

3.9 VEGETATION

3.9.1 Summary

Public scoping of the Glacier Project identified jack pine and aspen as species of concern. Spruce-fir and white pine are also considered species of concern because current acreages of these two forest types fall short of the Forest Plan's desired condition. In addition to the species of concern, the public raised a concern that vegetation management would negatively affect the ecological integrity of the Boundary Waters Canoe Area Wilderness (BWCAW).

Alternative 1 would not result in new management of the vegetation. Natural processes would continue and would result in not moving the forest towards landscape ecosystem (LE) objectives for young forest or for increasing jack pine or white pine. The impact to the jack pine resource under this alternative is undesirable. However, this alternative would move the forest towards the LE objectives for increasing spruce-fir and decreasing aspen through natural succession of forest ecosystems. This alternative would have no impact to the vegetation along the wilderness boundary.

Alternative 2 would move the forest toward meeting LE objectives for species composition, age class distribution, and for tree species diversity within individual stands. Within the Jack Pine/Black Spruce LE this alternative would provide more jack pine and white pine than Alternative 3, and the least amount of spruce-fir than in Alternative 3. However, this alternative provides less jack pine in the Dry-Mesic Red and White Pine LE. This alternative harvests more vegetation adjacent to the wilderness boundary than alternative 3. These regeneration harvests with the associated reforestation actions provide more opportunities for increasing the age class and diversity of species composition in this corridor.

Alternative 3 would also move the forest toward meeting LE objectives for species composition, age class distribution, and for tree species diversity within individual stands. Within the Jack Pine/Black Spruce LE this alternative would provide less young forest and fewer jack pine acres, and more spruce-fir than Alternative 2. However, this alternative provides more jack pine, and fewer aspen and spruce-fir acres in the Dry-Mesic Red and White Pine LE. This alternative would impact the fewest acres of vegetation adjacent to the wilderness boundary. This alternative would also provide the fewest opportunities for diversifying this corridor.

Alternative 4 was developed to address a significant issue raised during the 45-day comment period on the Draft EIS. Alternative 4 would treat the most acres and would move the condition of the vegetation toward the desired Landscape ecosystems for age class and species composition more quickly than Alternatives 2 or 3. Just like in alternative 2, within the Jack Pine/Black Spruce LE this alternative would provide more jack pine and white pine than Alternative 3, and the least amount of spruce-fir than Alternative 3. However, this alternative provides for the most jack pine in the Dry-Mesic Red and White Pine LE (approx 600 acres more). This alternative harvests 100 acres more vegetation adjacent to the wilderness boundary than the other two action alternatives (regeneration harvests). These regeneration harvests with the associated reforestation actions address more opportunities for increasing the age class and diversity of species composition in this corridor.

3.9.2 Introduction

The Forest Plan's vegetation objectives were developed for the ecological scale and context of landscape ecosystems (LEs). The Forest Plan's vegetation objectives also provide direction for management of white pine as a Management Indicator Species (MIS). The white pine MIS objective has been incorporated into the white pine objectives for the LEs (Forest Plan Ch. 2: O-WL-32 and O-

WL-33, pages 2-35). Forest Plan vegetation objectives apply to National Forest System land only; however, the development of the objectives considered the past, current, and future expected vegetative conditions of all land within the Northern Superior Uplands Section. This includes the Boundary Waters Canoe Area Wilderness, as well as land managed by owners other than the federal government (Forest Plan Ch. 2: pages 2-55- 2-78).

Forest Plan objectives seek conditions more representative of native vegetation communities than those which currently exist. Vegetation management activities would be accomplished through timber harvest to the extent practicable. The Forest Plan's vegetation objectives are also consistent with the desired forest conditions outlined in the Northeast Forest Landscape Report produced by the Minnesota Forest Resource Council (Record of Decision for Forest Plan, 2004)

There are three LEs in the project area. These are the Jack Pine/Black Spruce LE, the Dry-Mesic Red and White Pine LE, and the Lowland Conifer LE. Each LE is addressed separately. Section 3.9.6 "Environmental Consequences" has been broken into four parts, one for each affected LE. Following the three discussions on the LEs, the cumulative effects discussion is provided and addresses all the LEs together (Section 3.9.6.5).

The greater part of the eastern edge of the Glacier Project Area boundary (approximately 56 miles) coincides with the Boundary Waters Canoe Area Wilderness (BWCAW). This area along the wilderness boundary is part of Zone 3 of the Forest Vegetation Spatial Patterns zones (Forest Plan Chapter 2: pages 2-24). Areas within Zone 3 are areas proximate to the BWCAW and are thereby ecologically similar. The objective of Zone 3 is to strive to minimize the decreases in large mature/older upland patches and interior forest. Age and composition objectives will be the primary drivers of forest spatial patterns and conditions within this zone (refer to Glacier section 3.8 "Management Indicator Habitats" on the effects analysis to Forest Vegetation Spatial Patterns).

As mentioned above, all vegetative objectives on the Superior National Forest will be determined through a combination of Landscape Ecosystem Objectives (what is desired landscape-wide) and Management Area direction. See Chapter 1 for information on management areas in the project area.

3.9.3 Analysis Methods

The Glacier Effects Analysis for the vegetation resource is tiered to the Forest Plan Environmental Impact Statement (EIS). The Forest Plan EIS considered the role of disturbance, the range of natural variability, ecological classifications, and landscape ecosystems. The Forest Plan EIS disclosed the effects of implementing the Forest-wide objectives. However, the Glacier Effects Analysis discloses how each alternative would move the Glacier Project Area toward the Forest Plan objectives and desired future condition. This document does not repeat the analysis documented in the Forest Plan EIS. (See Forest Plan EIS pages 3.1-20 to 3.2-49)

The Forest Plan provides four specific measurable objectives for each LE. These objectives focus on the species composition, age class distribution, Management Indicator Habitats (MIH), and within-stand diversity for each LE. The focus of the objectives is different for each LE.

Because these objectives are measurable, they provide a good way to compare how the Glacier Project's alternatives would move each LE toward the Forest Plan's desired condition. Species composition, age class distribution, and within-stand diversity were selected as the three indicators used to compare the primary effects which would result from the implementation of each alternative. Management Indicator Habitats are discussed in Section 3.8.

The analysis on the impacts to the Boundary Waters Canoe Area Wilderness (BWCAW) will consider only the vegetation conditions within a corridor extending a quarter mile from the BWCAW Boundary along the entire 56 mile long common boundary. This distance was selected because minimal ecological effects are expected on the wilderness vegetation by managed vegetation actions beyond this distance. Since there are no separate objectives in the Forest Plan for the vegetation resource adjacent to wilderness boundary, the effects to the forest types and age classes within this area will be covered by the discussions under each LE below. The analysis for this resource will be disclosing the different vegetation types (e.g., lowlands vs. uplands) and both the young (zero to nine-years old age class) and mature (fifty plus years) acres within the forests of this area. This represents a total area of 8,353 acres in size, of which 4,857 acres are federal land (not including lakes or other permanent water bodies), 2,558 acres are nonfederal land and rest of the area is in water. Direct and indirect effects under each alternative will be restricted to the effects at decade one.

3.9.4 Analysis Area

The geographic boundary selected for analyzing the direct and indirect effects is the Glacier Project Area boundary. The northern one-third of the area is mostly within the Dry-Mesic Red and White Pine LE (southeastern extreme corner excluded), the southern two-thirds of the Area and the southeastern extreme corner of the northern one-third is within the Jack Pine/Black Spruce LE. The Lowland Conifer LE is interspersed throughout the upland LEs as is typical throughout Northern Minnesota (see Figure 3.9-1. below). The direct and indirect effects analysis includes land managed by the federal government only. This analysis area was chosen because it will show how the proposed actions within the Glacier Area help meet the Forest Plan objectives.

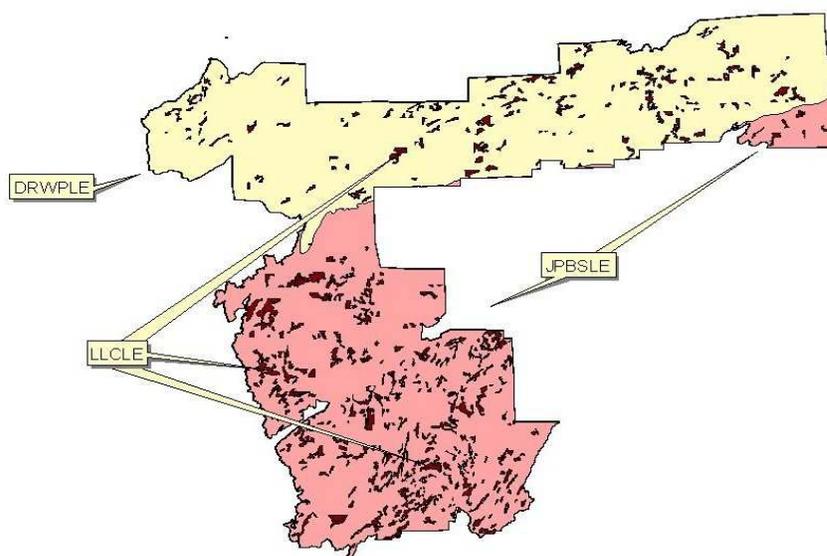


Figure 3.9-1. Glacier Area Landscape Ecosystems Generalized

The geographic boundary selected for analyzing the cumulative effects is all ownerships within the Glacier Project Area. This analysis area was chosen because it is the appropriate scale to consider the proposed actions with the known activities of other owners within the same project boundary.

The applied assumption to forest composition (including regeneration) on other ownership is that all harvested areas will be naturally regenerated in place with minimal planting of long-lived conifers for conversions or diversification.

The effects of past actions are reflected in the existing condition. Therefore, the time period selected for the direct, indirect, and cumulative effects analysis is ten years into the future. This time period was selected because it coincides with Decade One of the Forest Plan. The applied assumption is that within ten years the approved actions from previous environmental analyses and harvests on other ownerships will have been completed by 2017.

Since the existing condition is a very reliable snapshot of past cumulative effects on forest types and age class, the forest type and age class distribution of the area in year 2007 would reflect ALL prior commercial harvests (timber sales) and stand replacement natural disturbances (which affects both forest type and stand age class).

3.9.5 Affected Environment

The forest that exists today evolved as a result of both natural and human processes. The pioneer logging that occurred during the late 19th century, followed by widespread slash-fueled wildfires, altered the composition and structure of the original forests. Recent timber management and fire suppression activities have contributed to current forest conditions. Natural disturbances and forest succession have also taken place to varying degrees on managed and unmanaged lands within the Glacier Project Area. The most recent natural disturbance was the “derecho” windstorm of 1999. The acreage most affected by the windstorm was in the extreme eastern portions of the Glacier Area extending well into the Boundary Waters Canoe Area Wilderness. The forest that exists today is different from the forest that would have evolved under purely natural processes.

Each of the landscape ecosystems (LEs) that exist in the Glacier Project Area has objectives for species composition, age class distribution, and for tree species diversity within individual stands. The Forest Plan established these objectives by considering both the historic composition and structure of the Forest as well as the desired future condition. Please note: the affects of the windstorm of 1999 to the age classes of the LEs were incorporated into the final LE objectives.

Each affected LE’s current condition in regards to these objectives is discussed below.

Species Composition

Tables 3.9-1a, 3.9-4a, and 3.9-7a show the Glacier Area species composition as it was in 2007 (existing condition column). Most of the younger and middle age classes are predominantly aspen types with jack pine second and red pine third in frequency. The red pine acres are mostly a result of conversion through planting from past harvests of jack pine, spruce and aspen. Aspen occupies the most acreage (over 57%) due to past practices of harvesting other forest types and allowing aspen to occupy them naturally. Consequently this type occupies much more of the area than occurred naturally in the past.

When comparing the existing conditions to the amounts desired based on LE objectives, the existing amounts of jack pine, white pine, and spruce-fir forest types are under-represented; and the existing amount of aspen is over-represented (Forest Plan FEIS Chapter 3, Table FAC-2 on page 3.2-8).

Tables 3.9-1b, 3.9-4b, and 3.9-7b show the Glacier Area Vegetation Composition within the respective landscape ecosystem (LE) compared to forest wide composition. The first two columns

are percentages for the entire Superior National Forest in 2003 and 2006 (Existing Condition). The third column shows projected forest wide composition after one decade of desired conditions (year 2014). The last four columns of each table show percentages for the Glacier Area under alternatives 1, 2, 3 and 4 as projected for year 2017.

Age Class Distribution

Tables 3.9-2a, 3.9-5a and 3.9-8a show the Glacier Area age class distribution as it was in 2007 (existing condition column). Most of the younger and middle age classes are a result of past harvests, the majority of which occurred in the last 40 years. These past harvests peaked between 20 and 30 years ago. Even though harvesting occurred in the general area at the turn of the century, much of the older age classes, especially the older jack pine forests, resulted from natural disturbances, such as high intensity fires. Some of the other existing mature natural pine forests were too young to be harvested at the turn of the century.

When comparing the existing conditions to the amounts desired based on LE objectives, the current amount of upland forest in the 100+ year age class is under-represented, while the rest of the age classes are over-represented (Forest Plan FEIS CH3, Table FAC-2 on page 3.2-8).

Tables 3.9-2b, 3.9-5b and 3.9-8b compare the forest wide Age Class Composition within the respective LE to the percentages projected for each Glacier Area alternative by the year 2017. The totals for the Superior National Forest in 2003 and 2006 (existing conditions) are shown in the first two columns. The third column depicts percentages produced after one decade of desired conditions (year 2014). The last four columns of each table show percentages for the Glacier Area under alternatives 1, 2, 3 and 4 as projected for year 2017.

With-in Stand diversity

Tables 3.9-3 and 3.9-6 show the Glacier Area stand diversity trend objectives for 2017. The typing of stands is based on what tree species occupy the majority of the main canopy of a given stand. Therefore it does not allow one to ascertain a stand's true tree diversity. Stand diversity has been naturally increasing in the past 30 years. This is true for both the white pine and the balsam fir tree species component. This is a direct affect of over-mature stands aging. The older stands all have seen a reduction of jack pine, aspen, and paper birch tree species due to canopies naturally breaking up and allowing more shade tolerant species to occupy the spaces. These shade tolerant species are more spruce-fir types (more balsam than spruce). The existing source of white pine seed has mainly been provided by scattered, individual white pine (although white pine planting has occurred in isolated areas across the project area on all ownership). This has allowed this species to occupy more area (as well as maintain and expand the local genetic pools), although it remains a minor component of a stand's forest type. Tamarack and northern white cedar have experienced an increase in certain parts of the Glacier Area as well, and these remain a minor component when present.

Historically, large areas of spruce and balsam fir forest conditions did not typically occur since stand replacement fires occurred every fifty to three hundred years (dependant on forest type). Today, wildfires within the Superior National Forest are mainly suppressed outside the wilderness areas. The exclusion of fire can cause the loss of a distinct ecosystem as surely as if the forest were clear cut and not regenerated to the existing forest type of the parent stand (Noss et al. 1995). The exclusion of this integral part of the forest ecosystems of northern Minnesota has created a situation

where, according to Heinselman (1996), stands are aging on a scale far beyond anything the ecosystem has experienced in the last 6000 years.

Even though Heinselman (1996) suggests that large acres of old forests had always existed in the pre-settlement forests of northern Minnesota, it is the scale of the changes and eighty year gaps in recruitment of new age classes that is unnatural, because of the exclusion of fires. Potential effects of the exclusion of fires include changes in species diversity and composition of the shrubs, lichens, and mosses. An overall decrease in diversity of species, age classes, and structure of the forested landscape, may be more likely to occur. In addition, nutrient cycling changes as mosses invade. The organic matter would continue to accumulate on the forest floor and within the under story. Thus, the maturing forests would tie up nutrients.

Heinselman (1996) suggests that in the long term, the complete exclusion of fires or other disturbance may result in red, white, and jack pine, and aspen being virtually lost from the system. However one must keep in mind that there may be isolated areas where *in situ* regeneration of red and white pine would occur (Quinby 1990). Mueggler (1985 *in* Quinby 1990) agrees with Heinselman's conclusions that without fire or other disturbance, aspen is likely to be replaced by other forest types, primarily the more shade tolerant species such as balsam fir and white spruce, within a single generation.

Vegetation Along the BWCAW Boundary

The Glacier Project Area's edge coincides with approximately fifty-six miles of the wilderness boundary. The vegetation conditions within a corridor extending one-quarter mile from the wilderness boundary are based on the 4,857 acres of forested land off of federal land.

Tables 3.9-9 and 3.9-10 show the total upland forests within this area is ninety percent. Lowland forests occupy eight percent of this area. The rest of the landscape is open area (both in non forested lowlands and upland terrain).

3.9.6 Environmental Consequences

3.9.6.1 Jack Pine/Black Spruce LE

Forest Plan objectives for the JP/BSLE can be found in Chapter 2 of the Forest Plan. See pages 2-61 and 2-62.

Table 3.9-1a shows the Glacier Area species composition within the Jack Pine/Black Spruce Landscape Ecosystem (JP/BSLE) as it was in 2007 (existing condition column) and what would result in the year 2017 under each alternative. Table 3.9-2a shows the Glacier Area age class distribution within the (JP/BSLE) as it was in 2007 (existing condition column) and what would result in year 2017 under each alternative.

Table 3.9-3 shows the Glacier Area stand diversity trend objectives for the (JP/BSLE) for 2017 and what would result in year 2017 under each alternative.

3.9.6.1.1 Direct and Indirect Effects

Species Composition

Alternative 1

Tables 3.9-1a and b display how much of each forest type would be present in the project area under each alternative in year 2017. The applied assumption is by 2017 the approved actions from previous environmental analyses will be completed. It also takes into account the changes most likely to occur naturally (through succession) during the next ten years.

Based on the rules of succession used in the Forest Plan EIS (Refer to Appendix B Table BEIS-11 page B-18), some of the older-aged jack pine and aspen forest types are expected to succeed to spruce-fir forest type. Threshold ages for succession applied for these types are 110 years old for aspen and 120 years old for jack pine stands. More than 1,800 plus acres would succeed to the spruce-fir forest type by 2017 in this LE. The rest of the forest types' percentages would be maintained under the no action alternative.

Much of the jack pine would succeed to spruce-fir type (mostly to upland black spruce). This movement of jack pine acres into spruce-fir forest types (mainly upland black spruce) does not help in meeting the Forest Plan objectives for increasing the jack pine type in this LE. These acres are located entirely within the Research Natural Area (RNA) in the southern part of the project area. However, this succession trend does help meet Forest Plan objectives for the spruce-fir forest types.

The decrease in aspen types (approximately 1,348 acres through succession) would help meet Forest Plan objectives for increasing spruce-fir and for decreasing aspen types in this LE.

Effects Common to Action Alternatives

Compared to conditions within this LE in year 2017 (Alternative 1) the jack pine and white pine forest types would increase under the action alternatives; the spruce-fir and aspen forest types would decrease under the action alternatives.

Jack pine would be harvested and this would prevent some of the older jack pine stands (eighty-eight acres out of 500+) proposed for harvest from converting to spruce-fir forest types. Some aspen forests would be converted to jack pine and this would result in an increase in this forest type on the landscape. Forest Plan objectives show the desired condition is to increase the amount of jack pine in the landscape ecosystem.

To offset the loss of this forest type within the southern part of the project area aspen forests would be converted to jack pine. This opportunity to offset the loss of jack pine is not proposed in Alternative 3 to address shallow soil issues (refer to the discussion in Glacier Section 3.5 regarding this non-native invasive species issue).

Aspen – Some aspen would be harvested and maintained as aspen types and some aspen would be converted to either jack pine or white pine (or white pine mixed with white spruce and other desirable long-lived species) to address the forest plan objectives. Out of the approximately 1,348 acres that would succeed in Alternative 1, 505 acres of these would be harvested in Alternatives 2 and 4; 191 acres would be harvested in Alternative 3. Forest Plan objectives show the desired condition is to decrease the acres of the aspen forest types on the landscape.

Spruce-fir – The amount of spruce-fir forest would decrease slightly under the action alternatives when compared to Alternative 1. Several reasons account for this foreseeable acreage reduction. First,

a high percentage of spruce-fir proposed to be regeneration harvested would be converted to jack pine and / or white pine forest. Second, stands that are of other forest types but are likely to succeed into the spruce-fir forest type within the next decade would be harvested and mostly converted as well. Not all likely to succeed would be converted though. Those areas left untreated would be allowed to succeed to help meet other Forest Plan objectives that address desired future conditions.

White Pine – White pine forest type would increase under the action alternatives because some aspen stands would be converted to white pine through planting.

Alternatives 2, 3 and 4

See Table 3.9-1a for the specific changes that would occur to the amount of forest types in the project area in this landscape ecosystem (LE) by 2017.

All of the action alternatives contribute more jack pine than Alternative 1. Compared to Alternative 1, Alternative 4 would provide the most (1,168 acres) and Alternative 3 would provide the least (496 acres) amount of additional jack pine forests. Alternatives 2 and 4 only have a difference of 11 acres between the two.

All of the action alternatives result in the reduction of approximately 935 acres (Alternatives 2 and 3) up to 1,009 acres (Alternative 4) of the aspen forest type than Alternative 1 through proposed pine conversions.

All of the action alternatives result in less spruce fir acres than Alternative 1: Alternatives 2 and 4 would result in the reduction of 356 acres and Alternative 3 would be 192 acres fewer.

All of the action alternatives result in more white pine acres than Alternative 1 with Alternatives 2 and 4 providing 135 acres more and Alternative 3 providing seventy-eight acres more.

Age Class

Alternative 1

Table 3.9-2a displays what the age class distribution would be under each of the alternatives within this landscape ecosystem (LE) in the year 2017. The applied assumption is by 2017 the approved actions from previous environmental analyses will be completed. It also takes into account the likely changes to the age class distribution that would occur naturally (through succession) during the next ten years.

Most stands currently in the young age class (zero to nine years old) would move into the next age class in ten years. Only 508 acres of this LE would be in the zero to nine years age by 2017 (mostly the acres currently under contract to be harvested). This alternative does not move the project area toward the landscape ecosystem objectives for young forest.

All of the succeeded stands would move into the ten to forty-nine year old class. As time goes by stands in the older age classes would continue to age, as well as move into different succession stages.

Effects Common to Action Alternatives

The 0 – 9 age class would increase under all of the action alternatives and this would contribute to the landscape ecosystem objectives for young forest.

The majority of stands proposed for regeneration harvests are in the fifty to one hundred and nine year age classes and the Forest-wide LE objectives are to decrease the amount in these age groups.

Some harvest would occur in the 110+ age classes (twenty-eight acres) but this would have minimal impact on the amount of forest desired in the oldest of age classes.

Alternatives 2, 3 and 4

All of the action alternatives result in more acres in the zero to nine age class than Alternative 1. Alternative 2 would provide approximately 4,719 acres, Alternative 3 approx. 3,308 acres, and Alternative 4 approx. 4,794 acres.

Neither one of the action alternatives result in more acres in the ten to forty nine year old age class than Alternative 1. This reflects the fact that the greatest number of stands would succeed to this age class under Alternative 1. Alternatives 2 and 4 would provide the least acres in this age class due to more regeneration harvesting of stands. These stands would have succeeded into the age class under the no action alternative.

All of the action alternatives result in fewer acres in the fifty to one hundred and nine age classes than Alternative 1. Alternatives 2 and 4 would provide the least in this age class, approximately 11,976 acres. Alternative 3 would provide 12,993 acres in this LE.

Within-Stand Diversity

Alternative 1

Table 3.9-3 shows the Forest Plan objectives for within-stand tree species diversity and what is likely to happen to the individual species under each alternative.

Under Alternative 1, jack pine would decrease and the Forest-wide objective is to increase the amount of jack pine

Jack pine stands that succeed mainly succeed into the upland black spruce forest type. Forest plan objectives show a desire to increase jack pine and decrease black spruce.

White pine is coming in naturally under many stands within the Glacier Area, and therefore is showing an increasing trend, although at a much slower rate than under the action alternatives that include diversity planting of white pine.

Balsam fir would increase because the seed source is readily available throughout the Glacier Area. Forest Plan objectives call for a decrease in balsam fir.

With time, diversity of the stands within the Glacier Area would eventually decrease. In the absence of any type of disturbance (human or natural), the existing stands would eventually experience high mortality. The dead trees of the main canopy would start to fall over, creating gaps. With increased age, this accelerates creating larger gaps. White pine seedlings may establish themselves within the under story. In the absence of ground fires, however, balsam fir may establish itself in greater numbers potentially out-competing the pine regeneration as well as other tree species.

Effects Common to Action Alternatives

The trends for increasing the desired tree species diversity would generally be met through partial cuttings (such as PC60), diversity and under plantings, releasing areas with known advanced white and red pine regeneration and conversions proposed under the action alternatives. In addition, the leave trees, legacy patches, and other parts of treatment units not harvested would also add to with-in stand diversity.

The objective for balsam fir is a reduction of this tree component within stands. However, due to a lack of wide spread treatments that would address this tree species (such as prescribed burns); it is expected to increase its presence in most stands under all the alternatives.

All action alternatives identify relatively the same amount of treatments, labeled here as restoration treatments. This category of treatment would help mitigate past harvest and regeneration effects on these desirable species within the area. A good portion of these areas to receive these treatments are previously harvested hardwood and conifer mixed stands. Most were allowed to regenerate to more pure aspen stands. Mostly aspen stems would be reduced within these areas to allow birch and other desirable conifer species a more competitive edge over the aspen.

Several jack pine stands that would succeed to other forest types under the no action alternative have proposals for jack pine seeding to increase its presence. This would result in areas with a multi-aged condition. Several other stands that would succeed under Alternative 1 have proposals for a release. These additional releases would reduce the aspen and balsam fir components of the stands allowing the more desirable species to be more competitive.

White pine and white spruce would be increased throughout with under planting, release of existing young pines/spruces, and through partial cuttings followed with under planting and diversity plantings. This would result in areas with a multi-aged condition.

Northern white cedar would also increase slightly through under plantings.

Long-term benefits to diversification along the wilderness boundary can be attained under all action alternatives. All alternatives help to provide a future seed source of desirable species within a quarter mile of the wilderness boundary.

Alternatives 2, 3 and 4

All action alternatives would help meet the Forest Plan direction for within-stand diversity. Based on the proposed actions, Alternatives 2 and 4 both propose to improve diversity on 3,418 acres (45% associated with harvests); alternative 3 proposes to improve diversity on 2,914 acres, (36% associated with harvests).

Table 3.9-1a Vegetation Composition within the Jack Pine/Black Spruce LE of the Glacier Area in Year 2007 (Existing Condition), and by Alternative in year 2017

Upland Forest Type	Existing Condition	Alt 1	Alt 2	Alt 3	Alt 4
Jack Pine	3,076	2,875	4,032	3,371	4,043
Red Pine	1,672	1,617	1,617	1,710	1,680
White Pine	330	330	465	408	465
Spruce-fir	4,682	6,342	5,984	6,208	5,984
Northern Hardwoods	0	0	0	0	0
Aspen	13,492	12,088	11,153	11,154	11,079
Paper Birch	665	665	665	665	665
Total Acres	23,917	23,917	23,916	23,916	23,916

Table 3.9-1b Glacier Area Vegetation Composition within the Jack Pine/Black Spruce LE (by Alternative in year 2017) (compared to SNF 2003, 2006 (Existing Condition) and 1 Decade desired conditions (year 2014) LE Wide)

Upland Forest Type	Forest Wide			Glacier Area			
	2003	2006	1 Decade Objective	Alt 1	Alt 2	Alt 3	Alt 4
Jack Pine	24%	23%	28%	12%	17%	14%	17%
Red Pine	10%	10%	10%	7%	7%	7%	7%
White Pine	3%	4%	3%	1%	2%	2%	2%
Spruce-fir	13%	13%	15%	27%	25%	26%	25%
Northern Hardwoods	1%	1%	0%	0%	0%	0%	0%
Aspen	45%	45%	40%	51%	47%	48%	46%
Paper Birch	5%	5%	5%	3%	3%	3%	3%

Table 3.9-2a Age Class Composition within the Jack Pine/Black Spruce LE of the Glacier Area in year 2007 (Existing Condition), and by Alternative in year 2017

Age Class	Existing Condition	Alt 1	Alt 2	Alt 3	Alt 4
0-9	314	508	4,719	3,308	4,794
10-39	7,900	6,620	6,032	6,426	6,032
40-79	8,130	7,231	5,659	6,391	5,659
80-109	5,676	8,340	6,317	6,602	6,243
110-179	1,897	1,217	1,189	1,189	1,189
180+	0	0	0	0	0
Total Acres	23,917	23,916	23,916	23,916	23,917

Table 3.9-2b Glacier Area Age Class Composition within the Jack Pine/Black Spruce LE (by Alternative in year 2017) compared to SNF 2003, 2006 (Existing Condition) and 1 Decade desired conditions (year 2014) LE Wide)

Age Class	Forest Wide			Glacier Area			
	2003	2006	1 Decade Objective	Glacier Alt 1	Glacier Alt 2	Glacier Alt 3	Glacier Alt 4
0-9	10%	7%	14%	2%	20%	14%	20%
10-39	38%	39%	42%	28%	25%	27%	25%
40-79	24%	24%	18%	30%	24%	27%	24%
80-109	25%	25%	22%	35%	26%	28%	26%
110-179	4%	5%	5%	5%	5%	5%	5%
180+	0%	0.17%	0%	0%	0%	0%	0%

Table 3.9-3 Tree Species Diversity Objectives for Jack Pine/Black Spruce LE

Species	Forest Plan Objective	Alt 1	Alt 2	Alt 3	Alt 4
Jack Pine	+	-	+	+	+
Red Pine	m/+	-	-	+	+
White Pine	+	+	+	+	+
Balsam Fir	-	+	+	+	+
Tamarack	+	+	+	+	+
White Cedar	+	+	+	+	+
White Spruce	+	+	+	+	+
Black Spruce	m/-	+	m	m	m
Aspen	-	-	-	-	-
Paper Birch	+	m	m	m	m
Change from existing condition: (+) = Increase (-) = Decrease (m) = Maintain					

3.9.6.2 Dry Mesic Red and White Pine Landscape Ecosystem

Forest Plan objectives for the Dry Mesic Red and White Pine Landscape Ecosystem can be found in Chapter 2 of the Forest Plan, pages 2-64 to 2-65.

Table 3.9-4a shows the Glacier Area species composition within the Dry Mesic Red and White Pine Landscape Ecosystem as it was in 2007 (existing condition column) and what would result in year 2017 under each alternative. Table 3.9-5 shows the Glacier Area age class distribution as it was in 2007 (existing condition column) and what would result in year 2017 under each alternative. Table 3.9-6 shows the Glacier Area stand diversity trend objectives for 2017 and what would result in year 2017 under each alternative.

3.9.6.2.1 Direct and Indirect Effects

Species Composition

Alternative 1

Table 3.9-4a displays how much of each forest type would be present in the project area under each alternative in year 2017. The applied assumption is that by 2017 the approved actions from previous environmental analyses will be completed. It also takes into account the changes most likely to occur naturally (through succession) during the next ten years.

Based on succession projections a total of 196 acres of aspen type would succeed to the spruce-fir forest type by 2017 in this LE. The threshold age for succession applied for aspen types is 110 yrs. The rest of the forest types' percentages would be maintained under the no action alternative.

The decrease in aspen also helps meet Forest Plan objectives by increasing spruce-fir. There would be no increase in the amount of jack pine

Effects Common to Action Alternatives

Compared to conditions within this LE in year 2017 (Alternative 1) the jack pine forest type would increase under the action alternatives; the spruce-fir and aspen forest types would decrease under the action alternatives, and the paper birch forest type would decrease by up to thirty-five acres.

Jack pine would be harvested and regenerated to jack pine and provide younger stands of this type. Conversion to jack pine in other harvested areas would help increase this forest type on the landscape and create larger young patches especially where harvests of this type occurred relatively recently. The desired condition, according to the Forest Plan, is to increase the amount of jack pine across the forest-wide landscape ecosystem.

Aspen – Some aspen would be harvested and maintained as aspen types. Some aspen would also be converted to jack pine to address the forest plan objectives for this desired species. Forest Plan objectives show the desired condition is to decrease the amount of acres of the aspen forest types on the landscape.

Spruce-fir – The amount of spruce-fir forest would decrease slightly under the action alternatives when compared to Alternative 1. Several reasons account for this foreseeable acreage reduction. First, a high percentage of spruce-fir proposed to be regeneration harvested would be converted to jack pine and / or white pine forest. Second, stands that are of other forest types but are likely to succeed into the spruce-fir forest type within the next decade would be harvested and mostly converted as well. Not all likely to succeed would be converted though. Those areas left untreated would be allowed to succeed to help meet other Forest Plan objectives that address desired future conditions.

White Pine – White pine forest type would remain unchanged under all Alternatives.

Alternatives 2, 3 and 4

See Tables 3.9-4a and b for the specific changes that would occur to the amount of forest types in the Project Area in this LE by 2017.

All of the action alternatives contribute more jack pine than Alternative 1. Compared to Alternative 1, Alternative 4 would provide the most (925 acres) and Alternative 2 would provide the least (328 acres) amount of additional jack pine forests. Alternative 3 would provide 517 acres of new jack pine forests.

All of the action alternatives result in the reduction of the aspen forest type. Compared to Alternative 1, Alternative 4 would result in the most reduction (765 acres) and Alternative 2 would result in the least reduction (279 acres) of aspen forests than in the no action alternative. Alternative 3 would reduce this type by 399 acres.

All of the action alternatives result in less spruce fir forest type than Alternative 1. Compared to Alternative 1, Alternative 4 would result in the most reduction (145 acres) and Alternative 2 would result in the least reduction (34 acres) of spruce fir forests than in the no action alternative. Alternative 3 would reduce the spruce fir type by 88 acres.

All of the action alternatives result in the same amount of white pine acres.

Age Class

Alternative 1

Table 3.9-5a displays what the age class distribution would be under each of the alternatives within this LE in year 2017. The applied assumption is by 2017 the approved actions from previous environmental analyses will be completed. It also takes into account the changes most likely to occur naturally (through succession) during the next ten years.

Stands currently in the young age class (zero to nine years) would move into the next age class in ten years. No acres of this landscape ecosystem (LE) would be in the zero to nine years age by 2017.

Most of the succeeded stands would move into the ten to forty-nine year old class; some succeeding stands would be moving into the fifty to ninety nine year age class. As time goes by stands in the older age classes will continue to age and decline, as well as move into younger stages of succession.

Effects Common to Action Alternatives

All of the action alternatives would contribute to the 0-9 age class. The majority of stands proposed for regeneration harvests are in the fifty to ninety-nine year age classes. The Forest-wide LE objectives are to increase the young forest and decrease the 50 - 99 age class.

Some harvest would occur in the 100-139 age classes but this would have minimal impact on the amount of forest desired in the oldest of age classes.

Alternatives 2, 3 and 4

Each of the action alternatives results in more acres in the zero to nine age class than Alternative 1. Alternative 2 would provide approximately 1,115 acres, Alternative 3 approx. 1,032 acres, and Alternative 4 approx. 2,158 acres.

Neither one of the action alternatives results in more acres in the ten to forty-nine age class than Alternative 1. All action alternatives each provide thirty-five acres less than Alternative 1.

The action alternatives result in fewer acres in the 50-99 and 100-139 age classes than Alternative 1.

Within-Stand Diversity

Alternative 1

Table 3.9-6 shows the Forest Plan objectives for within stand tree species diversity and what is likely to happen to the individual species under each alternative.

Under Alternative 1 all species, except for jack pine and balsam fir, show trends in the direction desired in Forest plan objectives. Forest Plan objectives show a desire to increase jack pine and a decrease in black spruce.

White pine is coming in naturally under many stands, and therefore is showing an increasing trend, although at a much slower rate than under the action alternatives that include diversity planting of white pine.

Balsam fir would increase because the seed source is readily available throughout the area. Forest Plan objectives call for a decrease in balsam fir.

With time, diversity of the stands would eventually decrease. In the absence of any type of disturbance (human or natural), the existing stands would eventually experience high mortality. The

dead trees of the main canopy would start to fall over, creating gaps. With increased age, this accelerates creating larger gaps. White pine seedlings may establish themselves within the under story. In the absence of ground fires, balsam fir may establish itself in greater numbers, potentially out-competing the advanced pine regeneration as well as other tree species.

Effects Common to Action Alternatives

Increasing the desired tree species would generally be met through partial cuttings (such as PC60), diversity and under plantings, releasing areas with known advanced white and red pine regeneration and conversions proposed under the action alternatives.

Once again the objective for balsam fir is a reduction of this tree component within stands. However, due to a lack of wide-spread treatments that would address this tree species (such as prescribed controlled burns); it is expected to increase its presence (under all the alternatives) in most stands and encroach into stands with an existing minor presence of fir under all the alternatives.

All of the action alternatives identify relatively the same amount of treatments labeled here as restoration treatments. This category of treatment would help mitigate past harvest effects on and encourage regeneration of desirable species within the area. A good portion of these areas to receive these treatments are previously harvested hardwood and conifer mixed stands. Most were allowed to regenerate to more pure aspen stands. In most cases, aspen stems would be reduced within these areas to allow birch and other desirable conifer species a more competitive edge over the aspen.

White pine and white spruce would be increased throughout with under planting, release of existing young pines/spruces, and through partial cuttings followed with under planting and diversity plantings. This would result in areas with a multi-aged condition.

Northern white cedar would also experience a minor increase with under plantings.

Long-term benefits to diversification along the wilderness boundary can be attained under all action alternatives. The action alternatives help to provide a future seed source of desirable species within a quarter mile of the wilderness boundary.

Alternatives 2, 3 and 4

All action alternatives would help meet the Forest Plan direction for within-stand diversity. Based on the proposed actions, Alternative 2 proposes to improve diversity on 4,407 acres (30% associated with harvests) alternative 3 proposes to improve diversity on 3,893 acres, (15% associated with harvests) and Alternative 4 on 4,695 acres (33% associated with harvests).

Table 3.9-4a Glacier Area Vegetation Composition within the Dry Mesic Red and White Pine LE of the in year 2007 (Existing Condition), and by Alternative in Year 2017

Upland Forest Type	Existing Condition	Alt 1	Alt 2	Alt 3	Alt 4
Jack Pine	1,223	1,224	1,552	1,741	2,149
Red Pine	578	578	578	578	578
White Pine	257	257	257	257	257
Spruce-fir	727	922	888	834	777
Northern Hardwoods	5	5	5	5	5
Aspen	7,913	7,717	7,438	7,318	6,952
Paper Birch	2,566	2,566	2,551	2,535	2,551
Total Acres	13,269	13,269	13,269	13,268	13,269

Table 3.9-4b Glacier Area Vegetation Composition within the Dry Mesic Red and White Pine LE (by Alternative in year 2017) compared to SNF 2003, 2006 (Existing Condition) and 1 Decade desired conditions (year 2014) LE Wide

Upland Forest Type	Forest Wide			Glacier Area			
	2003	2006	1 Decade Objective	Alt 1	Alt 2	Alt 3	Alt 4
Jack Pine	9%	9%	10%	9%	12%	13%	16%
Red Pine	13%	13%	13%	4%	4%	4%	4%
White Pine	7%	8%	9%	2%	2%	2%	2%
Spruce-fir	8%	8%	11%	7%	7%	6%	6%
Northern Hardwoods	1%	1%	1%	0%	0%	0%	0%
Aspen	52%	52%	47%	58%	56%	55%	52%
Paper Birch	10%	9%	9%	19%	19%	19%	19%

Table 3.9-5a Glacier Area Age Class Composition within the Dry Mesic Red and White Pine LE of the in year 2007 (Existing Condition), and by Alternative in Year 2017

Age Class	Existing Condition	Alt 1	Alt 2	Alt 3	Alt 4
0-9	979	0	1,115	1,032	2,158
10-49	2,331	3,138	3,103	3,103	3,103
50-99	9,124	8,276	7,481	7,655	6,606
100-139	828	1,847	1,569	1,478	1,402
140+	8	8	0	0	0
Total Acres	13,270	13,269	13,268	13,268	13,269

Table 3.9-5b Glacier Area Age Class Composition within the Dry Mesic Red and White Pine LE (by Alternative in year 2017) compared to SNF 2003, 2006 (Existing Condition) and 1 Decade desired conditions (year 2014) LE Wide

Age Class	Forest Wide			Glacier Area			
	2003	2006	1 Decade Objective	Alt 1	Alt 2	Alt 3	Alt 4
0-9	10%	9%	10%	0%	8%	8%	16%
10-49	33%	35%	44%	24%	23%	23%	23%
50-99	45%	44%	32%	62%	56%	58%	50%
100-139	12%	11%	14%	14%	12%	11%	11%
140+	0%	0.31%	0%	0.06%	0%	0%	0%

Table 3.9-6. Glacier Area Tree Species Diversity Objectives for Dry Mesic Red and White Pine LE

Species	Forest Plan Objective	Alt 1	Alt 2	Alt 3	Alt 4
Jack Pine	+	m	+	+	+
Red Pine	+	m	m	m	m
White Pine	+	+	+	+	+
Balsam Fir	-	+	+	+	+
Tamarack	+	+	+	+	+
White Cedar	+	+	+	+	+
White Spruce	+	+	+	+	+
Black Spruce	m	+	m	m	m
Aspen	-	-	-	-	-
Paper Birch	m	m	-	-	-

Change from existing condition: (+) = Increase (-) = Decrease (m) = Maintain

3.9.6.3 Lowland Conifer Landscape Ecosystem

Forest Plan objectives for the Lowland Conifer Landscape Ecosystem can be found in Chapter 2 of the Forest Plan Tables LLC-1. (Vegetation Composition Objectives...), and LLC-2A (Vegetation Age Class Objectives...); pages 2-76.

Table 3.9-7a shows the Glacier Area species composition of the Lowland Conifer within the Jack Pine/Black Spruce and Dry-Mesic Red and White Pine Landscape Ecosystems of the Glacier Area as it was in 2007 (existing condition column) and what would result in year 2017 under each alternative. Table 3.2-8a shows the Glacier Area age class distribution of the Lowland Conifer within the JP/BS and DMRWP LEs as it was in 2007 (existing condition column) and what would result in year 2017 under each alternative.

3.9.6.3.1 Direct and Indirect Effects

Species Composition

Alternatives 1, 2, 3, and 4

Table 3.9-7a displays how much of each forest type would be present in the project area under each alternative in year 2017. There would be no change in species composition under any of the alternatives.

Within this landscape ecosystem (LE) all the forest types are presently in line with the Forest Plan objectives for desired conditions.

Age Class

Alternative 1

Table 3.9-8 shows how all age classes are slightly under-represented, except for the 80-159 class. Forest plan objectives identify a desire for all these age classes to slightly decrease and a slight increase for the 80-159 age class in the first decade.

The two acres that are currently in the young age class (zero to nine) would move into the next age class in ten years. The 12 acres currently under contract for regeneration harvest would be in the zero to nine age class in 2017. The only age classes that show a considerable increase in acres are the much older ages (80-159 and 160+). All these effects are in line with Forest Plan direction for the older age classes within the Lowland conifer LE.

Effects Common to Action Alternatives

The project creates young lowland forest and this would contribute to meeting Forest Plan objectives. All the other age classes experience a reduction in acres under the action alternatives. All these effects on the much older ages (80-159 and 160+) are in line with Forest Plan direction for the older age classes within the Lowland Conifer Landscape Ecosystem. The reduction in the older age classes is due to the proposed harvests within this LE.

Alternatives 2, 3 and 4

Alternative 2 proposes 261 acres for regeneration harvest. Alternative 3 proposes 151 acres for regeneration harvest and Alternative 4 proposes 234 acres for regeneration harvest. All these harvest proposals fall within this LE (over ninety-nine percent from the 80-159 age class). This increases the young age class and reduces the 80-159 year age class. The resulting age class is closer to the Forest Plan objective under each action alternative.

Within-Stand Diversity

Alternative 1

Density of stands may be reduced due to natural mortality in the canopies. Depending on water levels and productivity of the sites this may result in some seeding in of lowland conifers and/or lowland brush. It is expected that these gaps in the canopies would seed in desirable species (e.g., black spruce, tamarack). Without any stand replacement disturbance, this pattern is likely to result in multi-aged structures in the stands. In areas where lowland brush takes over more of the stand, the densities of the canopy would be reduced. This situation would likely be temporary and eventually seed back to desirable lowland conifer species.

Effects Common to Action Alternatives

Within this LE the lowland black spruce forest type benefits under all the action alternatives. The supplemental seeding of black spruce would help facilitate ample stocking of regeneration sooner than if allowed to regenerate without the planned seeding. This does not mean that other species won't naturally regenerate themselves. In the purer black spruce stands, the diversity would be minimal. In the more diverse stands proposed for harvests the diversity of the regenerated stands would be expected to be higher than the less diverse stands.

Alternatives 2, 3 and 4

All of the action alternatives would help meet the Forest Plan direction for within-stand diversity within this LE. There are some differences in what the specific alternatives accomplish; however, both would generally address the species of most concern.

Table 3.9-7a Glacier Area Vegetation Composition of the Lowland Conifer within the Jack Pine/Black Spruce and Dry-Mesic Red and White Pine LEs of in year 2007 (Existing Condition), and by Alternative in year 2017					
Lowland Forest Type	Existing Condition	Alt 1	Alt 2	Alt 3	Alt 4
Black Spruce and lowland conifers	4,682	4,682	4,682	4,682	4,682
Tamarack	336	336	336	336	336
Northern White Cedar	249	249	249	249	249
Lowland Hardwoods	630	630	630	630	630
Total Acres	5,897	5,897	5,897	5,897	5,897

Table 3.9-7b Glacier Area Vegetation Composition within the Lowland Conifer within the Jack Pine/Black Spruce and Dry-Mesic Red and White Pine LEs (by Alternative in year 2017) compared to SNF 2003, 2006 (Existing Condition) and 1 Decade desired conditions (year 2014) LE Wide

	Forest Wide			Glacier Area			
Lowland Forest Type	2003	2006	1 Decade Objective	Alt 1	Alt 2	Alt 3	Alt 4
Black Spruce and lowland conifers	79%	79%	79%	79%	79%	79%	79%
Tamarack	2%	2%	2%	6%	6%	6%	6%
Northern White Cedar	12%	12%	12%	4%	4%	4%	4%
Lowland Hardwoods	6%	6%	6%	11%	11%	11%	11%

Table 3.9-8a Glacier Area Age Class Composition of the Lowland Conifer within the Jack Pine/Black Spruce and Dry-Mesic Red and White Pine LEs in year 2007 (Existing Condition), and by Alternative in year 2017

Age Class	Existing Condition	Alt 1	Alt 2	Alt 3	Alt 4
0-9	2	12	273	163	246
10-39	168	117	117	117	117
40-79	1,450	896	896	896	896
80-159	4,234	4,685	4,430	4,540	4,450
160+	43	187	181	181	181
Total Acres	5,897	5,897	5,897	5,897	5,890

Table 3.9-8b Glacier Area Age Class Composition within the Lowland Conifer within the Jack Pine/Black Spruce and Dry-Mesic Red and White Pine LEs (by Alternative in year 2017) compared to SNF 2003, 2006 (Existing Condition) and 1 Decade desired conditions (year 2014) LE Wide

	Forest Wide			Glacier Area			
Age Class	2003	2006	1 Decade Objective	Alt 1	Alt 2	Alt 3	Alt 4
0-9	0%	0.23%	3%	0%	5%	3%	4%
10-39	7%	7%	5%	2%	2%	2%	2%
40-79	24%	24%	18%	15%	15%	15%	15%
80-159	65%	65%	69%	79%	75%	77%	75%
160+	3%	3%	4%	3%	3%	3%	3%

3.9.6.4 Effects on Vegetation Along the Boundary Waters Canoe Area Wilderness (BWCAW) Boundary

3.9.6.4.1 Direct and Indirect Effects

Alternative 1

Under this alternative (existing condition year 2007), there are approximately 242 acres of young (or five percent of the total acres within one quarter mile from the wilderness boundary) and 3,404 acres of mature (or 70 %). See Table 3.9-10. There are 3,021 acres of mature (fifty plus years in age) within the upland forested acres.

Effects Common to Action Alternatives

All action alternatives propose to treat units within this area. They each identify regeneration harvests and intermediate treatments as well as non-harvest restoration units.

Alternatives 2, 3 and 4

All three action alternatives propose a variety of treatments. The main difference in effects to this resource between the action alternatives is the number of acres on which regenerative harvests are proposed.

Table 3.9-10 shows the affects to the age class groups analyzed after a decade (year 2017). The assumption here is that all the existing young and proposed harvests would have moved into the next age class by 2017. Immediate affects are assumed to be the first year after harvest. The greatest affect is under Alternative 4 due to the amount of regeneration harvests proposed. There is no change under Alternative 3. Following harvests, the young age class goes from an existing five percent to 16% in Alternative 2 and 18% in Alternative 4. After 10 years the young age class goes back down to 10%. This is due to the Tomahawk units under contract that have not been harvested yet. However, by 2020 the young age class goes back down to 0 percent.

Alternative 2 proposes approximately 1,300 acres of treatments within a quarter mile of the BWCAW. These include: 290 acres of regenerative harvests of which 191 acres have diversity planting or pine conversions; 159 acres of intermediate treatments of which 44 acres have under planting for diversity. In addition, there are 851 acres of non-harvest restoration units all aimed at increasing diversity.

Alternative 3 proposes approximately 851 acres of treatments within a quarter mile of the BWCAW. These are all non-harvest restoration units all aimed at increasing diversity.

Alternative 4 proposes approximately 1,400 acres of treatments within a quarter mile of the BWCAW. These include: 390 acres of regenerative harvests of which 282 acres have diversity planting or pine conversions; 159 acres of intermediate treatments of which 44 acres have under planting for diversity. In addition, there are 851 acres of non-harvest restoration units all aimed at increasing diversity.

Table 3.9-9. Federal Lands Vegetation Community Types within ¼ Mile of the BWCAW Boundary that Coincides with the Glacier Area Boundary	
Vegetation Community Types	Existing Condition
Total Forested Area	4,372
Total Upland Forest	3,988
Total Lowland Forest	384
Total Lowland Brush	142
Total Open Area	343
Total Acres	4,857

Table 3.9-10. Federal Lands Young and Mature Acres within ¼ Mile of the BWCAW Boundary that Coincides with the Glacier Area Boundary (by Alternative in Year 2017 (1st Decade)					
Age Class	Existing Condition	Alt 1	Alt 2	Alt 3	Alt 4
Young (0-9yrs)	242 (5% of total area)	484 (10%)	484 (10%)	484 (10%)	484 (10%)
Mature (50 yrs +)	3,385 (70% of total area)	3,526 (73%)	3,236 (67%)	3,385 (70%)	3,136 (65%)

Areas adjacent to the boundary of the BWCAW share the same ecological composition whether in the wilderness or outside of it, thus the value of these vegetation management opportunities to the ecology of either side is shared. The goal of the actions is to restore desired long-lived species that were more prevalent in the past.

The seed source of desired tree species is prevalent throughout the area. However, planting desired species within a quarter mile of the wilderness boundary will help provide a greater amount of future seed trees in a shorter amount of time than if left alone. Among the desired species, this would benefit the jack pine forests that continue to succeed within the wilderness area for lack of disturbances conducive for successful jack pine regeneration (mainly through high intensity wild land fires).

3.9.6.5 Cumulative Effects on All Landscape Ecosystems

3.9.6.5.1 Cumulative Effects

The project file contains a list of past timber sales that are still influencing the project area, primarily in regards to age class distribution and species composition. These earlier harvests are taken into account under the existing condition and therefore, no further analysis on these past actions is necessary.

A total of 484 acres of federal lands are under contract to be harvested within the next three years (all from the Tomahawk Environmental Analysis, signed Sept. 17, 2004); 338 acres will be converted to the jack pine forest type; the rest will be naturally regenerated to existing forest types.

The existing condition on federal lands show there are approximately 1,295 acres of zero to nine year old stands in the project area.

The existing condition of the zero to nine year old age class on non federal lands include 1,896 acres of Minnesota Department of Natural Resources (MNDNR) land, 633 acres of Lake County and 950 acres of "Other" ownerships. "Other" refers to privately owned and/or corporate lands.

On federal lands there are approximately 25,663 acres of fifty plus year old upland stands (mature age class) and 4,256 acres of mature lowlands in 2007. There are approximately 4,006 acres managed by MNDNR, 2,342 acres managed Lake County and 10,439 acres under "Other" ownerships within the mature age class.

The State of Minnesota is the second largest land-managing agency in the project area as well as a fellow key player in developing the Northeast Forest Landscape Report of the Minnesota Forest Resource Council (which is consistent with the Forest Plan LE objectives). The state currently has harvest plans scheduled for 2007 and 2008 within the project area. Most of these plans take place within the "Triangle Area" (a.k.a. "Crocket Lake Area" to the MNDNR). They propose to manage the vegetation on 1,218 acres through mostly regeneration harvest methods (e.g., clear cut). As of 2007, 872 acres of these acres are planned, and 346 acres are already sold (under contract).

Note: the DNR timber plans may be offered for sale between July 1, 2007, and June 30, 2008. Timber sold may be harvested immediately, or up to five years after the date of sale.

The other known potential harvests within the Glacier Project boundary would occur on county land. Lake County identified 334 acres for regenerative harvests.

No plans have been provided from "other" ownerships (including Northwest Paper Company lands) within the project area. The assumption here is that no regeneration harvest plans will be developed between 2007 and 2017 on these lands. This is an acceptable assumption because private land is approximately 18 percent of the land ownership and while some land owners may harvest timber and conduct other vegetation activities, most landowners include resorts, summer and permanent residences who are generally less likely to create young forest or conduct other activities that would result in measurable changes in age class or species composition in the project area.

Out of the 82,000 acres (lakes not included) total land area of Glacier, the young age class is approximately five percent and total area within the mature age classes is approximately fifty-nine percent.

The proposed regeneration harvests on federal land vary between alternatives. Alternative 2 proposes 5,533 acres, Alternative 3 proposes 4,001 acres, and Alternative 4 proposes 6,742 acres.

The total proposed and the known maximum regeneration harvests that would create young forest on other ownerships totals 1,552 acres which would result in approximate 7,569 acres under Alternative 2, 6,037 acres under Alternative 3, and 8,778 acres under Alternative 4.

The maximum potential impact would be if all the harvests were completed in the same season or year. The immediate result would be an increase of the young age class of the project area from an existing five percent to fifteen percent under Alternative 2 and to thirteen percent under Alternative 3. There would be a decrease of the mature age class of the project area from an existing fifty-nine percent to forty-nine percent under Alternatives 2 and 4, and approximately fifty-one percent under Alternative 3. However, it is very unlikely that all the harvests would occur in the same season or year.

It is unknown how much planting was done in the past or is planned in the future on other ownerships for converting forest types or diversifying harvested areas. However, there have been plantings of long-lived tree species across the area on all ownerships.

In general most of the harvested areas on other ownerships are usually allowed to regenerate naturally to forests types similar to pre-harvest conditions.

Due to the amount of known harvests planned, none of the harvests to occur on non-federal lands in conjunction to proposed harvests under the action alternatives would lead to any adverse cumulative affects on the overall desired ecosystem conditions of the Glacier Project Area.

The age classes are always changing and any young forest created through this project would remain in the young age class for ten years and would then grow out of that age class. After a decade the young age class will go back down to less than 2%. However, by 2020, plus or minus a few years, the young age class goes back down to 0 percent. Therefore, the cumulative impacts to the young age class is minimal and short term in nature across all ownerships of the Glacier Project Area.

Vegetation Along the BWCAW Boundary

The cumulative effects along the quarter mile of the wilderness boundary considers all proposed treatments on both federal and non-federal lands within the Glacier Project Area. Including are the Tomahawk units under contract and the proposed treatments along the wilderness boundary on Lake County land (26 acres of aspen forest). No other known harvests have been disclosed on non federal ownership along this area.

Table 3.9-12 shows the affects to the age class groups analyzed after a decade (year 2017). The assumption here is that all the existing young and proposed harvests would have moved into the next age class by 2017. Immediate affects are assumed to be the first year after harvest. The greatest affect is under Alternative 4. There is no change under Alternative 3. Following harvests, the young age class goes from an existing nine percent to 20% in Alternative 2 and 22% in Alternative 4. After 10 years the young age class goes back down to 7%. However, by 2020, plus or minus a few years, the young age class goes back down to 0 percent.

Table 3.9-11. All Ownerships Vegetation Community Types within ¼ Mile of the BWCAW Boundary that Coincides with the Glacier Area Boundary	
Vegetation Community Types	Existing Condition
Total Forested Area	6,794
Total Upland Forest	6,307
Total Lowland Forest	487
Total Lowland Brush	170
Total Open Area	451
Total Acres	7,415

Table 3.9-12. All Ownerships Young and Mature Acres within ¼ Mile of the BWCAW Boundary that Coincides with the Glacier Area Boundary (by Alternative in Year 2017 (1st Decade)					
Age Class	Existing Condition	Alt 1	Alt 2	Alt 3	Alt 4
Young (0-9yrs)	702 (9% of total area)	510 (7%)	510 (7%)	510 (7%)	510 (7%)
Mature (50 yrs +)	5,250 (71% of total area)	5,469 (74%)	5,153 (69%)	5,469 (74%)	5,053 (68%)

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