend to create less favorable beetle habitat, which may also help maintain the stand for a longer period against possible mountain pine beetle attack. However, under epidemic beetle population levels, these effects would not offer much protection and the lodgepole pine would be expected to experience high mortality.

Some root, bole, and crown damage to residual trees may occur as a result of harvest operations using mechanized equipment. Using designated skid trails to reduce the area of impact can reduce the extent of root damage to residual trees. Bole damage can be reduced by using “rub trees” to buffer the in-stand impacts of skidding cut whole trees. Rub trees (trees intended to be thinned out) would later be removed in the harvest operations. Limiting equipment use to periods when boles are less susceptible to damage (spring sap flow) also reduces bole damage. Spring sap flow occurs during the spring breakup period (about March 15 to June 15), when logging activities are not permitted or restricted. Using mechanized (precision felling) equipment that can cut, carry and place bundles of trees can reduce damage to residual tree crowns and boles. These are a few of the many techniques that can be used to reduce root, bole, and crown damage during harvest operations.

Some tree blowdown may occur along (southwestern/western or prevailing wind facing) unit boundaries; and more likely where adjacent stand harvest activity has most recently occurred and the stand edge has not yet stabilized or adjusted to the new exposed environment. Little blowdown was noted during field reconnaissance; and the blowdown tended to be smaller trees with less developed

root systems that would have been thinned as a part of this proposal. Some within stand blowdown can also occur on more wind exposed sites (such as exposed knobs), or if retained trees are more prone to blowdown due to tree species root structure characteristics (shallow rooted spruce on wet sites). Blowdown can be reduced by selecting more windfirm species to leave if available, by thinning more lightly (edge feathering) in areas where blowdown risk is likely, or by not thinning at all in specific locales where high blowdown would occur, depending on site-specific conditions. It should be noted that natural blowdown commonly occurs within stands due to a whole host of site-specific causes, such as micro-bursts.

G. Other Related Effects

Some of the treatment areas contain hardwood trees, mainly small birch with some aspen and cottonwood. These hardwood and brush species would be retained where feasible to promote species diversity within the area.

Fuel reduction treatments include the removal of concentrations of existing downed wood, as well as slash created by the treatments. Emphasis would be placed on leaving the larger (>9 inches diameter) wood where available, which provides for longer term soil productivity needs and is beneficial for many wildlife species. Also, all large diameter live or dead trees (i.e. > 20 inches diameter) would be left within the stands, to preserve what remnant trees and snags exist and provide this important wildlife habitat component. Heavier fuel loadings and snags would also remain in untreated portions of the area, particularly in the riparian areas and other areas excluded because of resource or social concerns. This would provide a diversity of downed wood and snag conditions across the landscape, adequately providing for small mammal and other wildlife habitat needs and long term soil productivity, while meeting the purpose and objectives for the project to reduce risk of high intensity fire.

Alternatives 2, 3, and 4
Cumulative Effects

The Cumulative Effects Worksheet (Project File Exhibit G-14) considers and describes proposed activities in addition to the past, present, and reasonably foreseeable activities listed in Chapter 3. Those activities that cumulatively contribute indiscernible effects on Vegetation are not included in this section but are discussed in the Vegetation Cumulative Effects Worksheet. Those activities that cumulatively affect Vegetation will be discussed below.

Considering all past, present, and reasonably foreseeable actions, in combination with the action alternative, the overall cumulative effects on the forest vegetation resource would be positive in the near-term, resulting from reduced competition for limited site resources and improved stand health in the areas of treatment, lasting up to 20 years or longer. As time goes by, and succession advances, the effects of the treatments would become less noticeable. The proposed treatments would improve the health, resiliency, and sustainability of the treated stands. Treatments would also reduce the current fire hazard associated with these stands. Treatment would not eliminate the risk of fire originating in or moving through the treated areas, but would create a more defensible space from which to initiate suppression action should a wildfire occur at some future, yet unknown time.

Past, present and reasonably foreseeable actions were considered for the action alternatives. Past actions that were considered included timber harvest treatments on NFS, corporate/industrial, and private lands. Past acres treated are discussed in the harvest history section of this report.

Reasonably foreseeable actions on corporate/industrial lands are anticipated to continue the past trends, converting mid- and late-seral stands to early seral. The majority of these lands have already been converted, so increases are not likely to be substantial.

Foreseeable actions on NFS lands include the Condon Fuels Reduction Project, and the Meadow Smith Timber Sale. These actions are similar to the actions proposed in this project, primarily intermediate treatments to reduce stand densities and fuel loadings, and increase the percentage of ponderosa pine and western larch by reducing the amount of Douglas-fir and lodgepole pine within stands. These actions have been incorporated into the effects discussion, and would contribute towards increasing the amount and distribution of stand composition and structure to increase forest resiliency and sustainability.

Regulatory Framework and Consistency

The treatments proposed in the action alternatives are consistent with the regulatory framework and MA direction for the areas being treated. The project has been designed to be consistent with the Forest Plan goals, objectives and standards. All areas are located within the suitable timber base, where timber harvest may be scheduled and is an appropriate management action. The proposed actions meet the intent of the NFMA findings for vegetation manipulation, suitability for timber production, appropriateness of even-aged management and optimality of clearcutting, and maintenance of the diversity of plant and animal communities (Higgins, 2007).

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