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 Island Unit Ecosystem Analysis at the Watershed Scale (EAWS) (Project File Exhibit Q-4) and the Porter Mount Silviculture Report (Project File Exhibit G-1).

During the last few centuries, fire and human activities were the predominant agents influencing the development of forests in the Flathead 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 a while 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 ponderosa pine-western larch-Douglas-fir forests have revealed several important consequences resulting from past management practices (Peterson, et.al. 2005; Arno, et.al. 1997; Arno, et.al. 1999). Since the early 1900's, interruption of frequent fire cycles and logging has lead to changes in the historic vegetative composition and pattern of the forests. The intermingled ownership pattern and respective land management has fragmented the forest ecosystem and the disturbance-recovery regimes in the project area and surrounding areas. Where prior to settlement, these areas once supported expanses of open grown mature ponderosa pine and western larch forests; today these forests exist as smaller isolated cohort of trees within stands of closed canopy Douglas-fir forests.

Analysis Area

Spatial Bounds

The project boundary is the Porter Mount Management Project Area and is sufficient in size (11,431 acres) 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 or Island Unit) the change would be unnoticeable.

Temporal Bounds

Treatment activities are planned to take 2 or 3 seasons and would likely begin in 2009. 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 pre-treatment 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 Island Unit EAWS which provides a broad-scale view of existing and historic vegetation conditions within the project area and surrounding area (Project File Exhibit Q-4).

The 11,43-acre Porter Mount Management Project Area encompasses NFS lands south of Highway 2, east of Porter Creek, West of Wild Bill Mountain, and north of Brown's Meadow Pass. Lake Rogers is immediately west of the project area and Brown's Meadow Road bisects the project area. Within the project area, the majority of the lands are NFS lands (11,111 acres), with only one inholding (320 acres) of private land. Adjacent to NFS lands is mostly a mixture of Plum Creek Timber Company (PCTC) and private lands. Elevations range from 6280 feet at Haskill Mountain to 3440 feet near Porter Creek. Please refer to Map 1-1 Vicinity Map for a display of the project area.

Historic Condition

Fire History

Historic observations and recent studies from the area reveal a dynamic landscape influenced by fire. Ponderosa pine forests are generally associated with warm-dry sites; however with frequent disturbance they can occupy moist sites as well. Fires either caused by native 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.

Fire suppression efforts started in the early 1940's 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 to 1889 period. Many of the snags were sawed down during the 1960's and '70s as a reduction of 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 1960's removed mostly large diameter ponderosa pine, western larch and Douglas-fir. To provide for inexpensive building material, the forest management practice was expanded to regeneration cuts.

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

Harvest History

Past harvest on NFS lands within the project area are displayed in Table 3-8. Also refer to Project File Exhibit G-4. Since the 1960's, approximately 43 percent of the project area has been regeneration harvested, and 23 percent intermediate harvested. Some of these treatments overlap on the same stand, as multiple treatments may have occurred on the same acreage. Secondary treatments on regeneration units (Shelterwood/Seed Tree removals) were not included in this summary. Data was generated from TSMRS Activity records (Project File Exhibit G-5), for the compartments within this project area.

TABLE 3-8
PAST HARVEST ACTIVITIES ON NATIONAL FOREST SYSTEM LANDS*

Acres by Harvest Type	1960's	1970's	1980's	1990's	2000's	Total
National Forest Service						
Regeneration	383	1942	1966	519	0	4810
Intermediate	0	1380	700	211	217	2508
Total Acres Harvested	**383**	**3322**	**2666**	**730**	**217**	**7318**

*11,111 acres of NFS lands in Porter Mount Project Area

Stands that were regeneration harvested from 1960 to 1979 are fully stocked sapling and pole stands, ranging from 15 to 35 feet tall, 500 to 2000+ trees per acre, and 27 to 47 years of age. Stands that were regeneration harvested in the 1980's are fully stocked transitional sapling/pole stands, ranging from 10 to 15 feet tall, 400 to 1500+ trees per acre, and 18 to 27 years of age. Stands that were regeneration harvested in the 1990's are fully stocked transitional seedling/sapling stands, ranging from 3 to 11 feet tall, 400 to 1500+ trees per acre, and 8 to 17 years of age. Regeneration harvest stands of the late 1990's are initiating stocking, comprised of seedlings ranging from 1 to 3 feet tall, 150 to 1500+ trees per acre, and are 4 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. Treatments that occurred previous to the 1960's would be mostly indiscernible, as the vegetation would be in a mid-seral condition, and therefore similar to surrounding vegetation.

Existing Forest Conditions

Site Conditions:

Soils are a complex mix of residual and glacial till with volcanic ash influence within the project area. Topography varies from gentle slopes and benches in the lower elevations to very steep slopes (60+ percent) in the mid to upper elevations. Numerous perennial or intermittent streams intersect the landscape.

Composition, Structure, Age Class, and Drought:

The majority of the stands proposed for treatment have an overstory of large diameter Douglas-fir, 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 the trees in the overstory, 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 (minor inclusions of grand fir included in this type). 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/grand fir forest types. Table 3-9 displays the dominant forest types within the project area.

TABLE 3-9
ACRES BY FOREST TYPE WITHIN PORTER MOUNT PROJECT AREA
(NFS lands)

Forest Type	Acres
Ponderosa pine	89
Western larch	1693
Douglas-fir	6784
Subalpine fir/Grand fir	285
Lodgepole pine	2163
Non-Forest	97

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

TABLE 3-10
ACRES OF FOREST STRUCTURE WITHIN THE
PORTER MOUNT PROJECT AREA
(NFS lands)

Forest Structure	Description	Acres	Percent of Project Area
Early-seral	Includes non-stocked, seedling, and sapling stand size classes.	4226	38%
Mid-seral	Includes immature pole, mature high-risk pole, mature low-risk pole and immature saw stand size classes.	2766	25%
Late-seral	Includes mature low and high-risk saw timber and multiple stand size classes.	4022	36%
Noncommercial Forest	Wetlands, ponds, rock outcrops and other non- commercial forestland.	97	1%

C. Insects and Disease - Currently, insect and disease conditions are endemic in the project area, with minor levels of mortality occurring, primarily in lodgepole pine and Douglas-fir. Mountain pine beetle infestations were experienced 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.

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 (*the layer of cells under the bark and outside of the cambium layer, responsible for transporting food created by the leaves*), 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 very large numbers.

Many of the larger Douglas-fir trees throughout the project area are being affected by mistletoe and root rot, with individual trees and small groups of trees being killed. This condition is widespread throughout the project area. 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. Mistletoe in the Douglas-fir is scattered throughout the project area, and where past harvest activities have retained overstory Douglas-fir, these trees are heavily infected. The understories in these stands are dominated by Douglas-fir, and are highly susceptible to infection.

Douglas-fir infected with Mistletoe

D. Drought - There are many younger trees in these mixed-conifers stands and their roots are located at the soil surface above the larger tree root masses. Due to fire exclusion, the forest nutrients are tied up in organic material and are released through slow decomposition processes. The feeder roots of the younger trees are more competitive than the older tree roots in gathering water and nutrients at the soil surface. This highly competitive situation results in drought-like conditions for the large trees. Mountain pine beetle, Douglas-fir bark beetle, and root rot can take advantage of trees stressed by a drought-like situation.

ENVIRONMENTAL CONSEQUENCES

Alternative A - 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.

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 periods of drought. 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 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 riparian areas. 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.

Alternative A – No Action
Cumulative Effects

Beginning in the 1960's, previous regeneration harvest has occurred on approximately 43 percent of the project area. These managed stands are fully stocked with a mixed species composition, provide wildlife hiding and thermal cover, and contribute to the mosaic of vegetative diversity that occurs in the project area. These conditions would not be influenced in the short term by no action. The No Action Alternative would not allow for restoration of ponderosa pine and western larch. The continued loss of these important species would vary by specific location, but would occur. Accumulative of fuels from existing and expected dead treefall would likely increase the intensity of a fire in the future. No action would add some degree of degradation where poor forest health is a present concern.

Alternatives B and C
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 the treatment summary table (Table 3-11). Descriptions of each treatment type are found in Chapter 2 and Appendix B of this document.

TABLE 3-11
TREATMENT SUMMARY BY ALTERNATIVE

	Alternative B		Alternative C	
Commercial Harvest Treatment Acres				
Treatment	**Acres**	**MBF**	**Acres**	**MBF**
Commercial Thin	546	3783	561	3903
Seed Tree	410	2723	349	2275
Salvage	66	162	66	162
Sanitation	63	178	63	178
Sanitation with Pre-Commercial Thin	13	13	13	13
Clearcut with Reserves	323	1775	277	1510
Total Acres/Volume	**1421**	**8634**	**1329**	**8041**
Non-Commercial Treatment Acres				
Thin from Below – Non-Commercial	13		8	
Ecosystem Burning	128		128	
Total Acres of Commercial and Non-Commercial Treatments	**1562**		**1465**	
Hand Planting	601		540	
Logging System Acres				
Skyline	488		332	
Tractor	689		543	
Tractor/Skyline	199		160	
Tractor/Helicopter	26		26	
Skyline/Helicopter	19		46	
Helicopter	0		222	
Hand	13		8	
Total Logging System Acres	**1434**		**1337**	
Fuels Treatment Acres				
Excavator Pile/Chipping	724		673	
Excavator Pile/Yard Tops/Lop and Scatter	30		30	
Lop and Scatter	13		8	
Underburn	660		580	
Yard Tops/Lop and Scatter	135		174	
Total Acres of Fuel Treatment	**1562**		**1465**	

A. Intermediate Harvest Treatments

Commercial Thinning, Salvage, Thin from Below – Non-Commercial, Sanitation, and Sanitation with Pre-Commercial Thin - These treatments are intended to reduce stand density, widen the distance between tree crowns and 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, and those with insect or disease occurrences, 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.

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 not 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 2-13). 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. (Please refer to Chapter 2 and Appendix C for more specific descriptions of Intermediate Harvest Treatments).

B. Regeneration Harvest Treatments

Clearcut with Reserve Trees, Seed Tree Harvest - 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 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. 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 would be implemented (Refer to Design Criteria, Table 2-13). (Please refer to Chapter 2 and Appendix C for more specific descriptions of Regeneration Harvest Treatments.)

C. Ecosystem Burning

These treatments would not change the 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. (Please refer to Chapter 2 and the Fire/Fuels Section for a more specific description of Ecosystem Burning.)

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 and understory Douglas-fir 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 would convert stands that are currently dominated by either Douglas-fir or lodgepole pine to ponderosa pine and western larch. 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. Overall, this conversion would move the project area towards the desired species composition, and improve age class diversity on the landscape. **Alternative B** would convert approximately 463 acres of Douglas-fir, 220 acres of lodgepole pine and 46 acres of subalpine fir, through regeneration harvest methods, planting to ponderosa pine-western larch, and 124 acres of natural regeneration. **Alternative C** would convert approximately 399 acres of Douglas-fir, 200 acres of lodgepole pine and 23 acres of subalpine fir to ponderosa pine-western larch through regeneration harvest methods, or natural regeneration (101 acres).

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.

Alternative B would convert approximately 397 acres of late-seral, and 336 acres of mid-seral stands; **Alternative C** would convert 356 acres of late-seral, and 270 acres of mid-seral stands to early seral through regeneration harvest treatments. These changes would not measurably alter the existing percentages of forest structure within the project 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.

Opening Sizes Greater Than 40 Acres

The NFMA, Section 6 (g)(3)(F)(iv), establishes opening size limits according to geographic areas, forest types, or other suitable classifications. Regulations establish the size limit for harvest openings in the project area at 40 acres, with exceptions for larger openings when they will produce a more desirable combination of net public benefits. The Northern Regional Guide (USDA Forest Service, 1983a, page 2-5A) provides for limitations on sizes of openings. Exceeding the 40-acre size limitation requires Regional Forester approval. Table 3-12 displays the opening sizes for larger units that would be created under Alternative B (Proposed Action), and changes made to address opening size in Alternative C.

TABLE 3-12
OPENINGS GREATER THAN 40 ACRES

Unit	Alt. B (acres)	Alt. C	Forest Type
3	77	39 acres in Unit 3, 24 acres in Unit 54 (Units separated by untreated area)	Douglas-fir
17	67	40 acres in Unit 17, (24 acres changed to Intermediate Treatment-Unit 53)	Douglas-fir
26	41	40 acres (reduced in size)	Lodgepole pine
31	86	40 acres (reduced in size)	Douglas-fir
51	59	40 acres (reduced in size)	Lodgepole pine

Two issues drive the reasoning behind the request to exceed the 40 acre limit; (1) insect and disease considerations; and (2) fuel loads related to past mountain pine beetle mortality and in-growth of heavy Douglas-fir regeneration. Following is a brief description of these issues:

a. **Insect and disease –** All of these units have existing root rot that is affecting the Douglas-fir, with mortality in the overstory. The understory is comprised primarily of Douglas-fir, and lodgepole pine. The understory Douglas-fir is susceptible to root rot, and any management activity would increase the potential for mortality in the Douglas-fir. The lodgepole pine in these stands has reached maturity, and is at risk of mountain pine beetle infestation. There is existing mortality in the lodgepole pine, and evidence of current mountain pine beetle activity.

b. **Fuel loads –** All stands identified for treatment exceeding the 40-acre size limitation currently have existing fuels loads from past mortality in the understory lodgepole pine and Douglas-fir. Douglas-fir regeneration provides fuel ladders into the overstory, and continued mortality in the lodgepole pine continues to increase existing fuel loads. The overstory component is primarily western larch and ponderosa pine, which historically would have been maintained in a mixed severity fire disturbance, whereas in the current condition would likely be lost in a stand replacement high severity fire disturbance.

The larger-than-40-acre harvest openings would emulate natural processes associated with a mixed severity fire occurrence and be closer to desired conditions in size and effects. Shade-intolerant species, primarily western larch and ponderosa pine, would have sufficient light and other resources to grow vigorously. This would lead to more resilient forest stands with a trend toward maintaining forest health. Within the larger landscape, larger openings are common in the adjacent ownerships. All of the regeneration openings on NFS lands have successfully regenerated, and many are no longer considered openings.

In Alternative C where these stands have been reduced in size, the effects within the areas not treated would be the same as Alternative A. For Unit 17, which is modified with a Commercial Thin treatment (Unit 53), there would be some risk of increased mortality in residual Douglas-fir trees from

root rot as disturbance from harvest activities may exacerbate the existing root rot areas. Since cable yarding would occur in this unit, the effects should be localized near the skidding corridors.

C. Insects and Disease

Because of the increased tree vigor expected in the mixed species stands, harvest treatments would increase the residual stand components ability to resist future insect or disease influences. These treatments would not prevent future insect activity; however, they would 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.

1. 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-inch 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., $\geq$ 20-inch 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 B and C
Cumulative Effects

The Cumulative Effects Worksheet (Project File Exhibit G-2) considers and describes proposed activities in addition to the past, current, 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 alternatives, 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 upward 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 lands, corporate/industrial, and private lands. 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 in early seral lands are not likely to be substantial. Much of the private industrial land is being sold to non-industrial private owners, who may or may not continue forest management actions on these lands.

Regulatory Framework and Consistency

The treatments proposed in the action alternatives are consistent with the regulatory framework and management area 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).