Fallen Bear Forest Vegetation Report

James McFarland

September 10, 2008

Introduction

The forest vegetation of northern Idaho displays strong diversity in both composition and structure. This diversity is attributable to climate, geology, and disturbance patterns (insects, disease, fire history and extreme weather events). These elements combine to create some of the most varied and productive forest communities found in the Inland Northwest. The most dominant vegetative feature of the northern Idaho forests is trees. The major tree species growing in this area include western hemlock (*Tsuga heterophylla*), mountain hemlock (*Tsuga mertensiana*), western redcedar (*Thuja plicata*), grand fir (*Abies grandis*), Douglas-fir (*Pseudostuga menziesii var. glauca*), western larch (*Larix occidentalis*), western white pine (*Pinus monticola*), lodgepole pine (*Pinus contorta*), ponderosa pine (*Pinus ponderosa*), subalpine fir (*Abies lasiocarpa*), and Engelmann spruce (*Picea engelmannii*) (Burns and Honkala 1990).

This report addresses the purpose and need for vegetation treatment. The forest vegetation in the Fallen Bear Project Area will change through the interaction of plant succession and the influence of disturbances (both natural and human disturbance). Forest vegetation across the landscape will be impacted by these changes. This analysis focuses on the composition, structure, patterns and processes which affect change to forests expressed by the tree component but recognizes that associated layers of vegetation are important parts of the plant communities in the area.

Regulatory Framework

The regulatory framework providing direction for the management of forest vegetation is provided through the *National Forest Management Act* and the *Forest Plan for the Idaho Panhandle National Forests* (USDA Forest Service, 1987).

NFMA provides for balanced consideration of all resources. It requires the Forest Service to plan for diversity of plant and animal communities. The Forest Plan, in compliance with NFMA, establishes Forest-wide management direction, goals, objectives, standards and guidelines for the management for forest vegetation and plant communities.

Direction concerning implementation of NFMA and the Forest Plan can be found in Forest Service Manuals (FSM) and Handbooks (FSH), as well as various written communications from the Forest Service's Washington Office, Regional Office and the Supervisor's Office for the Idaho Panhandle National Forests.

Analysis Area

A review of the Fallen Bear Project and the updating of data with the most current information was completed. The current information and data for vegetation is displayed in this analysis.

The analysis area for the forest vegetation resource is the area that includes the stands that fall completely within the Fallen Bear Project Area. It includes approximately

10,524 acres total, which are all under USDA-Forest Service jurisdiction. This project area was also used for the Fallen Bear Environmental Analysis at the Watershed Scale (EWAS).

Analysis Methods

The information used in this forest vegetation section is a combination of the available data, research material, literature, assessments and field reviews. Vegetation attributes such as forest cover type, stand size class, as well as habitat group and other information were compiled from the Timber Stand Management Record System (TSMRS) and the FSVeg data base. In addition, field reviews were conducted during the original process of diagnosis and analysis to verify site conditions. New stand exams over a portion of the project area were accomplished in 2003, 2004, 2006 and 2008 to update data for this project. Stand tables developed from the most current stand data were used in this analysis (project file, FV-1).

Large-scale context for the terrestrial vegetation and landscape ecology was provided by the *Integrated Scientific Assessment for the Interior Columbia Basin (*Quigley and others 1996) and the St. Joe Geographic Area assessment titled, *Toward a Forest Ecosystem Approach: An Assessment for the St. Joe Area* (IPNF 1997). This information and the objectives described under the purpose and need section of this document, as well as the IPNF Forest Plan, were used in evaluating the Fallen Bear Project Area's existing condition for forest vegetation and comparing it to the landscape and desired forest stand conditions.

Forest stands were reviewed for current insect and disease activity, current production (growth rates), productive potential, regeneration potential, species composition and stand structure. Areas unsuitable for timber production were not considered for treatment related to timber production. In addition to field reconnaissance, determining reforestation potential involved review of the reforestation indices for the District and the project area (project file, FV-2). These indices display our ability to regenerate stands in the project area proposed for regeneration harvest in a period of five years as required under NFMA.

Forest stand treatment needs were identified by a silvicultural forester based on insect and disease activity and potential, existing vegetation conditions and desired stand conditions identified in the Purpose and Need, as well as the EWAS for this project area. Desired stand conditions were developed which are ecologically compatible with the site, as well as the current and historic disturbance patterns and successional pathways of the landscape vegetation. These desired stand conditions are also based on the IPNF Forest Plan management area direction for the sites as described in the IPNF forest Plan. Treatment needs were based on a comparison of the existing stand condition to the desired condition and the alternative actions that would move the stands from the existing condition toward that desired condition over time, and generally maintain or improve forest health in this project area. Consideration included stand composition, especially the condition and amount of long-lived early seral species, stand structure, and the potential of the stand to provide mature stand structures with large trees in the future.

Documentation for the general target stands, site-specific stand data and stand diagnosis is in the project file (project file, FV-3, 4 and 5). A description of the features of various silvicultural systems are included in the EA and in the Forest Plan and Forest Plan FEIS.

Affected Environment

Habitat types were used for the project planning and site-specific considerations in this environmental analysis. *Forest Habitat Types of Northern Idaho: A Second Approximation* (Cooper and others 1991) outlines the classification and characteristics of the habitat types. This information was used for stand-level diagnosis and analysis.

Specific field determined habitat types and phases can be found in the St. Joe District's TSMRS and FSVeg data bases. Additionally, habitat types were grouped to facilitate landscape-level analysis and planning. Habitat type grouping aggregates habitat types that fall within similar temperature and moisture environments. As a result of similar environments and vegetation characteristics, the habitat group can be used to describe similar productivity, fire and other disturbance regimes, stand dynamics, susceptibility to insect and disease, forage and cover potential, rare plant potential, cover types, structural stages and successional pathways. *A Biophysical Classification, Habitat Groups and Descriptions* (USDA 1996) was used for this analysis. The Fallen Bear Project Area includes eight of the forest habitat type groups described in that document. The relative distribution of the habitat type groups occurring in the project area is displayed in Table 1-1below, and is characterized in the subsequent description. Habitat groups indicate the potential natural vegetation within the area.

Table 1-1: Distribution of Habitat Types of NFS in Fallen Bear Analysis Area

Habitat Group	Potential Vegetation	Temperature and Moisture	% Acres
2	Dry Forest	Moderately Warm and Dry	6.9%
3	Dry Forest	Moderately Warm and Moderately Dry	2.0%
4	Moist Forest	Moderately Warm and Moist	20.0%
5	Moist Forest	Moderately Cool and Moist	41.6%
6	Moist Forest	Moderately Cool and Wet	1.5%
7	Cool Forest	Cool and Moist	18.0%
8	Cool Forest	Cool and Moist	2.9%
9	Dry Forest	Cool and Moderately Dry	7.0%

Habitat Group 2 is primarily dominated by ponderosa pine or Douglas-fir with understory dominated by grasses and brush. Within the Fallen Bear Analysis Area, this habitat group is primarily dominated by Douglas-fir. This habitat group occurs at lower elevations on most aspects and can also be found at higher elevation on more southerly and westerly aspects. Understory is maintained by more frequent (5 -50 years), low intensity/severity fires, maintaining an open, park-like stand. Stand replacing fires usually occur only after long fire-free intervals (usually 50 - 200+ years). This habitat group falls on approximately seven percent of the analysis area.

Habitat Groups 3 and 4 are primarily the transition between dry and moist habitat types. They are commonly found on lower slopes and valley bottoms. Stand composition transitions from drier sites of ponderosa pine and Douglas-fir to moister sites of grand fir and more diverse composition. Understory vegetation is very diverse with regeneration pri-

marily of Douglas-fir and grand fir. These groups have low intensity fires occurring on drier sites every 15 – 50 years and on moister sites every 50 – 200+ years. These low-intensity fires create a mosaic pattern where this habitat type occurs. Stand replacing fires are usually caused by extremely dry conditions and fires burning from an adjacent and drier type. These habitat groups fall on approximately twenty-two percent of the analysis area.

Habitat Groups 5, 6, and 7 are primarily cool, moist or wet habitat types. Habitat Type Groups 5 and 6 correspond to the western redcedar and western hemlock habitat type series, which are generally on low and mid-elevation slopes. These three groups are highly diverse, and nearly all conifer species in northern Idaho can occur in these groups. They can be characterized as the sites where western white pine has the capability to thrive and represent a major component of forest stands. It is also where western larch is most productive and capable of growing to large diameter trees sooner than in other habitat type groups. Fire intervals in these types are 50 – 200+ years and stand replacing/high severity fires are usually centuries apart. These habitat groups fall on approximately sixty-one percent of the analysis area.

Habitat Groups 8 and 9 are primarily cool and cold sites with varying moisture regimes of wet and moderately dry. These groups correspond to Engelmann spruce, subalpine fir, mountain hemlock and, on drier sites, lodgepole pine habitat type series. Wetter sites in these habitat type groups have long stand replacing fire intervals of 150+ years. Drier sites dominated with lodgepole pine may begin to accumulate heavier fuel loads, usually over 80 years, and be part of large scale stand replacing fires. These habitat groups fall on approximately ten percent of the analysis area.

Forest Composition

Throughout the Interior Columbia River Basin, there has been a decline in shade-intolerant early-seral species and an increasing dominance of shade-tolerant species (Quigley and others 1996), this same trend is present in Idaho. Table 1-2 below displays the trend away from potentially long-lived early seral species (western white pine, (WP), western larch (L) and ponderosa pine (PP)) and towards more shade-tolerant, mid to late seral grand fir (GF), subalpine fir (SAF), Englemann spruce (S), lodgepole pine (LP), and Douglas-fir (DF) (O'Laughlin and others 1993), Table 1-2 represents information from 1952 through 1987 in Idaho.

Table 1-2:- Species Composition Changes in Idaho

Idaho Forest Type	WP	PP	GF/SAF	S/ L/ Other	LP	DF
% Change 1952-1987	-60%	-40%	+60%	+30%	+38%	+15%

In stepping down to the St. Joe River Basin we find a similar major decline in long-lived early seral species, particularly western white pine, western larch and ponderosa pine (IPNF 1997).

There are ecological implications of changes in forest composition. Western larch, ponderosa pine and white pine are fire adapted, relatively drought resistant and more root disease resistant than other species, and are capable of dominating the forest stands from establishment to 350 years (Shiplett and Neuenschwander 1994). Additionally, they are

capable of producing tall trees of large diameter that serve important ecological functions. Western hemlock and grand fir are two of the more moisture-demanding tree species. They are highly stressed during drought. The increase of these drought-sensitive species at levels substantially higher than historical levels creates increased risk of large-scale insect and disease outbreaks during periodic droughts.

Western hemlock and grand fir are also less adapted to surviving fires than more seral species. As stand composition shifts to greater proportions of fire susceptible species there is an increase in the risk of higher mortality when fires do occur.

Grand fir and Douglas-fir are highly susceptible to root diseases. Conversion of forests to these more shade-tolerant and disease-prone species has contributed to an increase in the incidence of losses and damage associated with Armillaria root disease (Byler and Zimmer-Grove 1991). Historically, root pathogens acted more as a thinning agent. Increased dominance of these more susceptible species can change the relationship of root pathogens from one of thinning to a major disturbance agent in forest stands and across the landscape. Shifts in stand composition and other natural and human-caused disturbances have frequently resulted in increased damage from root-rot diseases (Rippy and others 2005). Within the Fallen Bear Project Area, it has been observed that root-rot has begun to be have more of an impact on the mid to late seral species, specifically Douglas-fir (project file, FV-6)

Lodgepole pine is a relatively short-lived seral species, especially in the moist forest sites of northern Idaho. Conversion from white pine, western larch and ponderosa pine forest types to Douglas-fir, grand fir, lodgepole pine and western hemlock types tends to reduce the species composition. Subsequently there is a potential increases in the risk of probable loss when disturbances such as fire, insect outbreaks, drought, etc. do occur. An increased risk of loss affects both the stand and landscape scales.

Table 1-3 below displays the current stand composition (defined by the forest type of the species with the greatest basal area represented in the stand) for the historic and the current stand composition for the St. Joe River Basin. It also displays the changes in forest composition (forest type) in this project area as it relates to the current and the historic forest composition for the St. Joe Forest.

PP = ponderosa pine, WP = western white pine, WL = western larch, DF = Douglas-fir, GF = grand fir, WH = western hemlock, C = western red cedar, LP = lodgepole pine, SAF = subalpine fir, MH = mountain hemlock, ES = Engelmann spruce, WBP = white-bark pine.

Table 1-3: Forest Type Changes in the St. Joe River Basin & Fallen Bear Project Area

Forest Type	PP	WP	WL	DF	GF/WH	C	LP	SAF/MH/ ES/WBP
St. Joe Basin (all lands) Historic Forest	4.3%	24.1%	16.7%	9.4%	9.7%	7.8%	7.1%	20.9%
St. Joe Basin (all lands) Current Forest	2.9%	2.2%	4.8%	22.3%	32.6%	4.3%	14.4%	16.3%
Fallen Bear Project Current Forest	0%	1.0%	3.0%	30.0%	30.0%	8.0%	7.0%	21.0%

Increase have occured in the shorter-lived seral species such as lodgepole pine and Douglas-fir and in the more shade-tolerant grand fir and western hemlock. Historic records of

the St. Joe National Forest show higher acreages of forest cover types in white pine and western larch than occur today for this area. The early timber inventory methods were plots distributed over large blocks of ground that were not tied to individual stands as done today. The differences in methodology of these timber surveys makes it difficult to do a direct comparison to today's inventories, however, the data does indicate a shift away from the long-lived early seral species and more towards Douglas-fir and grand fir.

Past timber harvest, generally starting in the St. Joe River Basin in the 1920-1930s, often focused on the removal of the largest-sized trees and the most market valuable species. The large and more dominant sized trees and the more valuable western white pine, western larch, and ponderosa pine were preferentially removed over other size classes and species. Large dominant western redcedar was also removed due to its market value. This practice reduced the contribution these species and size classes made to the individual stand composition, as well as their contribution to the general landscape of the St. Joe River Basin. This same treatment pattern occurred within the Fallen Bear Project Area, however, substantial amounts of timber harvest did not occur within the project area until the late 1960s.

With effective fire suppression for more than 80 years, fire as a natural thinning agent has been removed. Fire encouraged retention and regeneration of shade-intolerant early-seral species; subsequently have replaced the early seral species with more shade-tolerant, less fire-adapted species over time. The elimination of fire also reduced site preparation, which provided a seed bed for germination and establishment of early-seral species. Additionally, the lack of fire has allowed an increase in stand densities and the establishment of more shade-tolerant species such as grand fir, hemlock and Douglas-fir. As these species occupy the site, they generally exclude the establishment of the shade-intolerant early-seral species such as western larch and ponderosa pine.

When the long-lived, shade-intolerant early seral species (primarily western larch and western white pine and to a lesser extent ponderosa pine) establish early as a strong stand component. They are able to maintain a dominant or codominant position in a stand for long periods of time. The risk of total stand loss due to disturbances such as fire, insects and disease are reduced when these species are able to maintain a dominant or codominant place in a stand.

In areas that western larch is present a common disease found affecting the species is larch dwarf mistletoe (*Arceuthobium laricis*). It is estimated that approximately 35% of the western larch forests in the "Inland Empire" are infected with larch dwarf mistletoe (Beatty and others 1997). Dwarf mistletoe causes increased mortality, reduced growth rates and loss of vigor, lowered timber quality, reduced cone and seed production, increased susceptibility to other damaging agents and is often a major factor contributing to mortality (Beatty and others 1997). Spread of mistletoe through a stand is dependent on the stand structure. In single storied stands, spread is estimated to be 1.5 to 2 feet per year and in a multistoried stand, spread is more rapid because of understory trees being bombarded by dwarf mistletoe seeds from infected overstory trees (Beatty and others 1997). Mortality from fire can also occur due to increased fuel loading at the base of infected larch trees (Taylor 1992)

The accidental introduction of the exotic white pine blister rust (*Cronartium ribicola*) decimated western white pine, which was historically a major stand component. It is es-

timated that western white pine population throughout its interior Northwest range may be less than five percent of what it was at the turn of the 20th Century (Harvey and others 2008). Western white pine has a natural rust resistance of less than ten percent (10%), and as a result, ninety percent (90%) or more of the western white pine throughout this project area have been lost and similar mortality rates have occurred over the landscape in general.

The combined effects of these elements resulted in substantial reductions in the representation of these long-lived, shade-intolerant seral species in the overstory, and the associated reduction in seed source to provide for natural regeneration of these species.

The reduced amount of thinning with subsequent increased establishment of more shade-tolerant species has resulted in an increase in competition and a loss of adequate sites to encourage germination and effective establishment of early seral tree species that may have originated from an already reduced seed source.

Forest Structure

Forest structure refers to the vertical, horizontal and other spatial characteristic patterns of various components over time. Structure classifications of forest vegetation can be used to reflect processes which operate across landscapes and their component stands. Throughout the Interior Columbia River Basin there has been substantial reduction of older forest structures compared to historic structures (Quigley and others 1996). Over approximately the last 100 years this reduction ranges from 27 to 60 percent from historic levels, depending on the forest type.

During this same period, large residual trees and snags have decreased by about 20 percent. The *Assessment for Ecosystem Management of the Interior Columbia River Basin* indicates that forest composition and structures have become more homogeneous compared to historic conditions. Within the St. Joe River Basin, as well as within the Fallen Bear Project Area, there has been a shift from historic conditions to a more homogeneous structure and species composition. Late seral structures (forests dominated by large, late-seral species including grand fir, western redcedar, western hemlock and Douglas-fir) and early-seral structures (forests dominated by shade-intolerant, early-seral species including ponderosa pine, lodgepole pine, western larch, and western white pine) have been declining. There has been an increase in mid-seral structures dominated by grand fir and Douglas-fir, which have become contiguous and created a more homogeneous landscape.

When comparing the structural change within the St. Joe River Basin from mean historical vegetation to the current condition, there are indications of a reduction in large diameter trees, large snags and stands dominated by large old trees (IPNF 1997). There are fewer stands typified by an old, open overstory of large early-seral species with an understory of mixed species of varying shade tolerances. Stands typified by small and medium-sized young trees have increased. These stands are generally more uniform in structure and more densely stocked compared to historic conditions. The primary causal factors influencing this shift have been the commercial harvest of the older and larger overstory, and the efficiency of fire suppression reducing the incidence and extent of mixed and high severity fires.

Current and historic forest structure, based on size-class groupings, within the St. Joe River Basin is presented in Table 1-4 along with the current forest structure for the Fallen Bear Project Area. Forest structure on the landscape scale is trending away from mature/old and old growth forest structure, toward smaller trees (IPNF 1997). A different trend has developed in the Fallen Bear Analysis Area as discussed below.

Looking at the landscape scale, acres in the shrub/seedling/sapling size class are predominantly the result of past regeneration harvests. These areas do have some residual larger trees and snags, however, they are generally under-represented in these past harvest units. Stands which fall into the pole/small/medium sawtimber size class are generally densely stocked with trees where canopies are closed, or nearly closed, and little light reaches the plant communities in the understory. These stands are experiencing competition for growing space (Oliver and Larson 1996) and are developing under strong competition. Many of these stands have relatively small trees for their age and are more susceptible to drought and damage or destruction by wildfire, insects and diseases.

Table 1-4: Size Class Distribution for the St. Joe River Basin & Fallen Bear Project

Forest Structure	Shrub/Seed /Sapling	Poles/Small /Medium	Mature/ Large/Allocated OG
St. Joe Basin (All Lands) - Mean Historic Vegetation	20%	35%	45%
St. Joe Basin (All Lands) - Current Vegetation	28%	50%	22%
Fallen Bear Project Area - Current Vegetation	20%	31%	48%

Stands that are allocated as old growth currently meet or are providing old growth character based on *Old-Growth Forest Types of the Northern Region* (Green and Others 2005). The Fallen Bear Project involves one Old Growth Management Unit, OGMU27. Currently, the OGMU has approximately 2,845 acres (27%) of the project area allocated as old growth. More information on the topic of old growth in the Fallen Bear Project Area can be found in the Fallen Bear Old Growth Report.

Much of the Fallen Bear Project Area has had minimal past disturbance from wildfire. Timber harvest activities have occurred on 32% of the project area. With the absence of past disturbance on 68% of the project area, 48% of the project area has reached a stand structure of mature/large/allocated old growth. The stands that comprise the mature/large/allocated old growth stand in general are dominated by late seral species.

Historically, the landscape of the St. Joe River Basin included openings. These openings ranged in size from small openings of only a few acres, to large opening ranging in size from several hundred acres to larger than a thousand acres in size. The smaller openings were generally the result of low intensity fires, losses to endemic levels of insects and diseases, and localized wind and snow events. The larger openings in the forest were generally created by mixed to high severity wildfire. A series of large fires around 1830 burned nearly half of the St. Joe Basin. These fires were not all stand-replacing fires, however, they did create large openings and killed large acreages of forest. The large fire of 1910 burned over half of the St. Joe Basin. The Coeur d'Alene Basin fire study showed that over the last 450 years there was one major stand replacing fire episode somewhere in the basin every 19 years (Zach and Morgan, 1994). Fire created openings

in the Fallen Bear Project area. Records show that portions of the project area were burned by the mixed severity fire of 1910 (project file, FV-7). There have been numerous small fires throughout this project area since the 1910 fire. Due to fire suppression and other activities, the majority of openings created since the 1910 fire have been created by timber harvest activities, as well as losses due to insects and disease.

Vegetative Conditions Related to Past Harvest

Relatively little timber harvest occurred within the Fallen Bear Project area prior to the 1960s. Very old stumps and the Red Ives Ranger District Timber Sale Atlas (Management Activity Report; project file ACT-2) indicate that some harvest did occur prior to the 1960s, although very few records were found related to those early harvest activities. This early activity may have been related to salvage activity and removal of specific products such as large western larch, western white pine, ponderosa pine, Douglas-fir and western redcedar. A review of the stand data base does not include those possible harvest activities. The stand history, or activity, data base does record the timber harvest that has occurred from 1960 to the present, or approximately 48 years. More intensive timber management contracts were not prevalent until the 1960s. Review of the stand histories in FACTS for this area did not identify timber harvest activities prior to 1967. The most recent timber harvest activities within the Fallen Bear Project Area were Bruin Tumbledown (completed in 1992) and 3 Spot Helicopter (completed in 1992) (Project File, FV-8).

Records reveal that since 1967 approximately 3,397 acres of the 10,524 acres of the Fallen Bear Project Area have had some type of commercial harvest. Of this, approximately 75% (2,534 acres) was regeneration harvest system (1,665 acres clearcut/special cut, 511 acres shelterwood, 172 acres shelterwood final removal, and 186 acres seed tree), and 24% sanitation/salvage harvest. All of the acres treated by regeneration harvest have been certified as regenerated (project file FV-2). Additional methods of harvest in the project area were liberation cut (18 acres) and overstory removal (16 acres), which account for approximately 1% of the total project area.

Environmental Consequences

Alternative A

Direct and Indirect Effects

Forest Composition

As presented earlier, there has been a decline in the shade-intolerant early-seral species and an increasing dominance of shade-tolerant species within the Fallen Bear Project Area. For this area and associated potential vegetation, these early seral species are identified as western larch, western white pine and, on the more dry sites, ponderosa pine. Lodgepole pine and Douglas-fir are also regarded as seral species on certain habitats within this project area. One of the needs identified in the purpose and need for action is to improve resiliency in the vegetation. Action would include encouraging the establishment of long-lived early seral western larch, western white pine and where appropriate ponderosa pine. The retention of existing long-lived early serals is also important to meeting the purpose and need for action.

Alternative A, which proposes no stand treatment, would maintain the existing conditions and trends of the forest stands which are proposed for treatment in other alternatives. This alternative would continue the current trend of decreasing the contribution of western larch and western white pine in species composition within the project.

The loss of western white pine is primarily the result of white pine blister rust infections causing mortality. White pine blister rust will continue to infect and kill all or most of the remaining naturally occurring western white pine as well as the natural regeneration resulting from these existing seed sources.

Natural resistance to white pine blister rust is generally less than ten percent, and available natural seed sources in the Fallen Bear Project Area are relatively low and decreasing as mature western white pine continue to die from white pine blister rust infection and other factors. Western white pine is currently a minor component in the forest stands considered for treatment in this assessment and would continue to decrease under Alternative A.

The percent composition of western larch and western white pine dominated stands, currently five percent, in this project area would decrease with Alternative A. The development of western larch is related to its intolerance of shade. Western larch is the most shade-intolerant species in its range and the most resistant to fire (Fiedler and Lloyd, 1995). To regenerate, western larch needs fire or other major disturbance to provide appropriate seed bed conditions (Schmidt and Shearer, 1995) for effective germination and establishment. To survive in the stand, western larch must maintain at least a codominant or dominant position, but preferably a dominate position in the canopy. When stocking is high, growth rates will slow down, even for dominate trees.

Alternative A would not be treating western larch seed trees infected with dwarf mistletoe. By not treating these infected trees, the spread of larch dwarf mistletoe will continue into the next generation of western larch. This will cause increased mortality, reduced growth rates and loss of vigor, reduced cone and seed production, increased susceptibility to other damaging agents and is often the major factor contributing to death (Beatty and others 1997). The increased impacts from dwarf mistletoe will only increase the risk of suppressing western larch in these stands and reduce its ability to maintain at least a co dominate or dominate position.

Historically, low- and mixed-severity fires favored larch by thinning out some of the competition (Arno and Fishcer, 1995). Alternative A proposes no commercial harvest to encourage retention and/or establishment of western larch within the project area. The current policy to suppress all fires in the area would continue. As a result, the composition of western larch would depend on the survival of existing trees. Due to the severe intolerance of western larch to shading it does not effectively compete once its position in the canopy is not dominate. In the absence of fire or other thinning agents (natural or human-caused) the more shade-tolerant species would continue to develop and compete with the western larch. In areas where root rot or other forest pathogens are performing the thinning effect, some retention of larch, if present, is expected. In those areas, however, the natural regeneration would continue, and little long-range benefit in the retention of western larch is expected. The live shading from the more shade-tolerant species would result in decreased diameter and height growth. The existing western larch in the stands considered for treatment in other alternatives is demonstrating a current decline in

live crown and growth rate. In the absence of fire or other thinning agents, the decline in western larch is expected to continue and over time western larch would be substantially reduced or even eliminated from these stands under Alternative A.

Ponderosa pine has historically dominated a very small percentage (approximately four percent) of the St. Joe River Basin. Where ponderosa pine may be present in the project area, it is a minor stand component and usually consists of scattered individuals or very small groups.

Current conditions have resulted in much higher proportions of the more shade-tolerant species, especially Douglas-fir and grand fir/western hemlock forest types, than historically existed in the area. This trend is expected to continue under Alternative A.

This alternative would result in the continued trend of decreasing numbers of western larch and western white pine in forest stands.

Under Alternative A, stand composition is expected to change over time with a continued reduction in the existing component of intolerant early-seral species and a continued increase in more shade-tolerant mid- and late-seral species. As a result of this shift in species composition, the risk of losses to insect and disease would increase. Potential losses would be expected because of the existing disease and insects in these stands (*Armillaria ostoyae, Echinodontium tinctorium, Phaeolus schweinitzii* and *Dendroctonus pseudotsugae, Scolytus ventrails, Cronartium ribicola).*

The increase in stand density and shift in stand composition to more shade-tolerant species (predominantly Douglas-fir, grand fir and hemlock) would also increase the risk and extent of disturbance from fire. These species are less adapted to surviving fire than are the more shade-intolerant seral species. As these more fire-sensitive species increase as a percent of stand composition, the risk of losing entire stands increases should fire occur.

Forest Structure

Alternative A would result in no direct management induced changes to forest structure.

Forest structure would continue to change over time. Forest stands in the project area can generally be classified as stands where the canopy is moderately closed, trees are crowded (moderately to heavily stocked), and live crowns are beginning to decline in both crown width and height.

In the majority of the stands trees are competing for growing space and self thinning is occurring. The competition will result in a continued decline in western larch and western white pine because the susceptibility to disease and insect attack would increase over time as both diameter and height growth increase for all trees in the stands.

The shrub/seed/sapling stand size classes are expected to continue to develop towards the pole/small/medium size classes. In the absence of disturbance, the representation of the shrub/seed/saplings size class will be reduced. The current acreage of this size age class will transition to the larger size/age class (pole/small/medium).

The pole/small/medium stand size classes are relatively close to historic conditions. Although growth rates are declining, these stands are expected to continue development towards the older and larger size classes. This development trend is expected to occur at a relatively slow rate due to reduced growth rate and loss of vigor resulting from increased

stocking levels. Little change in growth rates, stand densities, species composition or other stand characteristics would be expected in the foreseeable future in the absence of disturbance associated with the action alternatives.

The mature trees in the large size classes would be expected to increase over time in the absence of disturbance. Wildfire is a potential to cause change in this age/size class, however, the current fire suppression policy would continue which reduces the probability of fire as a primary vector for change. The potential exists for other natural disturbance, more particularly insect or disease endemics or epidemics, to act as tree/stand replacing agents and influence a shift of impacted stand towards younger/smaller size classes.

Forest cover types are determined by the species with the greatest percent compositions (by basal area) in the stand. Within this proposal area, approximately 80 percent of the acres are in Douglas-fir, grand fir, western hemlock and subalpine fir forest types.

Douglas-fir and grand fir are the most susceptible to root disease of all the native forest trees in northern Idaho. The majority of disease is in Douglas-fir and grand fir trees in cedar/hemlock habitat types. A study on the Coeur d'Alene River Basin (Matthews, 1995) simulated effects of root disease on mature stands of Douglas-fir and grand fir cover types on these habitat types. Reductions of stand basal area were significant (net decline over 100 years), mean diameters never exceeded nine inches over a 50 year period (without root disease it exceeded 14 inches) and canopy closure decreased from 75 percent to 45 percent and did not regain 75 percent closure for a period of approximately 80 years. This indicates the effects severe root disease can have on these habitat types/cover types. Crown closure, average diameters and other stand characteristics recover over time when western redcedar and hemlock become predominant components. This recovery process may take up to 100 years to occur.

The occurrence of root disease is currently at endemic levels within the project area. With declining growth and vigor, these stands are expected to have increasing effects from root disease. Increased mortality from root disease and other agents can be expected in the larger sized, more susceptible trees. This would create small openings due to losses of individual and small groups of medium and large trees throughout the project area. These openings would regenerate with shade-tolerant, susceptible species. As we lose the larger trees over time, the vertical structure in these stands would be reduced, as well as average tree size. Over time, this would create a more homogeneous structure, one with fewer crown classes than currently exist. This is expected to occur within the individual stands as well as for the project area in general. As a result, over the next 30 to 50 years, these stands are expected to decrease in mean diameter and decrease in canopy closure resulting from individual tree and small group mortality. This could potentially extend the time needed for these stands to achieve a large/mature size class and reduce the number of acres in the large/mature size class.

Cumulative Effects

Forest Composition and Structure

Alternative A of this project would cumulatively maintain the current composition trends in this project area. There would be an incremental reduction of seral species within the project area. The number and extent of western larch, western white pine and ponderosa

pine would continue to decrease where it exists in the project area. The number and extent of grand fir, western hemlock, and Douglas-fir would continue to increase. An exception to this would be those areas that were previously reforested and/or pre-commercially thinned to promote early-seral species composition.

The effects of Alternative A on species composition would only differ by the incremental changes within the project area. This would be predominantly through losses in the existing western larch and western white pine components, and increases in the grand fir and Douglas-fir component.

Over the next 25 to 30 years, stands throughout the project would continue to grow bigger trees and move towards larger size classes in the absence of disturbance of fire or other disturbance agents. Due to species composition and the expected increase in the incidence of root disease and insect damage, this trend towards larger tree sizes is expected to begin a subsequent decline as a result of mortality. Over the longer term, vertical stratification and horizontal differentiation may also be expected to decline by only incremental amounts.

Alternative B

Direct and Indirect Effects

Forest Composition

Proposed regeneration harvest (clearcut w/reserves, shelterwood cut, and seed tree cuts) in Alternative B would regenerate 195 acres currently occupied predominately by grand fir, Douglas-fir and western redcedar with potentially long-lived seral species, primarily western larch and western white pine. Openings as a result of these proposed regeneration treatments would range from nine acres to 40 acres in size. This would result in an increase of 195 acres of long-lived, early-seral species through artificial regeneration (planting). Site preparation for planting would be done using prescribed burning as discussed in the Fallen Bear Fire and Fuels Report. Some mortality in reserve trees would be expected, however mitigation measures would be implemented to reduce those effects from fire. Reserve trees killed during site preparation operations would be left on site. They would contribute to course woody debris and snag needs in the stands.

In areas proposed to be planted with conifer seedlings, pocket gopher control (gopher baiting) activities are anticipated. Pocket gophers can adversely impact stocking and re-establishment of new stands by foraging on the roots of the new trees and causing mortality. When the opportunity exists, pocket gophers seem to prefer foraging on the roots of the planted early-seral western larch and western white pine over native/natural regenerated species present. These control activities reduce the overall mortality of planted seedling, and in particularly early seral western larch and western white pine. The direct effect of this activity on forest composition is improved retention of these species as a component of the new establishing stand.

Commercial thinning would maintain and/or increase the presence of long-lived, shade intolerant species in stands proposed for intermediate treatment in Alternative B. There would be a slight increase in earl seral representation, predominantly western larch, on approximately 151 acres where this species is present but is a minor stand component. On an additional 57 acres where western larch has a higher representation the retention of

the existing seral component and the reduction of more shade-tolerant species, the forest type is expected to change from grand fir/Douglas-fir to western larch. Approximately 63 acres of existing western larch forest type proposed for treatment would be maintained in the that forest type in the long term through preferential removal of species other than western larch and western white pine.

The proposed stand treatments have a potential to increase the current incidence of root and stem decays in susceptible species, within the treatment areas. Increased representation of western larch and western white pine is expected to reduced the impacts of root and stem decays in the treated stands. Reduced impacts would be accomplished by reducing the presence of susceptible species, Douglas-fir and grand fir. Stand loss to insects and other diseases is expected to remain at endemic levels as a result of increased representation of long-lived, early-seral species as well as improved growth and vigor in the areas proposed for treatment.

Under Alternative B, timber stand improvement work (pre-commercial thinning and white pine pruning) is proposed. Pre-commercial thinning is proposed in 45 stands totaling 775 acres and white pine pruning is proposed in 45 stands totaling 777 acres. Pruning greatly lowers the risk of blister rust infections (Schnepf and Schwandt 2006). Seven of these stands, involving approximately 168 acres, would be thinned and pruned according to the Northern Rockies Lynx Management Direction as discussed in the Fallen Bear Wildlife Report. Species composition in these stands currently are composed of a mixed conifer including early seral (western larch and western white pine). Through selective thinning, emphasizing on the retention of early seral species would be implemented in the stands. Western larch seedlings infrected with dwarf mistletoe should be cut to reduce the affected trees and the spread of dwarf mistletoe in the stand.

In addition to pre-commercial thinning and white pine pruning, girdling of existing dwarf mistletoe infected western larch seed trees is proposed to reduce the spread of dwarf mistletoe. Eleven stands, approximately 161 acres previously harvested using a seed tree silvicultural prescription, are the target of this treatment. The treatment would treat the western larch seed trees left as residual trees from the previous harvest and infected with dwarf mistletoe (*Arceuthobium laricis).* Treatment would consist of girdling infected trees. Treated trees would be left on site to meet other resource needs as snags or course woody debris. Dwarf mistletoe (a parasite) is dependent upon its host, in this case western larch, for water and nutrients (Beatty and others 1997). The intent of this treatment is to reduce the spread of dwarf mistletoe to the western larch understory by killing infected western larch seed trees (Beatty and others 1997). Treating these infected seed trees simultaneously would kill the tree and would kill the dwarf mistletoe by removing its water and nutrient source. In addition to girdling, trees may be inoculated with heartrot fungus to create cavity nesting habitat as discussed in the Fallen Bear Wildlife Report. Decay will not spread from inoculated trees to nearby healthy trees. Nearby healthy trees risk the same chance of becoming infected with or without the presence or inoculated trees in the stand (Hildebrand and Packs 1997).

Forest Structure

The areas proposed for clearcut w/reserves, shelterwood cut, and seed tree cuts would directly change structure of 195 acres within the project area. This treatment would re-

sult in even-aged stands with the larger reserve trees scattered throughout the treatment area as an overstory above the planted and naturally regenerated new age class. The larger trees would remain the dominate structure in these stands. These treatments would directly change stand size class in as much as the primary size class would shift from the pole/small/medium/size class to the brush/seedling/sapling size class. These treatments would decrease the vertical structure and increase the horizontal structure on 195 acres through creation of openings (ranging in size from 9 acres to 40 acres) in the existing homogeneous stand density.

Alternative B would directly change forest structure on all proposed harvest units. This change in structure in commercial thin treatment units would reduce stand density by an average of 45% and open the canopy cover by corresponding amount. This harvest treatment would remove smaller trees and favor retention of larger diameter and more vigorous trees and would increase individual tree growth and vigor. This would result in developing mature/large-sized trees over a shorter period than would be expected with no treatment. The vertical structure would have less variation because of the removal of smaller tree classes. Additionally, stand density and crown closure would be reduced. These stand characteristics would increase over time following this proposed activity. Commercial thinning harvest activities would affect up to 288 acres. These treatments would not directly change stand size class due to few trees currently in the large/mature size class currently present in these stands.

The pre-commercial thinning (775 acres) and seed tree treatment activities (161 acres) would not directly affect forest structure. Treatment in these stands would increase the growth and vigor in the stands. Selection of trees to be pre-commercially thinned would reduce the impacts of blister rust on western white pine, reduce the risk or spread of dwarf mistletoe in western larch and reduce the effects of root rots on susceptible species. Stands would remain in the brush/seedling/sapling size class after the treatment.

Cumulative Effects

Forest Composition Resulting from Stand Treatments

The contribution of long-lived seral species to stand composition is expected to increase. This would be the result of preferential removal of species other than long-lived early seral species in intermediate treatment activities and reforestation activities that preferentially select, maintain, and promote long-lived early serals within the stands.

Cumulatively, there would be an increase (approximately 3 percent) in the composition of long-lived early seral species from vegetation management activities within this project area.

Forest Structure Resulting from Stand Treatments

The tree and stand size classes in intermediate harvest areas are expected to increase due to retention of larger tree classes combined with improved growth and vigor of trees and stands. In areas receiving regeneration treatments the tree and stand size classes are expected to decrease due to removal of overstory trees. In areas proposed for pre-commercial thinning the tree and stand size classes are expected to increase over a shorter period of time due to improved growth and vigor resulting from treatment.

Cumulatively, only a small incremental increase in tree and stand size class resulting from vegetation management activities within this project area is expected.

The vertical structure complexity is expected to decrease, and horizontal structure complexity is expected to increase within the project area. This is due to removal of tree classes (vertical structure) and creation of openings (horizontal structure) related to various management activities. Both of these structural elements would increase in the complexity over time. Cumulatively, the decrease in vertical structure and increase in horizontal structure for the project area overall would be small, or incremental.

Root and stem decays are expected to still be present in treatment stands after treatment but, remain at low (endemic) levels due to increased stand vigor. Reduced affects from root and stem decay is expected due to the decreased representation of susceptible species. In areas not treated, it is expected that root and stem decays will continue to impact stands at current levels or have the possibility of a more epidemic level. Losses from insects and diseases other than root/stem decays are expected to decrease due to the improved growth and vigor resulting from management activities. An exception to this is the losses to western white pine due to blister rust, which is expected to continue at or near the current rate in untreated stands. Loss due to white pine blister rust in proposed pruning stands may be reduced. The effects of slight decrease in tree/stand size class and vertical structure, and a small increase in horizontal structure are expected. This is primarily due to the improvement in growth, vigor and improvement in species composition throughout the project area. On sites with mixed species composition, where seral and climax species co-occur with root disease organisms, infection and mortality of susceptible species have the potential to prolong the seral phase (Rippy and others 2005). Cumulatively, the effects of insects and disease on vertical and horizontal structure, as well as tree/stand size class would be incremental.

Table 1-5 below summarizes the effects of Alternative B on vegetation in the project area.

Table 1-5: Comparison of Vegetation Components in the Fallen Bear Project Area by Alternative

Measurement Parameters	A		B		C	
	Acres	%	Acres	%	Acres	%
Composition in Project Area of long-lived, early-seral tree species: WL/WWP/PP forest types	453	4	705	7	594	6
Stand Structure in Project Area						
brush/seedling/sapling	2056	20	2251	21	2155	21
pole/small/medium	3446	33	3380	32	3352	32
mature/large	2164	21	2035	19	2091	20
Allocated Old Growth	2845	27	2845	27	2913	28
Stand Density (Acres)						
Reduction in stand density through intermediate harvest	0	-	288	3	182	2
Improve growing conditions for overstocked seedling/sapling stands	0	-	775	7	775	7

Alternative C

Direct and Indirect Effects

Forest Composition

Regeneration systems of harvest proposed in Alternative C would regenerate 112 acres. The regeneration harvest that is proposed would have the same effects as discussed in Alternative B with the exception of fewer acres. Opening would range from nine acres to 24 acres in size. Regeneration in these units would be predominately artificial (planting) and would increase the representation of long-lived early-seral species by 112 acres. Site preparation, planting and pocket gopher control would have the same effects as in Alternative B.

Commercial thinning in Alternative C would have the same affects as in Alternative B, but with fewer acres of treatment. Proposed commercial thinning would cause a slight increase of representation of long-lived early seral species, predominately western larch, on 115 acres. Additionally, 29 acres, through the retention of long-lived early-seral species, western larch, and reduction of late seral species the forest type is expected to change to western larch. With the preferential removal of species other than western larch, approximately 21 acres of existing western larch forest type proposed for treatment would be maintained.

Timber stand improvement, seed tree treatment and tree inoculation activities proposed in Alternative C would be done as described in Alternative B. Activities are proposed on all of the same acres, and treatments would be done to meet the same goals and objectives described in Alternative B.

Forest Structure

Alternative C would directly change forest structure on all proposed harvest units. This change in structure in commercial thin treatment units would reduce stand density by an average of 43% and open the canopy cover by corresponding amount. This treatment harvest would have the same impacts on forest structure as discussed in Alternative B. Commercial thinning activities would have an affect of up to 182 acres. Treatment is not expected to change the stand size class in any of the treatment units.

Proposed regeneration treatment harvests would directly change stand structure on 112 acres. The effects of these treatments on the stands would be the same as in Alternative B, with the exception of reduced acres. These treatments would decrease the vertical structure and increase the horizontal structure on 112 acres through creation of openings (ranging in size from nine acres to 24 acres) in the existing homogeneous stand density.

The pre-commercial thinning (775 acres) and mistletoe treatment activities (161 acres) would not directly affect forest structure. Treatment in these stands would increase the growth and vigor in the stands and reduce the risk or spread of dwarf mistletoe infecting the stand. Stands would remain in the brush/seedling/sapling size class after the treatment.

Cumulative Effects

Forest Composition Resulting from Stand Treatments

Contribution of long-lived seral species to stand composition is expected to increase. This would be the result of preferential removal of species other than long-lived early

seral species in intermediate treatment activities and reforestation activities that preferentially select, maintain, and promote long-lived early serals within the stands.

Cumulatively, only a small increase (approximately 2 percent) in the contribution of long-lived seral species is expected to result from vegetation management activities within this project area.

Forest Structure Resulting from Stand Treatments

Treatments occurring in Alternative C would be the same as in Alternative B, but would affect fewer acres.

Cumulatively, only a small incremental increase in tree and stand size class resulting from vegetation management activities within this project area is expected.

Table 1-5 above summarizes the effects of Alternative C on vegetation in the project area.

Consistency with Forest Plan and Regulatory Framework

Specific goals, objectives and standards for timber management are described in the Forest Plan on pages II-2, II-8 and II-32. All alternatives are consistent with these guidelines. All action alternatives comply with Appendix A, Summary of Timber Information and Vegetation Management, providing direction for silvicultural practices on the Idaho Panhandle National Forests. The activities described for the action alternatives are consistent with this direction.

Proposed management activities are designed to improve stand health and vigor, and maintain or enhance species composition and stand structure. This would minimize risk of stand loss from forest insects and disease as well as reduce risk of stand loss to weather, fire or other disturbances.

All proposed openings are within size limitations directed by NFMA and Forest Service Manual (1921.12e). Stands proposed for clearcutting have reached culmination of mean annual increment as defined in Forest Service Manual (1921.12f). Openings would be naturally or artificially regenerated. Review of regeneration indices for the District and the project area (project file, FV-2) display adequate ability to regenerate these openings within the five year period as directed in NFMA and the Forest Plan.

All proposed vegetative treatments integrated other resource needs through project design during alternative development and analysis.

All proposed vegetative treatments are on lands classified as suitable for timber production (project file, FV-4).

Bibliography

Arno, S.F.; Fischer, W.C. 1995. *Larix occidentalis*: Fire ecology and fire management. In: Ecology and management of Larix forests: a look ahead, Symposium Proceedings. Gen. Tech. Rep. INT-GTR-319. Ogden, UT: USDA Forest Service Intermountain Research Station. 120-135.

Beatty, J.S.; Filip, G.M.; Mathiason, R.L., 1997, Larch Dwarf Mistletoe. Forest Insect & Disease Leaflet 169. U.S. Deptartment of Agriculture, Forest Service. http://www.fs.fed.us/r6/nr/fid/fidls/fidl169.htm.

Burns, R.M. and Honkala, B.H., 1990. Silvics of North America, Volume 1, Conifers. Agriculture Handbook 654. Washington D.C. USDA Forest Service.

Byler, J.W.; Zimmer-Grove, S. 1991. A forest health perspective on interior Douglas-fir management. In, interior Douglas-fir the species and its management symposium proceeding. Dept. of Natural Resource Sciences, Washington State Univ. Pullman, WA.

Cooper, S.V.; Neiman, K.E.; Steele, R.; Roberts, D.W. 1991. Forest Habitat Types of Northern Idaho: A Second Approximation. USDA Forest Service GTR INT-236.

Fiedler, C.E.; Lloyd, D.A. 1995. Autecology and synecology of western larch. In: Ecology and management of Larix forests: a look ahead, Symposium Proceedings. Gen. Tech. Rep. INT-GTR-319. Ogden, UT: USDA Forest Service Intermountain Research Station. 118-122.

Green, P., Joy, J., Sirucek, D. Hann, W., Zack, A., and Naumann B., 2005. Old-growth forest types of the northern region. R-1 SES 4/92; USDA Forest Service, Northern Region. Missoula, Montana.

Hilderbrand, Diane, Parks, Catherine. June 20, 1997. Inoculation of Living Trees with Stem Decay/Heartrot Fungi, To Produce Primary Cavity Nesting Habitat.

Quigley, T.M.; Haynes, R.W.; Graham, R.T. tech. Eds. 1996. Integrated scientific assessment for ecosystem management in the interior Columbia Basin and portions of the Klamath and Great Basins. Gen. Tech. Rep. PNW-GTR-382 Portland, OR: USDA Forest Service, Pacific Northwest Research Station. 303 p.

Rippy, Raini C.; Stewart, Jane E.; Zambino, Paul J.; Klopfenstein, Ned B.; Tirocke, Joanne M.; Kim, Mee-Sook; Thies, Walter G. 2005. Root diseases in coniferous forests of the Inland West: potential implications of fuels treatments. Gen. Tech. Rep. RMRS-GTR-141. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Shiplett, B.; Neuenschwander, L.F. 1994. Fire ecology in the cedar-hemlock zone of North Idaho. In, interior cedar-hemlock-white pine forests: ecology on management symposium proceedings. Dept. of Natural Resource Sciences. Washington State Univ. Pullman, WA.

Schmidt, W.C.; Shearer, R.C. 1995. Larix occidentalis: a pioneer of the North American west. In: Ecology and management of Larix forests: a look ahead, Symposium Proceedings. Gen. Tech. Rep. INT-GTR-319. Ogden, UT: USDA Forest Service Intermountain Research Station. 33-38.

Schneph, Chris C., Schwandt, John W. 2006. Pruning Western White Pine: A Vital Tool for Species Restoration. PNW 584. A Pacific Northwest Extension Publication, University of Idaho, Oregon State University, and Washington State University.

Taylor, Jane E., 1992, Western Larch Dwarf Mistletoe and Ecosystem Management. In: Ecology and Management of Larix Forests: A Look Ahead, Symposium Proceedings. General Technical Report INT-GTR-319. Ogden, UT. USDA Forest Service. Intermountain Research Station. 310-313

USDA Forest Service. 1987. Forest Plan: Idaho Panhandle National Forests.

USDA Forest Service. 1997. Integration of forest planning into ecosystem management: toward a forest ecosystem approach: An assessment for the St. Joe Area. Ecosystem team paper #3. Idaho Panhandle National Forests.

USDA Forest Service Biophysical Classification. 1996. Habitat groups and descriptions. U.S. Department of Agriculture, Forest Service, Northern Region. Missoula, MT. 17 p.

Zack, A.C.; Morgan, P. 1994. Fire History on the Idaho Panhandle National Forest. 44 p.