<u>Broadaxe Proposal</u>

Vegetation Report

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 coniferous trees. The major tree species growing in this area include western hemlock, mountain hemlock, western redcedar, grand fir, Douglas-fir, western larch, western white pine, lodgepole pine, ponderosa pine, subalpine fir, and Engelmann spruce. All of these are conifer trees.

The forest vegetation in the Broadaxe 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 conifer 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 of 1976 (NFMA) and the Forest Plan for the Idaho Panhandle National Forests.

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

This analysis area contains approximately 3,355 acres, all of which are under Forest Service jurisdiction. This provides an appropriate analysis area for the vegetation resource related to characteristics such as species composition, forest structure and insect/disease risk. This scale of analysis also provides an appropriate size area to monitor changes in vegetation trends, whether they are natural or human-caused, over time.

Analysis Methods

The information used in this coniferous vegetation section is a combination of the available data, research material, literature, field reviews and assessments. Diagnosis and analysis of stands within the Broadaxe Project Area were accomplished using stand summary data, basic stand data, stand component data and stand activity data (project file, V-1, V-2, V-3, V-4). Existing stand exam data generally displayed species composition, stocking levels and incidents of insect and disease. Additionally, a review of the annual insect and disease incidence reports was reviewed. As a result of recent (2000 to present) observed losses from the mountain pine beetle infestation in this area, stand examinations were conducted during fall of 2004 to obtain current data to better assess the Broadaxe Project Area. The stands examined in 2004 were stands where existing stand data showed ≥15% composition of lodgepole pine which would potentially be at risk because of the current mountain pine beetle epidemic in this area. This 2004 exam was conducted on 48 stands (total of 1,933 acres, or 58% of the analysis area) within or immediately adjacent to the proposal area. Proposed stands for treatment resulted from a review of all the stand data for this area, with particular emphasis to the new stand exam data (project file, V-5) and area field reviews conducted by the silvicultural forester while assisting in the 2004 stand examination process (project file, V-5). The silvicultural forester for this proposal felt that the existing stand data, supplemented with the 2004 exams adequately represented the vegetative conditions for the proposal area, and developed stand treatment recommendations from this review.

The proposed units were developed by the silvicultural forester and sale preparation staff with consideration for the proposed treatments coupled with current access (stand remoteness), extent stand was at risk, terrain characteristics related to logging systems, and economic considerations.

For this project analysis, lodgepole pine trees with a DBH of ≥5 inches were identified as high risk trees. This is due to identifying trees from 5-6.9 inches DBH that were killed by, or are currently infested by mountain pine beetle within this analysis area. Outputs from the FINDITS model (project file, V-5) showing mortality losses in DBH classes of ≥5 inches continuing over the next two to ten years supports this risk rating for this small a diameter. Due to current species composition, average age and densities of stands having lodgepole pine, and the severity of the current epidemic, lodgepole pine ≥5 inches DBH are considered at risk to mountain pine beetle.

Large-scale context for the terrestrial vegetation and landscape ecology was provided by the *Integrated Scientific Assessment for the Interior Columbia Basin (*Quigley et al, 1996) and the St. Joe Geographic Area assessment titled, *Toward a Forest Ecosystem Approach: An Assessment for the St. Joe Area*. 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 Broadaxe Project Area's existing condition for coniferous forest vegetation and comparing it to the landscape and desired forest stand conditions.

Habitat types were used for the project planning and site-specific considerations in this environmental assessment. *Forest Habitat Types of Northern Idaho: A Second*

Approximation (Cooper et al, 1991) outlines the classification and characteristics of the habitat types. This information was used for stand-level diagnosis and analysis.

Habitat types were grouped to facilitate landscape-level analysis and planning because of similar environments and vegetation characteristics such as productivity, disturbance regimes, stand dynamics, susceptibility to insect and disease, forest cover types, structural stages and successional pathways. *A Biophysical Classification, Habitat Groups and Descriptions* (USDA, 1996) was used for this analysis.

Forest stands were reviewed for insect and disease activity, production (growth rates), productive potential, regeneration potential, species composition, stand structure, and the current losses and damage from the mountain pine beetle infestation. Areas unsuitable for timber production were not considered for treatment related to sustained timber production, but were considered for treatments related to insect or disease activities. In addition to field reconnaissance, determining reforestation potential involved review of the reforestation indices for the Avery portion (formerly the Avery Ranger District) of the St. Joe Ranger District and the Broadaxe project analysis area (project file, V-6) since 1976. These indices display our degree of success in reestablishing stands after a regeneration harvest. Treatments prior to 1976 are not represented in the indices report. The silvicultural forester reviewed the activity records in the individual stand folders for stands receiving a regeneration treatment prior to 1976. This stand folder review was to determine each stands current regeneration status and degree of development. These indices (project file, V-6) and the stand folder reviews (project file, V-7) display our ability to regenerate these sites as required under NFMA.

Commercial forest stand treatments were identified by a silvicultural forester based on insect and disease activity and potential, existing vegetation conditions; desired stand conditions; and potential contribution to the larger landscape. 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. The stands within this proposal are classified as MA-1, MA-6 and MA-9 in the Forest Plan. Treatment needs were based on a comparison of the existing landscape conditions and existing stand conditions to the desired conditions (project file, V-9).

Proposed treatments were developed that would move the existing condition toward the desired condition over time. Considerations included stand species composition, stand size class, stand structure, and insect and disease risk.

The measurement criteria used in analyzing these proposed treatments are acres of change in long lived early seral forest types and acres of change in stand structure by stand size class.

AFFECTED ENVIRONMENT

The Broadaxe Analysis Area includes eight of the forest habitat type groups described in *A Biophysical Classification, Habitat Groups and Descriptions* (USDA Forest Service Biophysical Classification, 1996). The relative distribution of the habitat type groups

occurring in the project area is displayed in Table 1, and is characterized in the subsequent description.

Forest Composition

Throughout the Interior Columbia River Basin shade-intolerant early seral species have declined, and shade-tolerant species have become more dominant (Quigley et al, 1996). This same trend is seen at a step down in scale in Idaho. Table 2 displays the trend away from potentially long-lived early seral species of western white pine (WP), western larch (L) and ponderosa pine (PP); and towards more shade-tolerant and shorter-lived species of grand fir (GF), subalpine fir (SAF), Spruce (S), lodgepole pine (LP), Douglas-fir (DF) (O'Laughlin et all, 1993) from 1952 through 1987 in Idaho.

Table 1 - Distribution of Habitat Types in Broadaxe Analysis Area

Habitat Groups	Potential Vegetation	Temperature and Moisture	% Area
1 & 2	Dry Forest	Warm and Dry and Moderately Warm and Dry	0.3%
3 & 4	Moist Forest	Moderately Dry and Moderately Warm and Moist	13.1%
5, 6 & 7	Moist Forest	Moderately Cool and Moist, Moderately Cool and Wet, and Cool and Moist	52.1%
8 & 9	Cool Forest	Cool and Wet and Cold & Moderately Dry	34.6%

Table 2 - Forest Type 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, as displayed in *Toward a Forest Ecosystem Approach: An Assessment for the St. Joe Area*, we find a similar major decline in long-lived early seral species, particularly western white pine, western larch and ponderosa pine. There are ecological implications of changes in forest composition.

Western larch, ponderosa pine and white pine are fire adapted, relatively drought resistant, 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 and drought-susceptible tree species. They are more susceptible to numerous insects and diseases, and less adapted to surviving fires than more seral species. Periodic droughts increase this risk of loss.

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). 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.

Lodgepole pine is a relatively short-lived seral species, especially in the moist forest sites of northern Idaho. This species is moderately susceptible to fire, however, it generally regenerates well after major disturbance. Lodgepole pine is susceptible to various insects and diseases, especially mountain pine beetle, at moderate stand densities and relatively smaller diameters compared to other forest cover types.

Table 3 displays the historic and existing forest types (defined by the species with the greatest basal area represented in the stand) for the St. Joe River Basin and Broadaxe Project Area. The forest types are ponderosa pine (PP), western white pine (WP), western larch (WL), Douglas-fir (DF), grand fir (GF), western hemlock (WH), western redcedar (C), lodgepole pine (LP), subalpine fir (SF), mountain hemlock (MH), Engelmann spruce (ES), whitebark pine (WBP).

Table 3 - St. Joe River Basin and Broadaxe Project Forest Types

Forest Type	PP	WP	WL	DF	GF/ WH	C	LP	SAF/MH/ ES/ WBP
St. Joe Historic Forest	2.1%	24.9%	14.8%	10.4%	5.4%	4.4%	13.8%	24.3%
St Joe Current Forest	1.2%	3.2%	3.8%	18.0%	16.8%	7.2%	20.7%	28.6%
Broadaxe Project Current Forest	<1%	<1%	<1%	5.6%	13.4%	<1%	39.3%	41.9%

The shift in forest types displayed in Table-3 indicates a reduction or simplification of species representation, and a potential increase in the risk of probable loss when disturbances such as fire, insect outbreaks, drought do occur. This increased risk of loss would affect both the stand and landscape scales.

Past timber harvest, generally starting in the St. Joe River Basin in the 1920-1930s, often focused on 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.

Within the Broadaxe project area, however, substantial timber harvest did not occur until the late 1950s. The majority of harvest has been regeneration treatments of clearcuts, shelterwood seed cuts and seed tree harvests. All stands which have received a regeneration harvest are satisfactorily restocked and progressing as planned (project file, V-7).

The Broadaxe Project Area sustained two stand-replacing fires that have influenced stand development as it occurs at present. The southeast half of the area burned in 1889 and the northwest portion burned in 1910. As a result, this project area has large areas dominated by lodgepole pine. With the advent of effective fire suppression over the last 60 years, we have essentially eliminated fire from this area. Fire has historically been the primary natural thinning agent which encouraged retention and effective regeneration of shade-intolerant early seral species, and subsequently encouraged increased representation of the more shade-tolerant, less fire-adapted species over time. The result of essentially eliminating natural fire has also reduced site preparation which provided appropriate seed bed for germination and establishment of natural regeneration of early seral species. Additionally, the lack of fire has allowed increased stand densities and the natural establishment of more shade-tolerant species such as grand fir, hemlock and Douglas-fir. As these species occupy sites, they increase shading and other competitive conditions, which generally exclude adequate establishment of the less shade-tolerant early seral species such as western larch, western white pine and ponderosa pine.

The accidental introduction of the exotic white pine blister rust (*Cronartium ribicola*) decimated the white pine component, which was historically a major stand component. Western white pine has a natural rust resistance of less than ten percent (10%), and as a result, there has generally been a loss of ninety percent (90%) or more of the western white pine throughout this analysis area and over the landscape in general.

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

Within the Broadaxe Project Area stands dominated by late seral species (western redcedar, subalpine fir and mountain hemlock) have had relatively small amount of change. Stands with early seral species composition (forests dominated by the shade-intolerant early seral species of western larch and western white pine) display a substantial decline, accompanied by a relatively small increase in stands dominated by mid-seral species of Douglas-fir, grand fir. The stands that developed following the two wild fires discussed above have resulted in a large increase in stands dominated by lodgepole pine, or having lodgepole pine as a major species component.

As a consequence of these changes in forest composition the risk of large area losses to fire, insects, disease, weather events and other major disturbances is increasing compared to historical conditions.

Forest Structure

Existing and historic forest structure, based on size class groupings, within the St. Joe River Basin is presented in Table 4. Also, the current forest structure for the Broadaxe Analysis Area, located within the St. Joe River Basin, is presented in Table 4.

Table 4 - Size Class Distribution

Forest Structure	Shrub/Seed/	Poles/Small/	Large	OG

	Sapling	Medium	Mature/ Overmature	(allocated)
St. Joe Basin (all Lands) Mean Historic	20.5%	35.6%	23.7%	20.2%
St. Joe Basin (NFS Lands) Current	19.4%	49.4%	20.0%	11.2%
Broadaxe (NFS Lands) Current	6.5%	33.7%	35.0%	21.8%

There is a trend away from mature/overmature and old growth forest structure toward smaller trees (IPNF, 1997, Toward a Forest Ecosystem Approach: An Assessment for the St. Joe Area) in the St. Joe River Basin. Within the St. Joe River Basin, historic conditions are shifting to a more homogeneous structure. The primary causal factors influencing this shift have been the commercial harvest of the older and larger overstory starting in the early 1900s, combined with efficient fire suppression starting in the 1930s. The resulting trend has been a more homogenous forest structure influenced by an increase in the smaller stand size classes and a reduction in the large mature and old growth structure.

A different trend has developed in the Broadaxe Analysis Area. Within this project area there has been a substantial reduction in the shrub/seedling/sapling size classes accompanied by an increase in the large mature/overmature and old growth size classes. This shift in age or size class distribution results from successful fire suppression as discussed above combined with less timber harvest than the rest of the St. Joe River Basin. These circumstances promoted continued stand growth and development over a 60-75year period within this project area.

This period of low disturbance resulted in continuing growth of the pole/small/medium size classes into the larger size/age classes, while relatively few opportunities for replacement of the smaller size classes occurred. Replacement of the shrub/seedling/ sapling/pole size classes generally began as a result of regeneration harvests starting in the early 1958.

In the absence of disturbance, either natural or human-caused, stands in the pole/small/ medium size classes have changed from their historic stand characteristics. They have generally become more densely stocked often developing closed, or nearly closed, crown canopies and are displaying reducing growth rates and vigor. They are becoming more susceptible to damage or destruction by wildfire, insects and disease. The effects of these damaging agents is enhanced or increased when these overstocked stands experience drought.

In the absence of disturbance, stands that are mature/overmature continue to develop old forest characteristics including a large tree component, large woody debris, increasing snag component, and over time will develop into old growth stands.

Historically the stands within this analysis area were generally one to two-aged, often referred to as even-aged stands. These stands were also characterized as generally having only one or two well-developed canopy layers. The current trend for age and structure

characteristics is generally becoming more complex, with stands developing multiple components of different ages, often referred to as uneven-aged stands. Additionally, the current trend within this analysis area is stand development towards multi-storied stands, comprised of three or more canopy layers, often times representing different age classes.

The historic landscape of the St. Joe River Basin included openings. These openings ranged in size from small openings of only a few acres to large openings ranging in size from several hundred acres to greater than a thousand acres in size.

Fire was historically the primary disturbance agent in this analysis area. Records show stand replacement fires burned within the Broadaxe Project Area in 1889 and 1910. These fires involved acreages from a few hundred acres to greater than a thousand acres. Due to effective fire suppression since the early 1900s, only a few small openings were created by fire in this analysis area over the last 80 to 100 years.

Trees have also died because of insects and disease, resulting in small openings in this same time period. These disturbance agents have generally acted more as thinning agents rather than stand-replacing events. Specific to the Broadaxe Project Area, due to the extent of lodgepole at high densities and size classes, large areas have become susceptible to mountain pine beetle. Major mortality has occurred over the last five years and is continuing.

As a consequence of these changes in forest structures, the risk of large area losses to fire, disease, weather events and other potential disturbances is increasing.

Vegetative Conditions Related to Past Harvest

Relatively little timber harvest occurred within the Broadaxe Project Area prior to the late 1950s. Some very old stumps indicate that some harvest did occur prior to the late 1950s, although no records prior to that time 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. Review of the stand histories for this area did not identify timber harvest activities prior to 1958 (project file, V-4). Records reveal that since 1958 approximately 759 acres of the 3,355acre project area have had some type of commercial timber harvest. Of this, approximately 85% (646 acres) was regeneration harvest (231 acres clearcut and 415 acres of seed tree/shelterwood seed cuts), 15% (113 acres) was sanitation/salvage.

There are seven previous timber sales identified within the Broadaxe Project Area; Berge Creek (1966), Broadaxe (1966), Gold Bear (1976), Gold Skyline (1977), Berge Peak (1981), Golden Axe (1988) and Beetlemania (1998). The project file for this analysis area contains a listing of commercial timber harvest activities from 1958 through 1998 (project file, V-4, V-8).

ENVIRONMENTAL CONSEQUENCES

Table 5 summarizes the effects of the alternatives on vegetation in the Broadaxe Project Area. This table shows the difference (acres and % of analysis area) between the two alternatives related to long-lived early seral representation and stand size classes.

Table 5 - Comparison of Vegetation Components by Alternative

Measurement Parameters	No-Action Alternative		Proposed Action	
Early Seral Forest Cover Type:	acres	%	acres	%
Long-lived early seral species (WL, WWP, PP):	--	**<1%**	**252**	**7.5**
Stand structure (size/age class**):**				
Brush-seedling sapling	**220**	**6.5**	**472**	**14.1**
Pole-small-medium	**1,130**	**33.7**	**1,130**	**33.7**
Mature Sawtimber	**641**	**19.1**	**389**	**11.6**
Large Mature/Overmature	**1,364**	**40.6**	**1,364**	**40.6**

No Action

Direct and Indirect Effects

Forest Composition

The No-Action Alternative would continue the current trend of decreasing the contribution of western white pine and western larch in species composition within this project area. Generally, less than ten percent of western white pine is resistant to blister rust, and available natural seed sources in the Broadaxe Project Area are relatively low and decreasing as mature white pine continue to die from blister rust infection and other factors. White pine is currently a minor component (less than one percent) in the forest stands considered for treatment in this assessment and would continue to decrease under the No-Action Alternative.

The percent composition of western larch, less than one percent of this analysis area, would decrease with the No-Action Alternative.

The current policy to suppress all fires in this 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 dominant. In the absence of fire or other thinning agents (natural or human-caused) the more shade-tolerant species will continue to develop and compete with the western larch. Natural regeneration would continue to be the more shade-tolerant species. The impact of competition would continue, and over time a gradual replacement of western larch by more shade-tolerant species would be expected. In the absence of fire or other thinning agents that reduce competition, the contribution of western larch would be expected to decline under the No-Action Alternative.

Ponderosa pine has historically dominated a very small percentage (approximately two percent) of the project area and the St. Joe River Basin. Over time this component would remain only as very scattered individuals or very small groups, somewhat similar to its current contribution within this analysis area.

Lodgepole pine contributes approximately 39% to the forest cover types within this project area. These stands have developed to ages, average tree size, and stand densities that put them at moderate to high risk for stand loss to mountain pine beetle (*Dendroctonus ponderosae*). For this project analysis, lodgepole pine trees with a DBH of ≥5 inches were identified as high risk trees. This is due to identifying trees from 5-6.9 inches DBH that were killed by, or are currently infested by mountain pine beetle within this analysis area. Outputs from the FINDITS model (project file, V-7) showing mortality losses in DBH classes of ≥5 inches continuing over the next two to ten years supports this risk rating for this small a diameter. Due to current species composition, average age and densities of stands having lodgepole pine, and the severity of the current epidemic, lodgepole pine ≥5 inches DBH are considered at risk to mountain pine beetle. This forest pest is currently very active within this analysis area, as well as in neighboring areas. Under the No-Action Alternative, the majority of susceptible lodgepole pine are dead and the majority of the remaining live trees greater than five inches d.b.h. would be expected to be lost over the next two to ten years. These stands would be expected to regenerate naturally, predominantly to lodgepole pine. In the absence of fire or other ground-disturbing disturbance expected under this alternative, this regeneration process may require from ten to thirty years to restock these stands.

Current conditions have resulted in much higher proportions of the more shade-tolerant species, especially the lodgepole pine, grand fir and subalpine fir/mountain hemlock forest types, than historically existed in the area. This trend is expected to continue with the No-Action Alternative which would not harvest timber while current fire suppression policies continue.

Under the No-Action Alternative, 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. This alternative would result in decreased numbers of western white pine and western larch over time. Additionally, large areas dominated by lodgepole pine currently have substantial mortality, and would naturally regenerate back to lodgepole pine. This trend would be expected to continue. As a result of this shift in species composition, the risk of losses to insect and disease would increase.

This shift in stand composition to more shade-tolerant species, predominantly grand fir, subalpine fir, lodgepole pine and mountain hemlock, would also increase the risk and extent of loss from fire. These species are less adapted to surviving fire than are the more seral shade-intolerant species such as western larch, ponderosa pine and Douglas-fir. As these more fire-sensitive species increase as a percent of stand composition, the risk of losing entire stands increases if fire occurs.

Forest Structure

No-Action Alternative would result in no direct management induced changes to forest structure. The loss of these existing stands, and their associated structure, will occur as the result of an ongoing insect epidemic, more specifically the mountain pine beetle infestation of stands dominated by lodgepole pine.

Indirectly, forest structure would change over time. Forest stands in the project area that are dominated by shade tolerant species such as grand fir, subalpine fire and mountain hemlock 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 the trees are competing for growing space. Both diameter and height growth is decreasing, accompanied by a gradual decline in tree vigor. These stands are experiencing a gradual increase in susceptibility to disease and insect attack.

The existing shrub/seed/sapling stand size classes are expected to continue to develop towards the small/medium size classes. As a result of stand losses to mountain pine beetle in the lodgepole pine dominated stands, increases in these smaller size classes (shrub/seedling/sapling size classes) would be expected over the next two to ten years as stands are lost to insect mortality.

The small and medium stand size classes are generally represented at historical levels. Although growth rates are declining, these stands are expected to continue development towards the older and larger size classes. This developmental trend is expected to occur at a relatively slow rate due to reducing growth and vigor resulting from increasing stocking levels. In the absence of disturbance associated with this alternative little change in growth rates, stand densities, species composition or other stand characteristics would be expected in the foreseeable future.

The large mature/overmature age or size classes would be expected to increase over time in the absence of disturbance. This is predominantly the result of in-growth from the younger/smaller size classes. Wildfire is a potential cause for 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 disturbances, more particularly insect or disease outbreaks, to act as stand replacing agents and influence a shift of impacted stands towards younger/smaller size classes. If this were to occur, the shift would be a reduction in the mature/overmature classes and an increase in the shrub/seed/sapling classes. Under the existing conditions within this analysis area, this potential is highest in lodgepole pine forest cover types. The mature stands in lodgepole pine cover type are at high risk of loss as a result of the continued and expanding mountain pine beetle (*Dendroctonus ponderosae*) outbreak found within and in the vicinity of the Broadaxe Project Area. As discussed above, mature lodgepole pine stands would be expected to shift from the large mature/overmature size class to the shrub/seed/sapling size class.

Another potential disturbance vector effecting potential change in the forest structure, as described by stand age/size class, would be increases in root disease. Within this proposal area, approximately 19% of the acres in this analysis area are dominated by the most root disease susceptible species, specifically Douglas-fir and grand fir. These

species are the most susceptible to root disease of all the native forest trees in northern Idaho. 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 was 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 would indicate the effects severe root disease can have on these habitat 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 of 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 species.

As we lose the larger trees over time, these stands would experience a reduction in mean tree size. As a result, over the next 30 to 50 years, these stands may experience a decrease in mean diameter as well as a decrease in canopy closure resulting from individual tree and small group mortality. This would begin to develop a very minor increase in the smaller size class representation, and an equivalent decrease in the older/larger size class representation in this area. This would be expected to be a very slow process, and in-growth by smaller trees to larger size classes would be expected to exceed the size reductions resulting from this type of disturbance.

Cumulative Effects

Forest Composition and Structure

As a result of reduced disturbance patterns and continuing successional development of existing stands, this alternative would maintain the current species composition trend. The number and extent of western larch, western white pine and Douglas-fir would continue to decrease, being replaced by grand fir and subalpine fir. This same slow process of succession would gradually shift Douglas-fir and grand fir forest types towards mountain hemlock and subalpine fir types. Only incremental changes in these forest cover types would be expected.

The current moderate to high mortality rates from mountain pine beetle attack in the existing lodgepole pine component would be expected to continue. Natural regeneration back to lodgepole pine would be expected and only incremental change in this forest cover type would be expected over time.

Under this alternative only incremental cumulative effects on species composition, or forest type, would be expected.

Changes in forest structure from losses in the mature/overmature size classes in the lodgepole pine forest type resulting from mountain pine beetle caused mortality would generally increase representation in the shrub/seed/sapling size classes, and reduce the representation in the mature/overmature size classes. The resultant cumulative effects would be a moderate increase in the shrub/seedling/ sapling size class associated with a similar moderate decrease in the mature/overmature size class. The cumulative effects on the pole/small/medium size classes would be only incremental.

Proposed Action

Direct and Indirect Effects

Forest Composition

The Proposed Action would increase the contribution of western larch/western white pine dominated stands within this project as a result of planting these species during stand restoration activities. Reforestation of treatment areas would be a mix of seventy percent (70%) western larch and thirty percent (30%) rust-resistant western white pine. This would increase the representation of these long-lived seral species to approximately 252 acres, or 7.5% of the analysis area. Subsequently, the lodgepole pine component would be reduced to approximately 1,067 acres or 31.8% of the analysis area. Representation of other species would be expected to remain approximately the same as the current condition.

The current policy to suppress all fires in this area would continue. As a result, the contribution of western larch in untreated areas 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 dominant. In the absence of fire or other thinning agents (natural or human-caused) the more shade-tolerant species will continue to develop and compete with the western larch. Natural regeneration would continue to be the more shade-tolerant species. The impact of competition would continue, and over time a gradual replacement of western larch by more shade-tolerant species would be expected in untreated areas within this proposal.

Ponderosa pine has historically dominated a very small percentage (approximately two percent) of the project area and the St. Joe River Basin. Over time this component would remain only as very scattered individuals or very small groups, somewhat similar to its current contribution within this analysis area.

Following treatment under this alternative, the contribution of lodgepole pine would be approximately 32% to the forest cover types within this project area. These lodgepole pine dominated stands have developed stand ages, average tree size, and stand densities that put them at moderately high risk for stand loss to mountain pine beetle (*Dendroctonus ponderosae*). This forest pest is currently very active within this analysis area, as well as in neighboring areas. Under the Proposed Action, the majority of susceptible lodgepole pine in untreated areas would be expected to be lost over the next two to ten years. These same stands would be expected to regenerate naturally, predominantly to lodgepole pine. In the absence of fire or other ground disturbing disturbance, this natural regeneration process may be delayed for some time.

Current conditions have resulted in much higher proportions of the more shade-tolerant species, especially the grand fir, lodgepole pine, subalpine fir and mountain hemlock forest types, than historically existed in the area. This general trend is expected to continue with the proposed action; however, to a lesser degree than the No Action due to the reforestation activities discussed above.

This shift in stand composition to more shade-tolerant species, predominantly grand fir, subalpine fir and mountain hemlock, would increase the risk and extent of loss from fire within the project area. Additionally, lodgepole pine is at moderate to high risk of loss from fire; however, lodgepole pine dominated stands generally regenerate rapidly back to lodgepole following fire occurances. These species are less adapted to surviving fire than are the more shade-intolerant species such as western larch and Douglas-fir. As these more fire-sensitive species increase as a percent of stand composition, the risk of losing entire stands increases if fire occurs.

Forest Structure

The Proposed Action would result in no direct management induced changes to forest structure. Due to the extensive existing mortality in stands proposed for treatment, the structural change mature/overmature size class to shrub/seedling/sapling size class is the result of the current mountain pine beetle infestation. The proposed sanitation/salvage harvest treatments would remove dead, dying and high risk (mortality expected in two to ten years) lodgepole pine while these trees still retain some economic value. The loss of these existing stands, and their associated structure, is the result of an existing insect epidemic in stands dominated by lodgepole pine and will occur <u>with or without</u> the proposed sanitation/salvage treatments.

Indirectly, forest structure would change over time. Forest stands in the project area that are dominated by shade tolerant species such as grand fir, subalpine fire and mountain hemlock 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 the trees are competing for growing space. Both diameter and height growth is decreasing, accompanied by a gradual decline in tree vigor. Stands are experiencing a gradual increase in susceptibility to disease and insect attack. Stands which are dominated by lodgepole pine will continue to experience mortality from mountain pine beetle. In the absence of fire or other disturbance, these stands will be moderately slow to naturally regenerate.

The existing shrub/seed/sapling stand size classes are expected to continue to develop towards the pole/small/medium size classes. As a result of stand losses to mountain pine beetle in the lodgepole pine dominated stands, increases in these smaller size classes would be expected over the next five to ten years as stands are lost to insect mortality. Due to the extensive amount of lodgepole pine dominated stands at risk, the shrub/seedling/sapling size classes would be expected to increase over time.

The small and medium stand size classes are generally represented at historical levels. Although growth rates are declining, these stands are expected to continue development towards the older and larger size classes. This developmental trend is expected to occur at a relatively slow rate due to reducing growth and vigor resulting from increasing stocking levels. In the absence of disturbance associated with this alternative little change in growth rates and stand densities would be expected in the foreseeable future. As a result, little to no direct or indirect change would be expected in the small and medium size classes.

The mature/overmature age or size classes would be expected to increase over time in the absence of disturbance. This is predominantly the result of in-growth from the younger/smaller size classes. Wildfire is a potential cause for 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 disturbances, more particularly insect or disease outbreaks, to act as stand replacing agents and influence a shift of impacted stands towards younger/smaller size classes. If this were to occur, the shift would be a reduction in the mature/overmature classes and an increase in the shrub/seed/sapling classes. Under the existing conditions within this analysis area, this potential is highest in lodgepole pine forest cover types. The mature stands in the lodgepole pine cover type are at increasing risk of loss as a result of the expanding mountain pine beetle (*Dendroctonus ponderosae*) outbreak found within, and in the vicinity of, the Broadaxe Project Area. As discussed above, mature lodgepole pine stands would be expected to shift from the large mature/overmature size class to the shrub/seed/sapling size class.

Another potential disturbance vector effecting potential change in the forest structure, as described by stand age/size class, would be increases in root disease. Within this proposal area, approximately 19% of the acres in this analysis area are dominated by the most root disease-susceptible species, specifically Douglas-fir and grand fir. These species are the most susceptible to root disease of all the native forest trees in northern Idaho. 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 was 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 would indicate the effects severe root disease can have on these habitat 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 of 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 species.

As we lose the larger trees over time, these stands would experience a reduction in mean tree size. As a result, over the next 30 to 50 years, these stands may experience a decrease in mean diameter as well as a decrease in canopy closure resulting from individual tree and small group mortality. This would begin to develop a very minor increase in the smaller size class representation, and an equivalent decrease in the older/larger size class representation in this area. This would be expected to be a very slow process, and in-growth by smaller trees to larger size classes would be expected to exceed the size reductions resulting from this type of disturbance.

Cumulative Effects

Forest Composition and Forest Structure

The contribution of long-lived seral species, predominantly western larch and western white pine, to stand composition is expected to increase. This is the result of reforestation activities that would preferentially plant and/or maintain these long-lived early seral species on 252 acres within the project area.

Cumulatively, a relatively small increase (approximately 7.5%) is expected in the contribution of long-lived seral species resulting from vegetation management activities under the Proposed Action alternative within this analysis area.

Changes in forest structure from losses in the mature/overmature size classes in the lodgepole pine forest type resulting from mountain pine beetle caused mortality would generally increase representation in the shrub/seed/sapling size classes, and reduce the representation in the mature/overmature size classes. The resultant cumulative effects would be a moderate increase in the shrub/seedling/ sapling size class associated with a similar moderate decrease in the mature/overmature size class. The cumulative effects on the pole/small/medium size classes would be only incremental.

Cumulative Effects On Vegetation From Other Activities

Aggressive suppression of wild fires is expected to continue. As a result, the trends in stand structure and composition related to the absence of fire are also expected to continue. The rate of change influenced by the lack of wildfires is relatively slow over time, resulting in expected incremental cumulative effects on the vegetation resource over time.

Other activities including field survey and data gathering, weed control, public use activities, and road and trail maintenance would have only incidental or no cumulative effects on the vegetation resource.

Consistency with Forest Plan and Laws

Specific goals, objectives and standards for timber management are described in the Forest Plan on pages II-2, II-8 and II-32. The Proposed Action is consistent with these guidelines, as well as in compliance 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 Proposed Action 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 future stand loss from forest insects and disease as well as reduce risk of stand loss to weather, fire or other disturbances.

All openings are the result of a natural disturbance, specifically a mountain pine beetle epidemic which has caused substantial mortality within lodgepole pine stands. These are existing openings, and would not be the result of proposed management activities. Opening sizes are estimated to range from one acre to approximately 160 acres in size. Notification has been sent to our interested publics related to opening sizes associated with this proposed action. Openings would be naturally or artificially regenerated. Review of regeneration indices for the St. Joe Ranger District and the analysis area display adequate ability to regenerate these openings. Artificial reforestation is planned for these existing openings promoting stand reestablishment within a five to eight year period in support of NFMA and the Forest Plan.

All proposed vegetative treatments are on lands classified as suitable for timber production or where salvage and miscellaneous products may be removed on an unscheduled basis.

Michael Ware
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