

## Chapter 4. Cover Type Management Recommendations

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### 4.1 Introduction

The purpose of this chapter is to provide data and management information by cover type. These management recommendations will also provide direction to field staff for on-the-ground management activities for stands in the various cover types.

Tables in Chapter 3 of this plan show the treatment level (acres), recommended conversion acreages, old forest percent, effective Extended Rotation Forest (ERF) percentage, and average treatment ages. Some information from the general direction statements (GDS) and strategies is incorporated into this chapter, but staff should be familiar with the full contents of the GDSs and strategies found in Chapter 3.

Information provided by cover type<sup>60</sup> includes:

- Current Condition
- Future Direction
- Harvest Methods and Regeneration
- Cover Type Conversion Management (as applicable)
- Stand Selection Criteria
- Stand Treatment Summary

Acreage figures in this chapter include state forest lands administered by the Divisions of Forestry and Fish and Wildlife (Section of Wildlife) that are available for forest management activities. State lands in state parks, designated old-growth stands, and Scientific and Natural Areas (SNAs) are not included as managed acres in this plan.

<sup>60</sup> Several cover type species in the AP Subsection have very limited acres (i.e. <1000 acres /cover type). These cover types were not included in the stand selection modeling due to their limited acreages. Cover type management recommendations for these cover types are described in section 4.7 of this chapter.

In addition to the cover type recommendations and other information in this plan, following is a list of some other publications that field personnel should refer to when managing state forest lands:

- Minnesota Forest Resources Council (MFRC) *Voluntary Site Level Forest Management Guidelines*  
[http://www.frc.state.mn.us/documents/council/site-level/MFRC\\_FMG&Biomass\\_2007-12-17.pdf](http://www.frc.state.mn.us/documents/council/site-level/MFRC_FMG&Biomass_2007-12-17.pdf)
- *Field Guide to Native Plant Communities of Minnesota: The Prairie Parkland and Tallgrass Aspen Parklands Province*. MN DNR. 2005.
- ECS silvicultural interpretations. MN DNR:  
[http://www.dnr.state.mn.us/forestry/ecs\\_silv/interpretations.html](http://www.dnr.state.mn.us/forestry/ecs_silv/interpretations.html)
- Aspen Parklands SFRMP *Preliminary Issues and Assessment*. MN DNR. 2009:  
[http://files.dnr.state.mn.us/forestry/subsection/aspenparklands/prelim\\_issues\\_assess.pdf](http://files.dnr.state.mn.us/forestry/subsection/aspenparklands/prelim_issues_assess.pdf)
- *Forest Development Manual*. MN DNR. 1994.
- *Forestry-Wildlife Habitat Management Guidelines*. MN DNR. 1985.
- Manager's Handbooks for Cover Types. North Central Forest Experiment Station. General Technical Reports. Various dates for the individual publications for cover types common in the north central states.
- *DNR Divisions of Forestry, Fish & Wildlife, Ecological Resources Interdisciplinary Forest Management Coordination Framework*  
[http://files-intranet.dnr.state.mn.us/user\\_files/2535/forestcoodinationframework12\\_14\\_07.pdf](http://files-intranet.dnr.state.mn.us/user_files/2535/forestcoodinationframework12_14_07.pdf)

Cover type determination is based on the stand composition at the time the stand was inventoried. The composition of a stand typically changes to some degree over time, sometimes resulting in a cover type change if the change is significant. *Appendix B: Common Tree Species and Cover Types in the Aspen Parklands Subsection* lists the tree species and cover types found in the Subsection. Stand composition may range from a single species to several species. In general, a species or species group needs to comprise 40 percent of the stand composition for the cover types to have its name. For more details, see *Appendix C: Key for Main Cover Type Determination*. Table 4.1a on page 4.4 of this chapter, shows the main cover types by acreage and age class.

A desired future forest composition (DFFC) goal is to decrease the cover type acreage of some cover types (aspen, balm of Gilead, red pine and ash/lowlands hardwoods). These cover type decreases will result in conversions through artificial (e.g., harvesting and planting), natural (e.g., fire), and intermediate (e.g., thinning) treatment methods to cover types such as lowland and upland brush, oak, and lowland and upland grass. Stands may not be fully converted to the desired cover type for many years because of a gradual increase in the desired species over time. On some aspen and balm of Gilead stands where cover type conversion is desired, partial harvest, less intensive site preparation techniques, and/or successive prescribed fires, may be appropriate for the conversion to lowland and upland brush, oak, and lowland and upland grass.

Minnesota DNR has moved over time toward the use of Native Plant Communities (NPCs) and associated ECS silvicultural interpretations as tools to help determine the most appropriate management for forest stands. Specific cover type management recommendations in this chapter will refer to this tool.

For most even-aged managed cover types, recommendations assume that balancing the distribution of the 10-year age classes is a long-term goal, even though it may take more than one rotation to achieve for most cover types. In some cover types (e.g., black spruce lowland) this will be very difficult to achieve due to the limited acreage for these cover types that exist in the AP Subsection.

Treatment acreages determined in this plan comprise a stand examination list or pool that will be field visited over the 10-year planning period. This SFRMP used the Remsoft Spatial Planning System (RSPS, Fredericton, NB, Canada), a forest estate and harvest schedule model based on linear programming, to generate a draft stand examination list. More detailed information about Remsoft and the model used here can be found in *Appendix I: Stand Selection Process Using Remsoft Woodstock-Stanley Harvest Scheduling Model*.

Stands on the list will be field visited based on the annual treatment acres recommended for each of the cover types. Forestry areas have direction to minimize acreage deviation from year to year; the 10-year average should equal the annual treatment acres. Management recommendations, preliminary objectives, and other issues that were assigned to a stand during the SFRMP process should be considered in the management of a stand. This information will be provided to appraisers after each annual harvest plan is assigned from the 10-year plan. Stands that are suitable for harvest will be appraised for a timber sale. As each new 10-year plan is developed, the treatment levels by decade and modeling will be re-evaluated.

For stands found not suitable for final harvest or intermediate treatment, inventory data will be updated (i.e., altered).

**Table 4.1a. Aspen Parklands Subsection commercial forest cover types by acres and age- class.<sup>61</sup>**

Cover type	Age classes and acres in each age class												
	1-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	100-110	110-120	120+
Ash lowland hardwoods	3	93	472	112	171	388	780	334	452	21	40	95	0
A/BG “T” and “O” stands	7662	4893	2447	3760	3380	3652	2196	870	294	60	95	0	0
A/BG “S” stands	2866	1825	2827	4646	2592	1361	309	140	0	0	0	0	11
A/BG “R” stands	3512	2986	6509	7988	1649	926	625	332	46	21	0	0	0
A/BG “C” stands	2068	1805	3887	5716	1080	691	200	21	10	0	0	0	0
Black spruce, lowland SI=40+	0	65	0	21	10	440	0	0	0	0	0	0	0
Black spruce, lowland SI<40	24	0	9	0	81	54	374	87	132	19	0	140	240
Tamarack SI=40+	98	11	81	241	584	205	133	125	427	0	76	0	16
Tamarack SI<40	26	73	94	147	6	160	182	24	164	72	0	569	240

<sup>61</sup> Acreage totals have been rounded to the nearest whole number

A summary of the planned treatment acres for the Aspen parklands Subsection is found in Tables 3.5f-h in Chapter 3. Those tables are duplicated here as Tables 4.1b-d for convenience in reading the cover type management guidelines.

**Table 4.1b. Treatment levels for even-aged managed cover types by decade for AP SFRMP.**

Cover Type(s) / Group	Total Acres	FY 2012-2021	FY 2022-2031	FY 2032-2041	FY 2042-2051	FY 2052-2061
A/BG "T" stands	30,925	6,264	6,153	6,153	6,153	6,202
A/BG "O" stands	715	366	111	161	77	0
A/BG "S" stands	20,675	5,939	3,684	3,684	3,684	3,684
A/BG "R" & "C" stands	80,783	23,484	20,403	12,298	12,298	12,300
Tamarack SI $\geq$ 40	1,649	172	237	237	729	274
Tamarack SI < 40	1,253	74	268	294	271	346
Black Spruce, Lowland SI < 40	834	40	103	152	213	326
Black Spruce, Lowland SI $\geq$ 40	374	0	50	30	244	50
<b>Total</b>	<b>137,208</b>	<b>36,339</b>	<b>31,009</b>	<b>23,009</b>	<b>23,669</b>	<b>23,182</b>

**Table 4.1c. Treatment levels for uneven-aged managed cover types for AP SFRMP.**

Cover Type	Previous Decade <sup>62</sup> Volume Harvested	2012-2021 (1 <sup>st</sup> decade of plan implementation) Treatment Acres
Ash/Lowland Hardwoods <sup>63</sup>	250 cords (~25 acres)	2,062
Northern Hardwoods	50 cords (~5 acres)	0
White Pine	0	0

**Table 4.1d. Thinning treatment levels for AP SFRMP.**

Cover Type	Previous Decade <sup>61</sup> Volume Harvested	2012-2021 (1 <sup>st</sup> decade of plan implementation) Treatment Acres
Red Pine	500 cords (~50 acres)	3
Oak	50 cords (~5 acres)	108
White Pine	0 cords (~0 acres)	4

<sup>62</sup> Previous harvest levels are an approximation from DNR Forestry administrative area annual stand examination lists from FY2001 to FY2008, based on legal descriptions roughly corresponding to subsection boundaries.

<sup>63</sup> All ash stands will be site-visited during the first decade of the planning period.

## 4.2 Aspen/balm of Gilead/offsite aspen (A/BG)

### 4.2A Current condition

- a. Cover type acres:** In 2010, the A/BG cover types comprise approximately 89 percent (85,948 acres) of state managed forest lands in the Subsection. The A/BG cover types are combined for the SFRMP because these two species are commonly associated with each other and are managed under the same management prescriptions.
- b. Age-class distribution:** The current age-class distribution for A/BG stands are not balanced and do not reflect the desired age-class structure for even-aged managed cover types.
- c. Stand composition:** Mature aspen stands are typically comprised of a mixture of species, with aspen being the major component as measured by volume. These stands generally have few other secondary tree species including ash and bur oak. Shrub species including red osier dogwood, willow, and alder are common in the understory.
- d. Native plant communities:** To learn more about NPCs in which aspen is typically found in the Subsection, refer to the *NPC Field Guide*.

### 4.2B Future direction

- a. Cover type acres:** A composition goal for the next 50 years is to convert approximately 19 percent (16,227 acres) of the A/BG cover type across the Subsection to other cover types (lowland and upland brush, lowland and upland grass, and oak). In the first 10 years, the conversion goal for A/BG is approximately 9.5% (8,128 acres).

The quality of A/BG stands in the Subsection varies widely due to site and ecological conditions. The A/BG cover type was divided into five categories to help improve management of open landscape habitat, native plant communities, and forest health in accordance with the natural ecological transition of aspen species from the forests in the east to the prairies in the west. Historically, the prevalence and quality of the A/BG cover type decreased from east to west within the Subsection due primarily to frequent fires and drier climatic conditions.

The A/BG stands were divided up into the following five categories: “T”; “O”; “S”; “R”; and, “C”. Designations for specific A/BG stands were based primarily on area staff input, and adjusted by existing soil series data in combination with soil types expected to be associated with Native Plant Community classes. Area staff will use NPC data obtained from each site prior to establishing final management options for the individual stands.

These categories are defined as:

#### **T – Timber**

Stands that will be managed as a forested cover type and held to at least normal rotation (45 years). These stands generally have a higher site index, are usually associated with forested NPC classes, and are within areas desired to be managed for forest plant and wildlife species. Extended Rotation Forest (ERF) goals were derived from T stands.

**O – Conversion to other forested cover type**

Stands that will be converted to another forested cover type to better represent the ecological characteristics of the site (i.e. aspen to oak).

**S – Short rotation**

Stands that will be managed as a forested cover type, but harvested prior to normal rotation age (20 to 44 years). These stands generally have a lower site index, may or may not be associated with forested NPC classes, and are within areas desired to be managed for early successional forest plant and wildlife species. It should be noted that for this 10-year planning cycle, stands that would not meet age of merchantability (35 years) were not selected for examination.

**R – Regeneration**

Stands that will be managed as a short rotation cover type (less than 20 years). These stands generally have very low site indexes, are usually not associated with forested NPC classes, and are within areas desired to be managed for open landscape plant and wildlife species.

**C – Conversion to non-forested cover type**

Stands that will be converted or restored to a non-forested cover type (i.e., upland/lowland grass, upland/lowland brush). These stands have often invaded prairie or oak savannah habitats and the management goal is to greatly reduce or eliminate aspen/balm of Gilead from the site.

**Table 4.2a. Recommended A/BG cover type acres by aspen category by selected year.**

<b>Aspen Category</b>	<b>2010</b>	<b>2020</b>	<b>2060</b>
“T” Stands	28,560	28,560	28,560
“O” Stands	749	349	0
“S” Stands	16,576	16,576	16,576
“R” Stands	24,595	24,595	24,595
“C” Stands	15,478	7,750	0

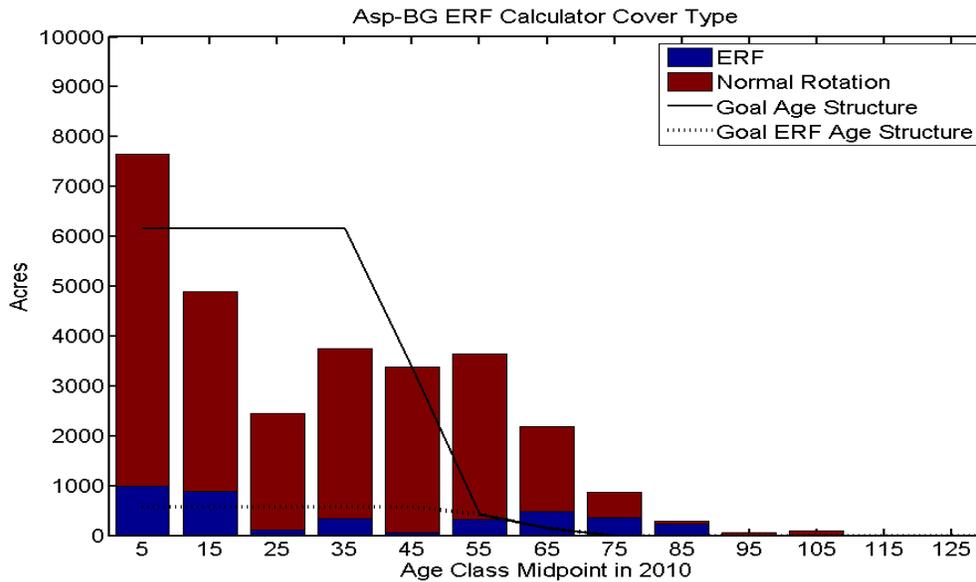
**4.2B.1 Future direction of A/BG “T” and “O” stands**

**a. Cover type acres:** In 2010, the A/BG “T and O” cover type comprises 30 percent (29,309 acres) of state timberland in the Subsection. A composition goal for the next 50 years is to convert approximately 2.4% (749 acres) of the A/BG “T and O” cover type across the Subsection to the oak cover type. In the first 10 years, the reduction goal for A/BG “T and O” type is 1.4% (400 acres).

**b. Age-class distribution:** Improve the balance among age classes. The Extended Rotation Forest (ERF) goal for the “T” cover type is to have 3 percent of the acres over Normal Rotation Age (NRA), with a declining age-class distribution from the NRA (45 years) out to the Maximum Rotation Age (MRA) (65 years). Figure 4.2a illustrates the tapering off of the age-class distribution after NRA.

In the Subsection, 30.7 percent (9,001 acres) of the A/BG “T and O” cover type is over the recommended normal rotation age of 45 years (Old Forest). In the future, it is desired to maintain 3% of the “T and O” cover type as effective ERF.

**Figure 4.2a. Current and desired age-class distribution for A/BG “T and O” stands.**



**c. Stand composition:** The desired future within-stand composition will range from pure aspen stands to a more diverse stand structure and/or mixed forest that includes other hardwoods such as oak, ash and birch, and conifers such as white spruce, balsam fir, white cedar and tamarack. As a guiding principle the future composition will maintain the range of species in the appropriate amounts that would normally be present in the associated NPC at a stand’s current age as described by the Department’s ECS system.

**4.2C.1 Harvest methods and regeneration for A/BG “T and O” stands**

**Even-aged management direction:** The A/BG “T and O” cover type will be managed on an even-aged basis for pulpwood and bolts. The goal is to move towards a balanced age-class structure while maintaining or improving site productivity, forest wildlife habitat, and biodiversity.

**b. Final harvest:** A/BG stands to be maintained in the cover type will be managed using clearcut or clearcut with reserves as the final harvest method. Use natural stand boundaries or natural features such as topography or soil type to delineate timber sale boundaries. Use harvest regulations and methods that favor maintaining or increasing within-stand diversity while retaining aspen or balm of Gilead as the main cover type. One of the strategies to accomplish this would be to reserve or partially reserve from harvest patches or individuals of non-aspen species. These reserve trees will maintain the within-stand species diversity as well as add structural diversity for the newly regenerating stand. Reserve trees may also function as a seed source that could aid in increasing the abundance of these other species in the new stand.

Harvest some larger blocks (100+ acres), where appropriate, using consolidated or natural stand boundaries. Small harvest blocks (less than 40 acres) will continue to be used. Using a range of harvest sizes will provide for various wildlife habitat needs.

**c. Even-aged management prescriptions:** The following are the most common prescriptions that will be used on A/BG timber sales:

- Clearcut-Sprouting
- Clearcut with Reserves – Sprouting

Additional coding of objectives in the DNR’s Forest Information System (FORIST) will be used to track accomplishments towards increasing within-stand diversity and mixed forest conditions. See *Appendix G: SFRMP Additional Field Names and Codes* for detailed information about the coding of management objectives in the Silviculture and Roads Module (SRM) of FORIST.

**d. Regeneration methods after final harvest:** Aspen and balsam of Gilead stands regenerate naturally through root sprouting (suckering) and seeding. The recommended minimum stocking of aspen regeneration two years after harvest is 4,000+ stems per acre scattered throughout the stand.<sup>64</sup> For some wildlife species, higher stem densities are desired. Usually, most clearcut stands regenerate at greater than 10,000 stems per acre. If stocking is below the desired level, consider conversion to another cover type or increase stocking by planting or seeding other species.

#### 4.2D.1 Cover type conversion management for A/BG “T and O” stands

**a. Conversion Goals:** Natural resource managers recognize that conversion goals can take more than a rotation age to accomplish. Over the next 50 years, it is recommended that approximately 750 acres of the A/BG “T and O” cover type be converted to the oak cover type (see Table 4.2a to see conversion goals by decade). The 10-year conversion goal out of A/BG “T and O” and into the oak cover type is 400 acres. The decision of whether or not to convert a stand to another cover type will be determined when the stand is field visited. The outcome of a NPC-ECS field evaluation will determine the appropriate species conversions.

Conversion of aspen to the oak cover type will be accomplished using a range of management options, including:

**On sites where it is determined that conversion to oak is the goal:**

1. Allowing natural succession to occur on sites where the within-stand composition contains a high percentage of oak;
2. Using aspen harvest to release existing oak where it is a dominant or co-dominant canopy tree; and,
3. Using partial harvest of aspen to release existing understory oaks Using post-harvest treatments such as herbicide application, mechanical site preparation, or prescribed burning followed by hand planting or artificial seeding, to establish oaks on the site.

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<sup>64</sup> Manager’s handbook for aspen in the North Central States. Gen. Tech. Rep. NC-36. St. Paul, MN. USDA, Forest Service, North Central Forest Experiment Station.

#### 4.2E.1 Stand selection criteria for A/BG “T and O” stands

**a. Normal rotation forest:** The Aspen Parklands SFRMP does not identify high-risk, low volume stands for treatment. The Remsoft model selected A/BG "T and O" stands above merchantable age for treatment based on the multiple objectives of balancing age classes, maximizing volume and creating an even flow of volume. For a more detailed description of harvest-level calculations, see GDS 5A in Chapter 3.

**b. Extended rotation forest:** The long-term goals for retention of acres over NRA in these cover types, while providing a declining age-class structure out to the MRA are listed in table 3.1a-b, (Chapter 3). The harvest level will be based on various harvest ages beyond the NRA out to MRA.

**c. Thinning:** Aspen and balm of Gilead stands were not considered as candidates for thinning, except where a thinning prescription was part of a strategy to accomplish conversion goals.

#### 4.2F.1 Stand treatment summary for A/BG “T and O” stands

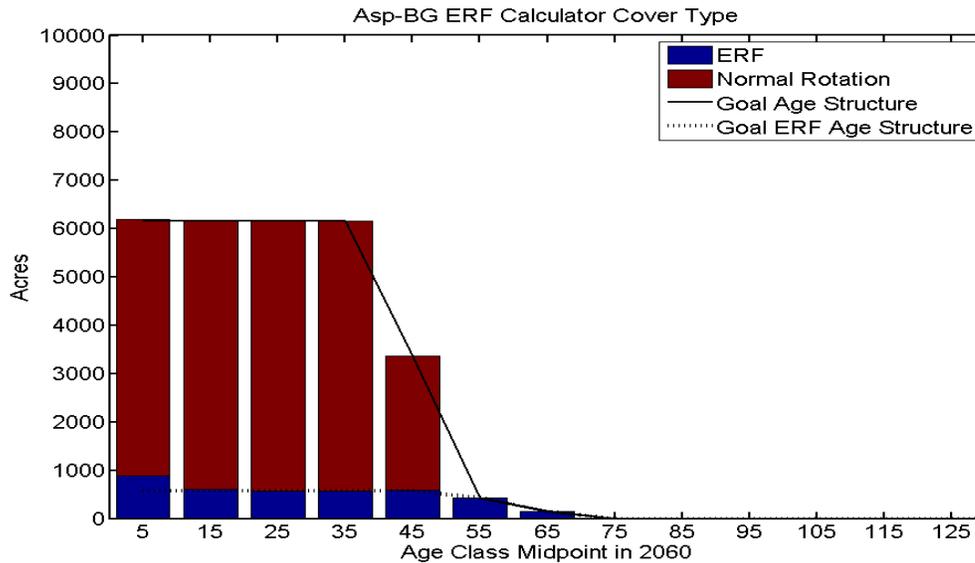
Table 4.2b shows the modeled treatment levels (acres) for the next five decades.

**Table 4.2b. A/BG “T” and “O” treatment level (acres) per decade.**

Cover type	Decade				
	1	2	3	4	5
A/BG “T” stands	6,264	6,153	6,153	6,153	6,202
A/BG “O” stands	366	111	161	77	0

Based on the modeling of these treatment levels, by the end of the fifth decade, the cover type should be approaching the projected age-class distribution as shown in Figure 4.2b.

**Figure 4.2b. Projected age-class distribution for A/BG “T” & “O” stands in 2060.**



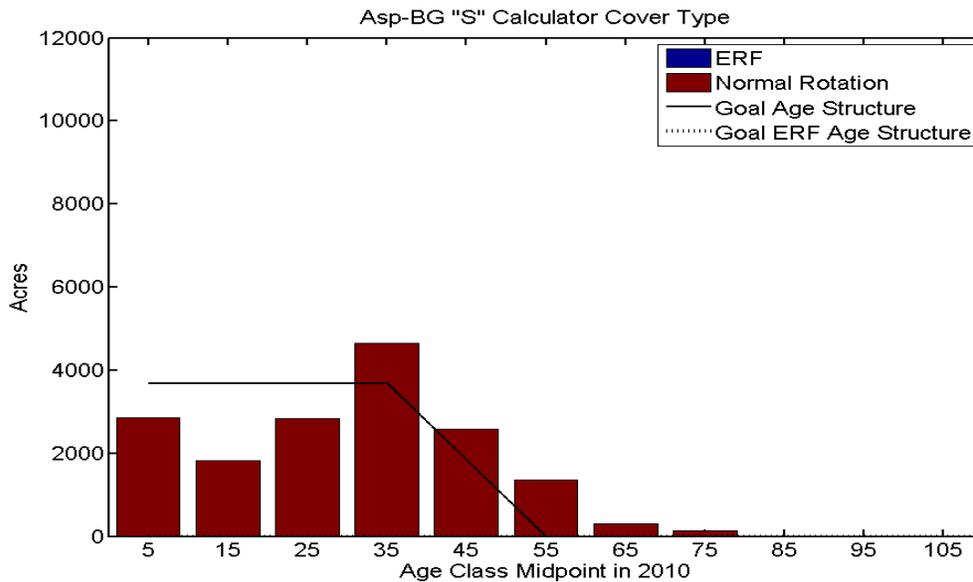
**4.2B.2 Future direction of A/BG “S” stands**

**a. Cover type acres:** In 2010, the Short Rotation “S” A/BG cover type comprises 17 percent (16,576 acres) of state managed acres in the Subsection. A composition goal for the next 50 years is to maintain the 16,576 acres of the A/BG “S” cover type across the Subsection.

In the Subsection, 18.7 percent (3,098 acres) of the A/BG “S” cover type is over the recommended normal/maximum rotation age of 45 years. The goal is to have 100 percent of the managed acres between age 0 and the normal/maximum rotation age. ERF/old forest percentage guidelines do not apply to the “S” cover type.

**b. Age-class distribution:** Improve the balance among age classes. The goal for this cover type is to have 0 percent of the acres over the normal/maximum rotation age. This cover type does not have a declining age-class distribution goal beyond the normal/maximum age (45 years). Figure 4.2c shows the current age-class distribution for the A/BG “S” stands.

**Figure 4.2c. Current and desired age-class distribution for A/BG “S” stands.**



**c. Stand composition:** The desired future within-stand composition will range from pure aspen stands to a slightly more diverse stand structure that includes other hardwoods such as balm of Gilead, oak, ash and elm (see GDS 1B and 3A). As a guiding principle the future composition will maintain the range of species in the appropriate amounts that would normally be present in the associated NPC at a stand’s current age as described by the Department’s ECS system.

**4.2C.2 Harvest methods and regeneration for A/BG “S” stands**

**a. Even-aged management direction:** The A/BG “S” cover type will be managed on an even-aged basis for pulpwood and biomass. The goal is to move towards a balanced age-class structure while maintaining or improving forest wildlife habitat, biodiversity and site productivity.

**b. Final harvest:** A/BG stands to be maintained in the cover type will be managed using clearcut or clearcut with reserves as the final harvest method. Use natural stand boundaries, burn unit boundaries or natural features such as topography or soil type to delineate timber sale boundaries. Use harvest regulations and methods that favor maintaining or increasing wildlife habitat and maintaining or increasing stand diversity while retaining aspen or balm of Gilead as the main cover type. One of the strategies to accomplish this would be to reserve from harvest most existing individuals of other hardwood species. These reserve trees will maintain the within-stand species diversity as well as add structural diversity for the newly regenerating stand. Reserve trees may also function as a seed source that could aid in increasing the abundance of these hardwood species in the new stand.

Harvest some larger blocks (100+ acres), where appropriate, using consolidated or natural stand boundaries. Small harvest blocks (less than 40 acres) may continue to be used where appropriate. Using a range of harvest sizes will provide for various wildlife habitat needs.

Many stands in the “S” cover type are within prescribed burn units. Although it is not the specific intent to use prescribed fire as a silvicultural treatment in “S” stands, it is not practical or feasible to modify burn unit boundaries to remove “S” stands from the effects of fire. Where “S” stands do occur within prescribed unit boundaries, coordination between the Division of Forestry and Section of Wildlife is important to ensure that prescribed burning does not conflict with planned harvests as well as the “S” cover type management goals. One way this potential conflict can be addressed is by considering any planned prescribed burning when annually selecting stands for exam, as well as considering planned timber harvests when planning prescribed burning. The timing of prescribed burning as well as the ignition pattern and fire intensity can also be modified so as to minimize negative impacts on “S” stands.

Likewise, harvests of “S” stands within prescribed burn units should be appraised and planned so as to minimize conflicts with prescribed burning efforts. This includes appropriate slash treatment, the length of timber permits, notification to prospective timber purchasers about wood quality as it relates to previous burns, and disclaimers regarding any planned prescribed burns.

**c. Even-aged management prescriptions:** The following are the most common prescriptions that will be used on A/BG “S” timber sales:

- Clearcut-Sprouting
- Clearcut with Reserves – Sprouting

**d. Regeneration methods after final harvest:** Aspen and balsam of Gilead stands regenerate naturally through root sprouting (suckering) and seeding. The recommended minimum stocking of aspen regeneration two years after harvest is 4,000+ stems per acre scattered throughout the stand.<sup>65</sup> For some wildlife species, higher stem densities are desired. Usually, most clearcut stands regenerate at greater than 10,000 stems per acre. If stocking is below the desired level, consider conversion to another A/BG management type or open-land type as appropriate for the native plant community.

#### 4.2D.2 Cover type conversion management for A/BG “S” stands

**a. Conversion goals:** Over the next 50 years, there is no planned increase or decrease in the 16,576 acres of the A/BG “S” cover type. Depending on site conditions, it is possible that these stands could be converted to another A/BG management type, oak savannah or open-land type.

The decision of whether or not to convert a stand to another cover type will be determined when the stand is field visited.

#### 4.2E.2 Stand selection criteria for A/BG “S” stands

**a. Normal rotation forest:** A priority in this landscape over the next 10 years will be to select stands over age 35. As mentioned previously, balancing age classes and creating an even flow of volume are also a priority. For a more detailed description of harvest-level calculations, see GDS 5A in Chapter 3.

<sup>65</sup> Manager’s handbook for aspen in the North Central States. Gen. Tech. Rep. NC-36. St. Paul, MN. USDA, Forest Service, North Central Forest Experiment Station.

**b. Extended rotation forest:** It is the desire to maintain A/BG “S” stands in an early successional forested condition by using a normal and maximum rotation age of 45. There are no ERF goals for this cover type group. It is the long-term goal to treat all stands prior to the normal/maximum rotation age.

**c. Thinning:** A/BG “S” stands were not considered as candidates for thinning.

**4.2F.2 Stand treatment summary for A/BG “S” stands**

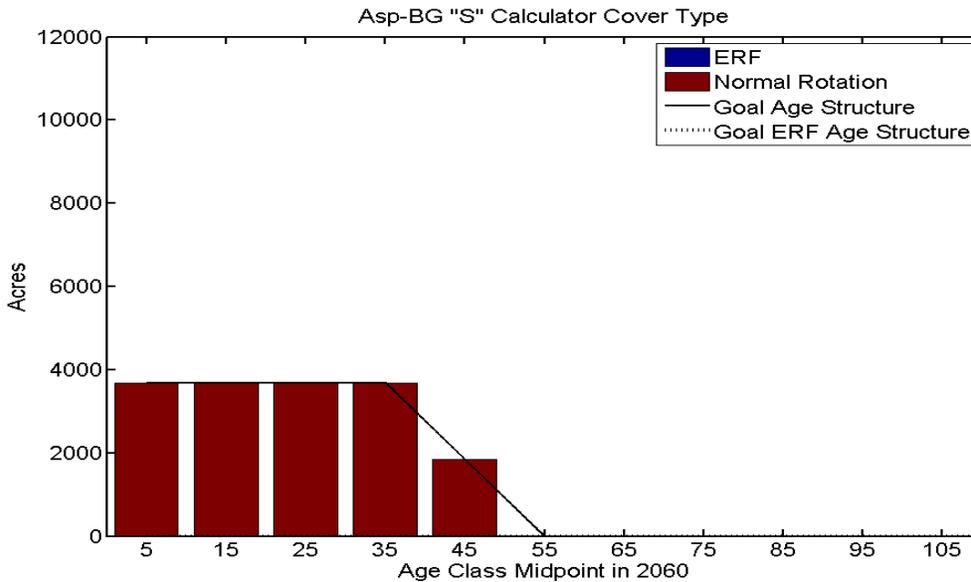
Table 4.2c shows the modeled treatment levels (acres) for the next five decades.

**Table 4.2c. A/BG “S” stands treatment summary by decade**

Cover type	Decade				
	1	2	3	4	5
A/BG “S” stands	5,939	3,684	3,684	3,684	3,684

Based on the modeling of these treatment levels, by the end of the fifth decade, the cover type should be approaching the projected age-class distribution as shown in Figure 4.2d.

**Figure 4.2d. Projected age-class distribution for the A/BG “S” stands in 2060.**

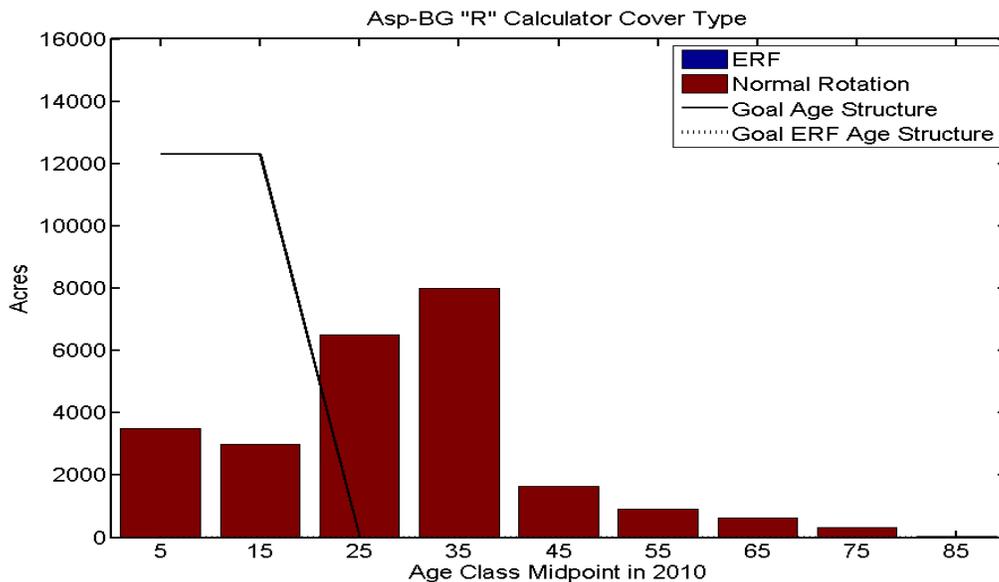


#### 4.2B.3 Future direction of A/BG “R” stands

**a. Cover type acres:** The 10- and 50-year cover type goal for the A/BG “R” stands is to maintain the existing acreage (24,595 acres).

**b. Age-class distribution:** The age-class distribution for “R” stands will be balanced across the first 20 years. This balanced age-class structure will be met after two planning cycles (20 years).

**Figure 4.2e. Current and desired age-class distribution for A/BG “R” stands.**



**c. Stand composition:** The goal is to keep these stands in a younger age-class with little emphasis on changes in species composition. These stands may shift to another cover type due to management (e.g., prescribed fire or shorter harvest rotation).

#### 4.2C.3 Harvest methods and regeneration for A/BG “R” stands

**a. Even-aged management direction:** These stands will be managed on a very short rotation (20 years or less) primarily for wildlife habitat with opportunities for woody biomass and pulpwood.

**b. Final harvest:** These stands will initially be managed using clearcuts as the final harvest method. Once regenerated, treatment methods may include biomass collection, shearing and prescribed burning. Natural stand boundaries or natural features such as topography or soil type will be used to delineate treatment boundaries.

**c. Even-aged management prescriptions:** The following are the most common prescriptions that will be used on A/BG “R” timber sales:

- Clearcut-Sprouting

- Clearcut with reserves-Sprouting

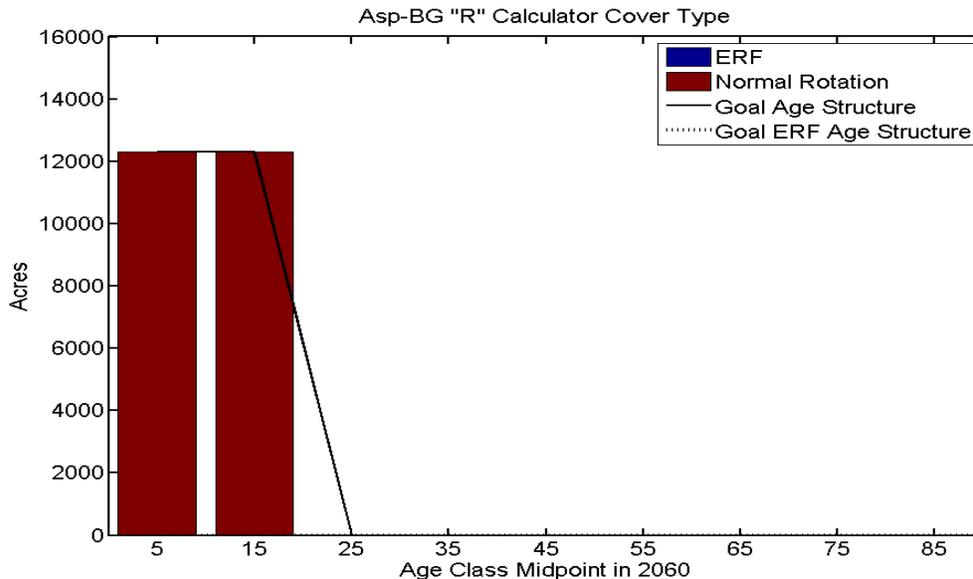
**d. Regeneration methods after final harvest:** These stands will be left to naturally regenerate after any harvest event. Little emphasis will be placed on future stocking rates for the A/BG cover type.

**Table 4.2d. A/BG “R” treatment summary by decade**

Cover type	Decade				
	1	2	3	4	5
A/BG “R” stands	15,616	12,793	12,298	12,298	12,300

Based on the modeling of these treatment levels, by the end of the third decade, the cover type should be approaching the projected age-class distribution as shown in Figure 4.2f.

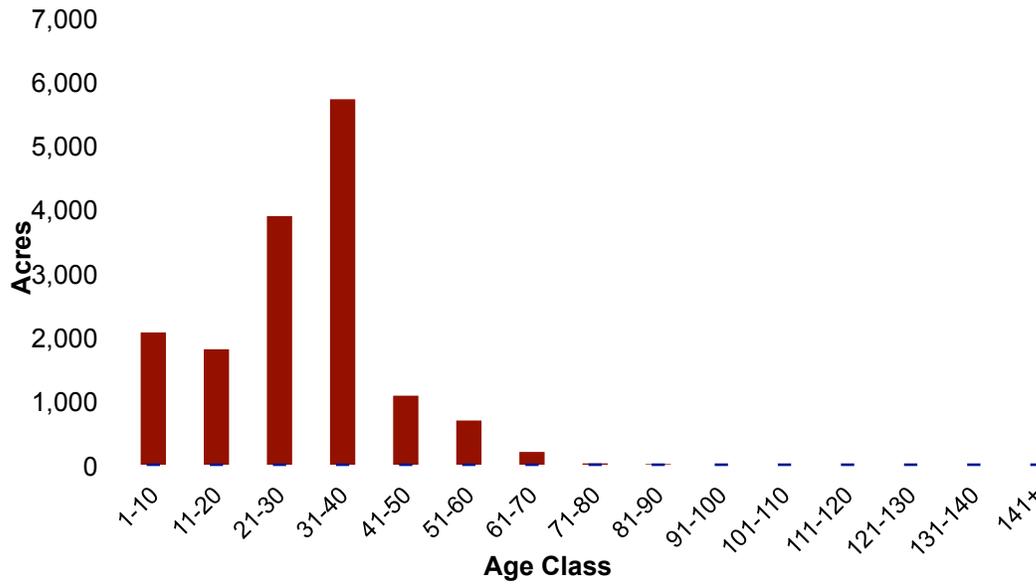
**Figure 4.2f. Projected age-class distribution for the A/BG “R” stands in 2060.**



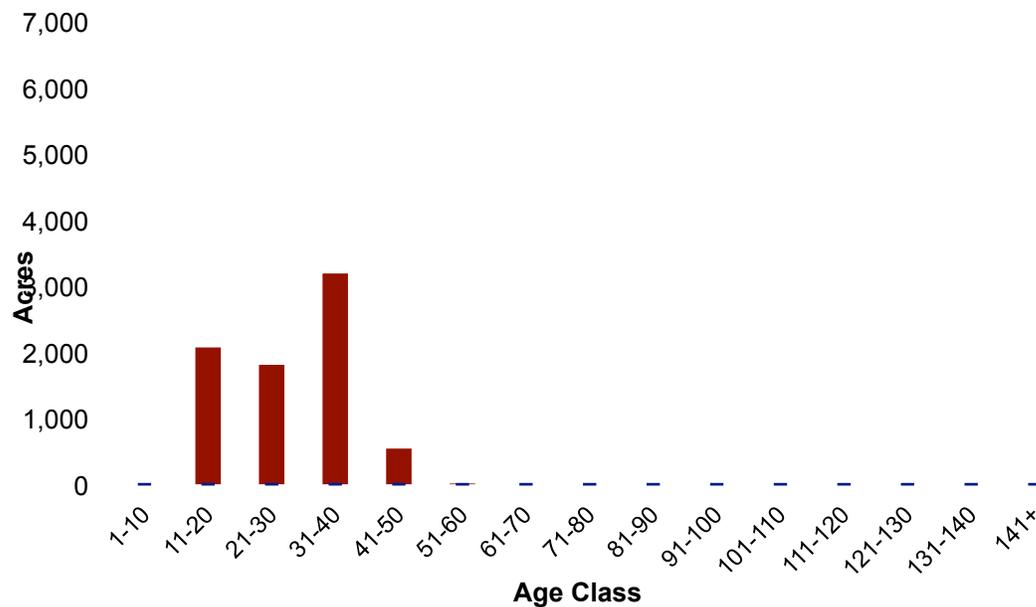
**4.2B.4 A/BG “C” stands**

**a. Cover type acres:** The “C” stands are those aspen stands that have been targeted for conversion out of aspen and into another non-forested cover type including upland brush, lowland brush, upland grass, and lowland grass. There are currently 15,478 acres in the A/BG “C” category. The 10-year goal is to convert 7,728 acres and then convert the remaining acres in the second decade.

**Figure 4.2g. Current age-class distribution for A/BG “C” stands.**



**Figure 4.2h. Age-class distribution for A/BG “C” stands in 2020\*.**



\*Note: There is no age class distribution for A/BG “C” stands past the second decade of the planning period due to the fact that all conversions are due to take place in the first two decades of implementing the plan.

**4.2C.4 Harvest methods and regeneration for A/BG “C” stands**

**a. Final harvest:** The harvest of stands during the first decade will focus on utilization of the mature wood through clearcuts as the final harvest method. Conversion of the “C” stands is expected to be completed during the second decade and may include timber harvests, prescribed fire, hydro-axing, shearing, or other management techniques. Once converted, these areas will be maintained in an open state through prescribed fire, hydro-axing, or shearing.

**4.2D.4 Cover type conversion management for A/BG “C” stands**

**a. Conversion goals:** Natural resource managers recognize that conversion goals can take more than a rotation age to accomplish. Over the next 50 years, it is recommended that approximately 15,478 acres of the A/BG cover type be converted to non-forested cover types (see Table 4.2a to see conversion goals by decade). Depending on site conditions, these stands will be converted to: oak savannah; upland or lowland brush; or upland or lowland grass.

The 10-year conversion goal out of A/BG and into a non-forested cover type is 7,728 acres. The decision of whether or not to convert a stand to another cover type will be determined when the stand is field visited. The outcome of a NPC-ECS field evaluation will determine the appropriate species conversions. Conversion of aspen to the desired cover types will be accomplished using a range of management options, including:

**On sites where it is determined that conversion to upland or lowland brush or prairie is the goal:**

1. Where aspen is of merchantable age or will be within the first two decades of the plan, utilize commercial timber harvests followed by prescribed burning on a 3-5 year return interval.
2. In locations where aspen will not be of merchantable age within the first two decades of the plan or is inoperable to commercial timber harvest operations, utilize mechanical treatment and/or prescribed burning on a 3-5 year return interval.

**On sites where it is determined that conversion to oak savannah is the goal:**

1. Where aspen is of merchantable age or will be within the first two decades of the plan, utilize commercial timber harvests reserving any oak, followed by prescribed burning on a 3-5 year return interval.
2. In locations where aspen will not be of merchantable age within the first two decades of the plan or is inoperable to commercial timber harvest operations, utilize mechanical treatment reserving any oak and prescribed burning on a 3-5 year return interval.

**Table 4.2e. A/BG “C” stands treatment summary by decade.**

Cover type	Decade				
	1	2	3	4	5
A/BG “C” stands	7,868	7,610	0	0	0

Based on the modeling of these treatment levels, by the end of the second decade, all “C” stands should be converted out of the A/BG cover type.

### 4.3 Ash/Lowland Hardwoods

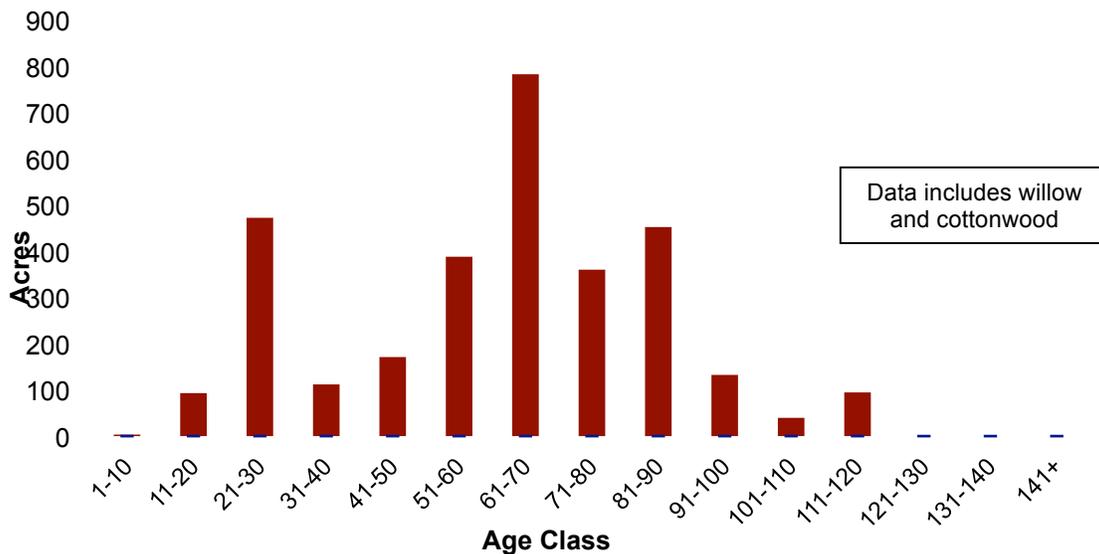
#### 4.3A Current condition

**a. Cover type acres:** In 2010, the ash and lowland hardwoods (ash/LH) cover type comprised 3.2 percent (3,101 acres) of state-managed acres in the Subsection. These cover types are combined into one management category for this SFRMP because these two cover types are commonly associated with each other and are managed under the same management prescriptions.

Due to small amounts of acres and similarity of ecological communities, both willow (140 acres) and cottonwood (153 acres) are also included in the ash/lowland hardwood cover type.

**b. Age-class distribution:** The current age-class distribution of this cover type reflects a mature forest with little acreage in the younger and very old age classes, with the exception of the 21-30 age class (see Figure 4.3a). These cover types are managed using uneven-aged treatments, thus a balanced age class is not a goal. In a regulated uneven-aged stand, each age class would occupy an equal amount of ground space per acre.

**Figure 4.3a. Current (2010) age-class distribution of ash/lowland hardwood stands.**



**c. Stand composition:** Natural, mature ash/LH stands range from pure or nearly pure black ash stands to mixed stands that include elm, boxelder, silver maple, green ash, cottonwood, basswood, balm of Gilead and aspen.

**d. Native plant communities:** Aspen Parklands NPCs, in which ash/LH are typically found, include MHw36, FFn57, FFn67, WFn55 and WFW54.

#### 4.3B Future direction

**a. Cover type acres:** A decrease of 300 acres is proposed for the ash/LH cover types over the next 50 years. The 10-year goal for the cover type is to maintain the current acreage.

**Limiting factor:** Emerald ash borer (EAB) was discovered in Minnesota in 2009; the extent to which Minnesota ash populations will be affected is yet to be determined. The Department's ash management guidelines are under development. Ash cover type acres are expected to decline as EAB infestations eventually spread across the state.

**b. Age-class distribution:** Continue to move these cover types toward an uneven-aged structure with trees representing all age classes in nearly equal spatial proportions.

**c. Stand composition:** As a guiding principle, the future composition will maintain the range of species in the appropriate amounts that would normally be present in the associated NPC at a stand's current age as described by the Department's ECS system. If emerald ash borer becomes established in this Subsection, ash may someday have diminishing occurrence in these stands. Pure or nearly pure black ash stands will become rare and will likely become non-forested communities. But mixed stands that once included black ash mixed in with balm of Gilead or other species may remain mixed lowland hardwood forest.

#### 4.3C Stand selection criteria

The ash/LH cover type will generally be managed on an uneven-aged basis and in accordance with ash management guidelines with considerations for the emerald ash borer. Whether or not a stand will be managed will be determined following the site visit. The draft Department ash management guidelines state that better sites offer more flexibility in management. While all ash stands will be assessed during this planning period, focus first on better sites, site index 55 and above. Management opportunities are more limited on stands between SI 45 and SI 55. Visit these sites only as opportunities arise to group them with better stands for treatment. Resources should not be spent on stands with SI <45. Other lowland hardwood types will be added to this site visit pool based on local Area knowledge.

#### 4.3D Stand treatment summary

The plan identifies 2,064 acres for possible treatment during this 10-year planning period. Based on additional field evaluations (e.g., re-inventory) of ash/LH stands during this planning period, additional acres may be added for treatment if the stands meet the harvest criteria.

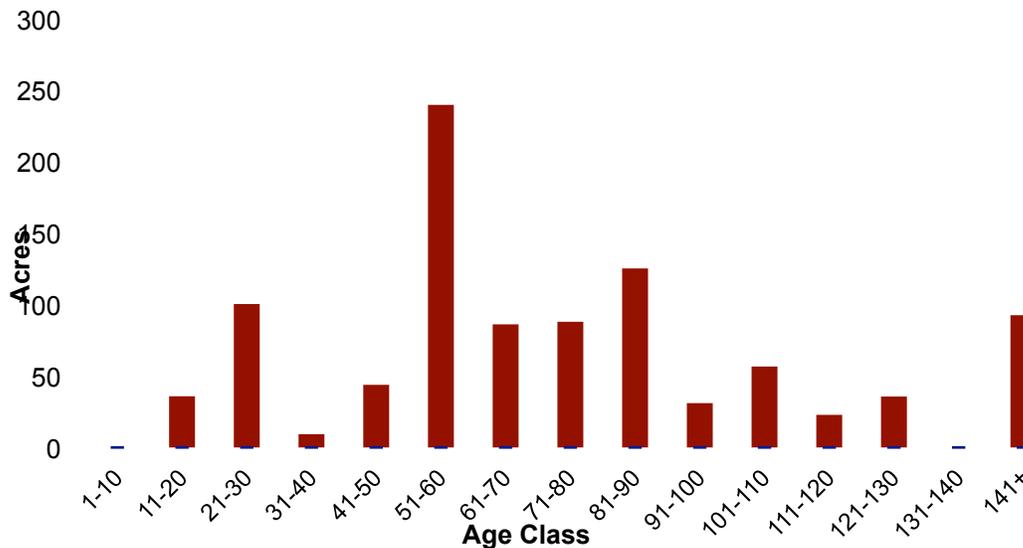
## 4.4 Oak

### 4.4A Current condition

**a. Cover type acres:** In 2010, the oak (O) cover type comprised 1.0 percent of state-managed acres in the Subsection (967 acres). Oak is commonly found as a component of other cover types such as aspen, offsite aspen, northern hardwoods, and lowland hardwoods.

**b. Age-class distribution:** The current age-class distribution of the O cover type is skewed towards middle-aged stands.

**Figure 4.4a. Current (2010) age-class distribution for the oak cover type.**



**c. Stand composition:** Natural oak stands range from nearly pure oak to mixed stands and are more likely to occur as younger woodlands, not mature forest. In the AP Subsection, bur oak is generally the only oak species present. The most common secondary species in the O cover type are: quaking aspen, balm of Gilead, American elm, green ash and basswood. Please note that oak savannah would likely be typed upland grass or brush under CSA rules.

**d. Native plant communities:** Information about Aspen Parklands NPCs in which oak stands are typically found, is located in the *NPC Field Guide* and in the ECS silvicultural interpretations. Consult these references when determining sites appropriate for oak emphasis.

### 4.4 B Future direction

**a. Cover type acres:** The long-term goal is to increase the O cover type acreage from the “O” stands in the aspen/balm of Gilead cover type group by 749 acres (+77.5%) and in native plant communities where oak species are excellent to good competitors. Field evaluation (including NPC information) will be used to confirm which “O” stands can be converted to oak or find other appropriate stands. All of the increase is planned to come from the partial harvesting of aspen and balm of Gilead stands with a significant oak component or from natural succession of these cover types. The main goal in this cover type is to provide wildlife habitat and sustain mast production over time. A secondary goal is to increase the oak component in other cover types where it is currently found or NPC information suggests it is an appropriate species to emphasize.

**b. Age-class distribution:** Currently 56 percent of the cover type is in 50 to 90-year age classes, with some acreage in the younger and older age classes. All oak stands were designated as ERF, so they will be managed on longer rotations between 80 and 170 years old. The primary goal is to create more young and middle-aged oak stands through conversion efforts and to maintain what is currently on the landscape.

**c. Stand composition:** The primary goal is to maintain or restore a stand structure, tree density, and mix of species, including prairie grasses and forbs, shrubs, and/or tree species, appropriate to the stand’s NPC.

#### 4.4C Harvest methods and regeneration

**a. Even-aged management direction:** The O cover type is shade intolerant and therefore these stands are typically managed on an even-aged basis. Group selection methods may be utilized in non-oak cover types to increase the presence of the oak component in those cover types.

**b. Final harvest:** No final harvest is planned within this 10-year management period but sites could be added based on field evaluations by the area personnel and following procedures identified in the *Coordination Framework*. The goal of a final harvest would be to increase the younger component of the cover type and then evaluate regeneration methods. Oak stands could be managed using shelterwood, seed tree, clearcut, or clearcut with reverses as the final harvest method.

**c. Intermediate treatment:** Thinning will produce best results if started before age 50. After that, the growth rate may not improve the merchantable products but could still capture products and improve wildlife habitat. When thinning has begun, re-entry can be as often as every 10 years, but should be related to the stocking tables (see *Manager’s Handbook for Oaks in the North Central States*, Appendix IV<sup>66</sup>). Attempt to retain trees from all size-classes to retain mast production and availability to wildlife over time. Retain the older forest characteristics within stands, when appropriate, by retaining a component of large old trees, coarse woody debris, and snags.

**d. Intermediate prescriptions:** The following are the most common prescriptions that will be applied:

- Shelterwood with Reserves-Interim Cut
- Selective Thinning

<sup>66</sup> [http://files.dnr.state.mn.us/forestry/ecssilviculture/ncsm/ncsm\\_oak.pdf](http://files.dnr.state.mn.us/forestry/ecssilviculture/ncsm/ncsm_oak.pdf)

**e. Regeneration methods:** The preferred method of regenerating oak stands is a shelterwood system to establish advance regeneration. Large-gap group selection methods in non-oak stands may be utilized to help increase the oak component. It is recommended that harvest methods and sale regulations protect advance regeneration and account for the site's NPC classification. Prescribed burning may be used to maintain or enhance these fire-dependent stands and also encourage natural regeneration.

Some control of understory competition may be necessary after the shelterwood harvest or prior to planting, or where there is competition from aspen sprouting.

Advance reproduction must be well-distributed and relatively tall (2-4 feet tall) in order to compete successfully with other woody vegetation in the new stand. Where advance reproduction is not well-distributed or not very tall, some success has been achieved with mowing of seedlings, which can help minimize competition and allow for more rapid growth of oak seedlings. Once advance reproduction is adequate, the overstory may be removed.

Protection of the seedlings from herbivory may be required. Various methods have been tried, such as bud caps and use of fencing (both semi-permanent barrier fencing and electric fencing).

#### 4.4D Stand selection

During this 10-year planning period, stands will be selected for treatment by area field staff based on stand management objectives.

### 4.5 Black Spruce Lowland

#### 4.5A Current condition

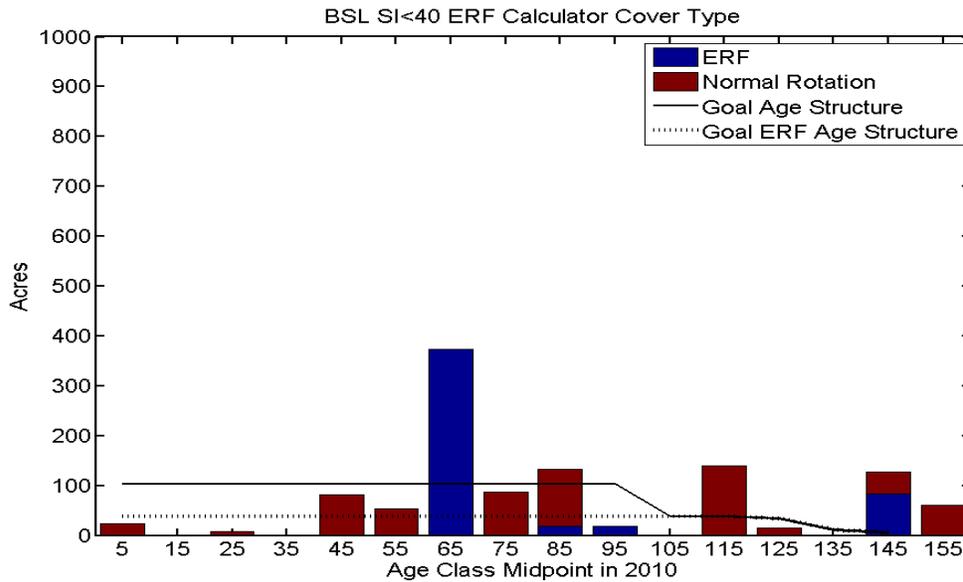
**a. Cover Type Acres:** In 2010, the lowland black spruce (BSL) cover type comprised 1.8 percent (1,697 acres) of the state-managed acres in the Subsection.

**b. Age-class distribution:** The current age-class distribution of the BSL cover type does not reflect the desired balanced age-class structure for even-aged managed cover types. Lowland black spruce has been divided into two site index groups (<40 and ≥40) for determining harvest rotation ages and allowable treatment acres. Of the BSL cover type, 1,161 acres are currently site index <40 and 536 acres are site index ≥40. The current age-class distribution predominantly represents the 50-70 age classes, with lesser amounts in each of the younger and older age classes.

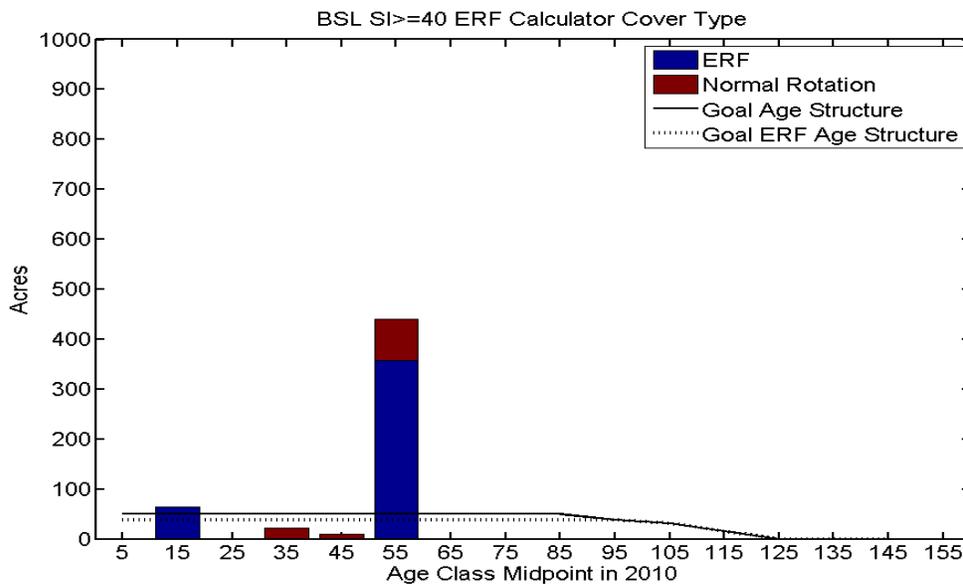
Black spruce has had markets and has been harvested for many years, but variable markets and limited amount of resource on state lands has produced an asymmetrical age-class distribution.

It is important to understand that black spruce occupies sites having a broad range of productivity. Trees on the poorer sites take many years to produce marketable products in harvestable quantities (see Figures 4.5a and 4.5b below).

**Figure 4.5a. Current and desired age-class distribution for low SI (<40) BSL cover type.**



**Figure 4.5b. Current and desired age-class distribution for high SI (≥40) BSL cover type.**



**c. Stand composition:** Natural, mature BSL stands range from pure or nearly pure stands to mixed stands. Secondary species in the BSL cover type include tamarack, balsam fir, cedar, and birch.

**d. Native plant communities:** Information about Aspen Parklands NPCs in which lowland black spruce is typically found is located in the *NPC Field Guide*, and in the ECS silvicultural interpretations. Consult these references when managing lowland black spruce.

#### 4.5B Future direction

**a. Cover type acres:** The 50-year goal is that the BSL cover type acreage will remain similar to the current level. No deliberate losses or gains of the BSL cover type are recommended, although minor changes may occur due to inventory updates.

**b. Age-class distribution:** A goal is to move the age class distribution toward a balanced structure. The older age classes will be managed with enough ERF stands to provide adequate tapering of the age-class distribution out to the maximum age. It is important to note that in the Aspen Parklands, the BSL cover type occurs in relatively few, large acreage stands, making it impossible to create a perfectly balanced age class distribution through time.

**c. Stand composition:** The future stand composition goal in the BSL cover type is to maintain the range of species in the appropriate amounts that would normally be present in the associated NPC at a stand's current age as described by the Department's ECS system.

#### 4.5C Stand management

**a. Even-aged management direction:** The BSL cover type will be managed on an even-aged basis for pulpwood while accounting for wildlife habitat and biodiversity.

**b. Final harvest:** BSL stands will be treated through even-aged management using clearcuts or clearcuts with reserves. Efforts were made during the development of the 10-year stand selection list to identify larger blocks for harvest using natural stand boundaries.

Maintain secondary component species in BSL stands such as tamarack, white cedar, balsam fir, and paper birch. This can be accomplished through reserving seed trees, islands or clumps of mature trees, advance regeneration, or harvesting to promote sprouting of deciduous species.

**Limiting factors:** The spread of eastern dwarf mistletoe to regenerating stands of black spruce is a primary silvicultural concern in the management of this cover type. The following recommendations for harvest and post sale treatment are recommended to limit its spread:

1. Black spruce reserve trees are not recommended due to the possibility of spreading dwarf mistletoe infection to the regenerating stand.
2. All clearcuts should kill all live black spruce greater than 5 feet in height.
3. If the site is to be burned prescriptively, slash should be distributed evenly across the site.
4. Design timber sales boundaries to include mistletoe pockets plus a 2-chain (132 feet) buffer of non-infected black spruce.

**c. Harvest prescriptions:**

The following are the most common prescriptions that will be used on black spruce timber sale

acres:

- Clearcut, followed by natural seeding
- Clearcut with Reserves, followed by natural seeding
- Clearcut, followed by artificial seeding
- Clearcut with Reserves, followed by artificial seeding

**d. Regeneration methods:**

Natural seeding or artificial seeding will be used to regenerate BSL stands after harvest. To reduce dwarf mistletoe infection in newly regenerating stands:

1. Use prescribed fire or winter shearing to remove all residual infected trees if they are not removed during timber harvest.
2. Regenerate densely stocked stands of black spruce because mistletoe spreads more slowly and causes less damage in them than open stands.

**4.5D Stand selection criteria**

The Remsoft harvest-scheduling model was used to optimize BSL stand selection based on the even-aged cover type scenario (see *Appendix I: Stand Selection Process Using Remsoft Woodstock-Stanley Harvest Scheduling Model*).

Lowland conifer stands that have been designated as ecologically important lowland conifers (EILC) will be reserved from harvest during this 10-year plan period or until such time that a DNR old-growth lowland conifer policy is developed, but they will be included in harvest-level calculations.

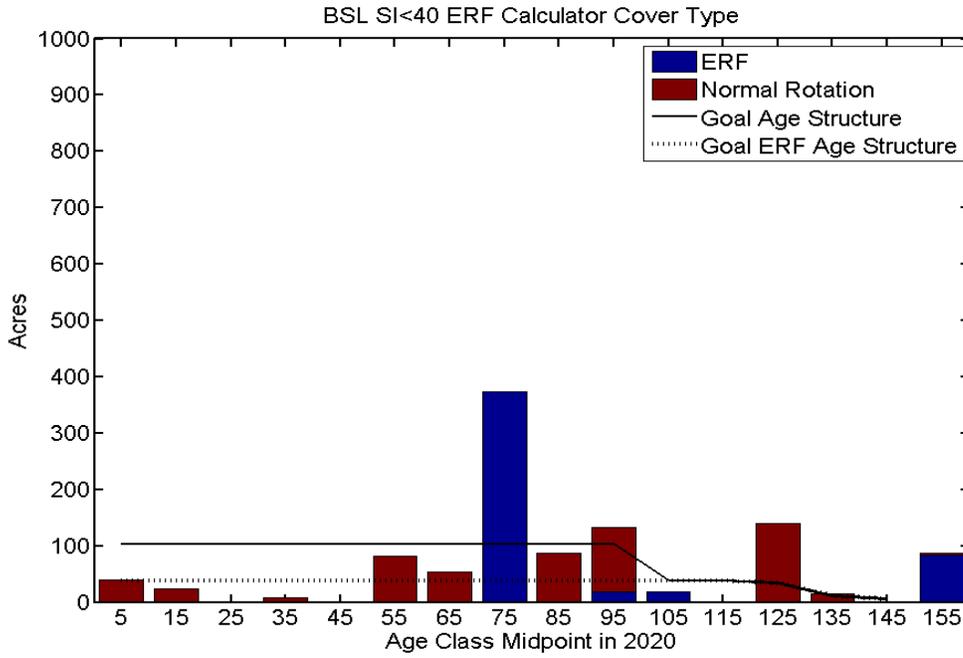
**a. Normal rotation forest:** Two site-index groups were used, with two corresponding NRAs. The objective is to move the age classes in each of the site index groups toward a more balanced structure. Table 3.9b in GDS-9A shows normal and maximum rotation ages for BSL by site index group.

**b. Extended rotation forest:** The selection of older-aged stands will be emphasized to help move the subset of ERF stands toward a desirable declining age-class structure. However, there are relatively few BSL stands in the cover type with over 40% of the total cover type acreage in just two large (>300 acre) stands. ERF in the BSL cover type was also chosen to compliment patch management and older forest complexes. One of the two large BSL stands was chosen as ERF, causing the ERF percentage of the BSL cover type to appear unusually large.

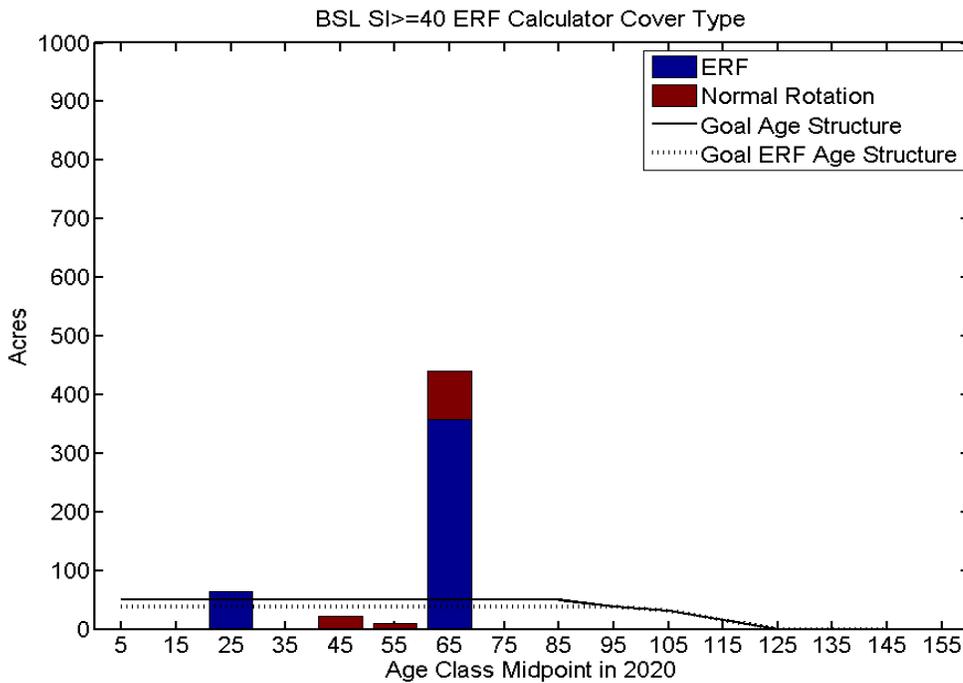
**4.5E Stand treatment summary**

Tables in GDS-9A of this plan show the modeled treatment levels (acres), old-forest percentages, effective ERF percentages, and the average treatment ages for the next five decades. There is variation from decade to decade because of the current age-class distribution and the number and sizes of stands in the cover type. Based on modeling of treatment levels, only 40 acres of BSL were selected for examination during the first decade of this plan.

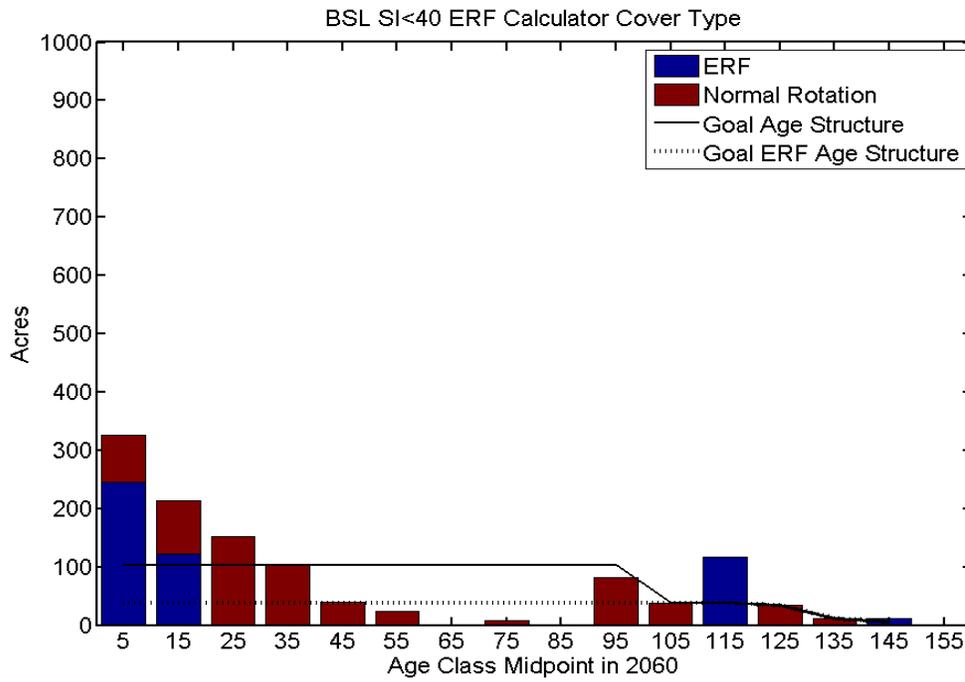
**Figure 4.5c. Projected age-class distributions for the low SI (<40) BSL cover type in 2020.**



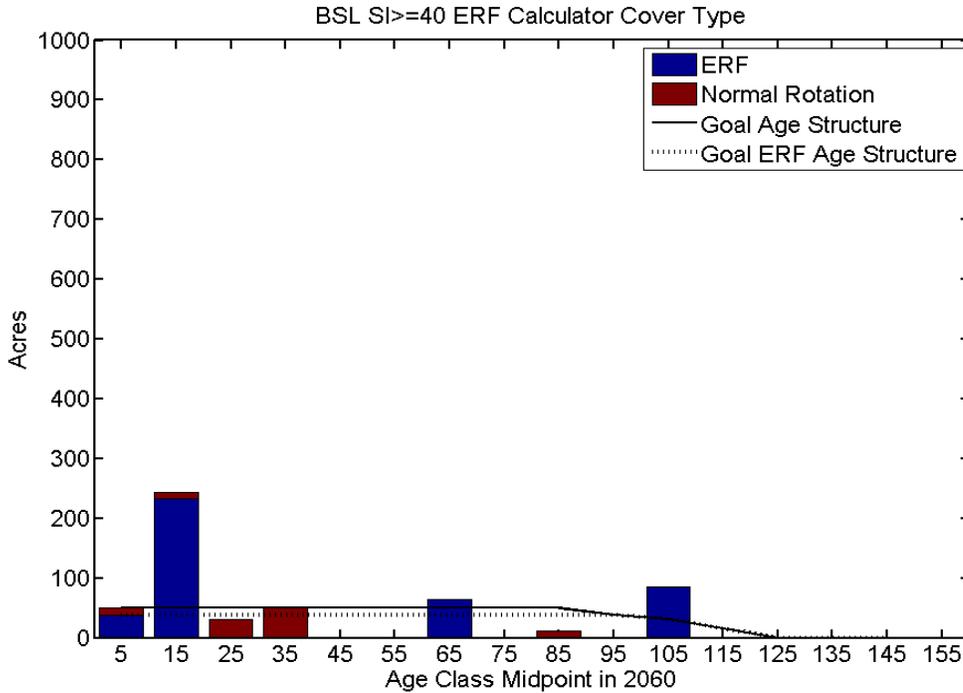
**Figure 4.5d. Projected age-class distributions for the high SI ( $\geq 40$ ) BSL cover type in 2020.**



**Figure 4.5e. Projected age-class distributions for the low SI (<40) BSL cover type in 2060**



**Figure 4.5f. Projected age-class distributions for the high SI ( $\geq 40$ ) BSL cover type in 2060.**



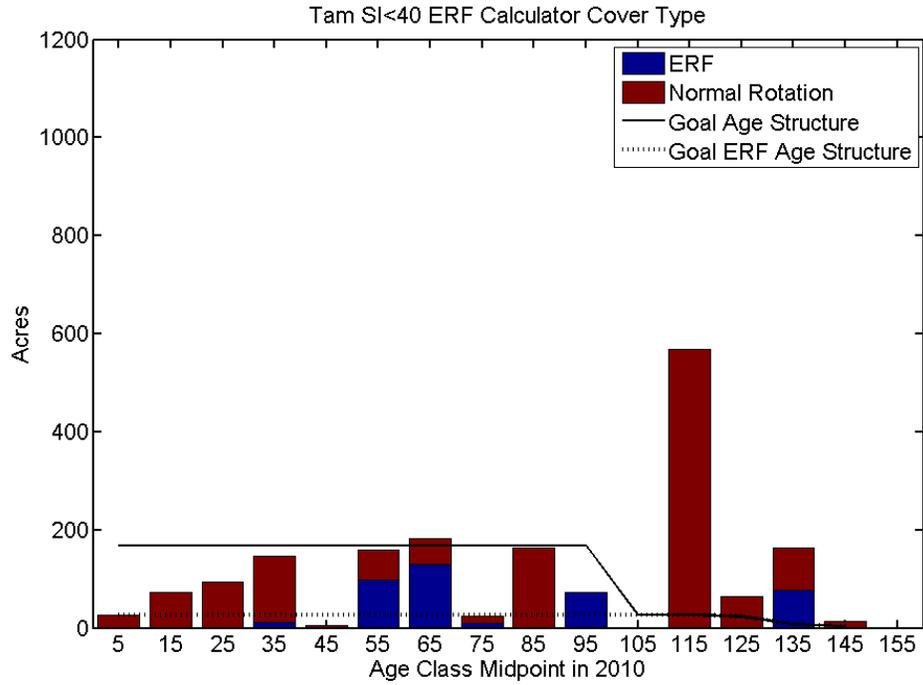
## 4.6 Tamarack

### 4.6A Current condition

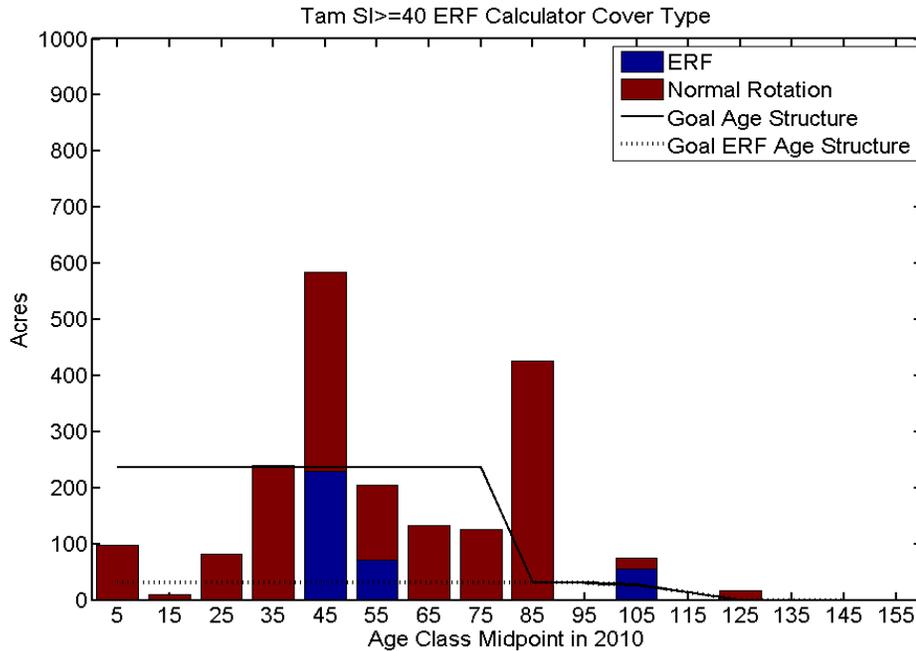
**a. Cover type acres:** In 2010, the tamarack cover type comprised 3.9 percent (3,754 acres) of the state-managed acres in the Subsection.

**b. Age-class distribution:** The current age-class distribution of the tamarack cover type does not reflect the desired balanced age-class structure for even-aged managed cover types.

**Figure 4.6a. Current and desired age-class distributions for low SI (<40) tamarack.**



**Figure 4.6b. Current and desired age-class distributions for high SI (≥ 40) tamarack.**



**c. Stand composition:** Natural, mature tamarack stands range from pure or nearly pure stands to mixed stands. Secondary species in the cover type include black spruce, balsam fir, cedar, and birch.

**d. Native plant communities:** Information about Aspen Parklands native plant communities in which tamarack is typically found is located in the *NPC Field Guide*, and in the ECS silvicultural interpretations. Consult these references when managing tamarack.

**4.6B Future direction**

**a. Cover type acres:** The 50-year goal is that the tamarack cover type acreage will be to maintain the current acreage in the cover type. No deliberate losses or gains of the cover type are recommended, although minor changes will occur due to inventory updates.

**b. Age-class distribution:** A goal is to move the age classes toward a balanced structure out to NRA, with a tapering age-class distribution out to the MRA. The older age classes will be managed with enough older stands (ERF) deferred from treatment to provide an adequate tapering age-class distribution out to the maximum age. The ERF goal for the high and low site index classes of this cover type is to have 5 percent of the acres over NRA at any one time.

**c. Stand composition:** The future stand composition goal in the tamarack cover type is to maintain the range of species in the appropriate amounts that would normally be present in the associated NPC at a stand’s current age as described by the Department’s ECS system.

**4.6C Stand management**

**a. Even-aged management direction:** The tamarack cover type will be managed primarily by even-aged management methods for pulpwood while accounting for forest wildlife habitat and biodiversity.

**b. Final harvest:** Tamarack stands will be treated through even-aged management using clearcuts or clearcuts with reserves. Leaving about 10 wind-firm and vigorous tamarack trees with open-grown form (full crown) per acre is recommended for successful natural seeding. In areas of larch bark beetle outbreak, artificial seeding is recommended. Where possible, maintain secondary species such as white cedar, paper birch, and balsam fir. This can be accomplished by reserving seed trees, reserve islands, or clumps of mature trees or advance regeneration. Efforts were made during the development of the 10-year stand selection list to designate larger blocks for harvest, using natural stand boundaries.

**c. Harvest prescriptions:** The following are the most common prescriptions that will be used on tamarack timber sale acres:

- Clearcut, followed by natural seeding
- Clearcut with Reserves, followed by natural seeding
- Clearcut, followed by artificial seeding
- Clearcut with Reserves, followed by artificial seeding

**d. Regeneration methods:** Natural seeding and artificial seeding are the methods used to regenerate tamarack stands. Artificial seeding may be an option for maintaining secondary species, especially for black spruce, which is not recommended as a mature reserve tree due to the possibility of spreading dwarf mistletoe to black spruce regeneration. Artificial seeding is dependent upon availability of tamarack seed which can be difficult to obtain.

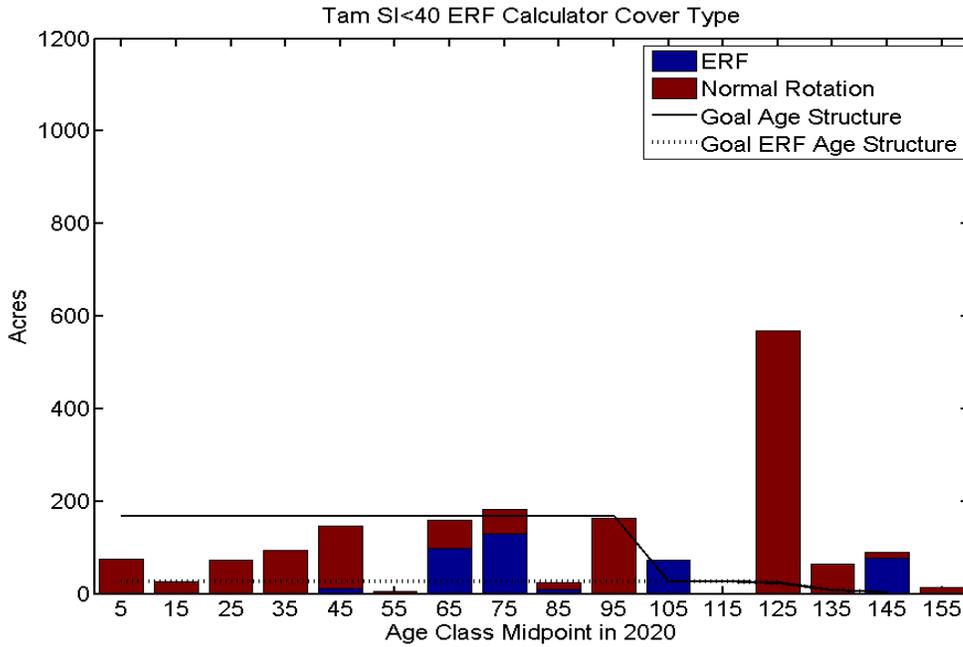
#### 4.6D Stand selection criteria

The Remsoft harvest-scheduling model was used to optimize tamarack stand selection based on the even-aged cover type scenario. Details about the modeling process can be found in *Appendix I: Stand Selection Process Using Remsoft Woodstock-Stanley Harvest Scheduling Model*. Normal and maximum rotation ages for cover types are in Table 3.5a in Chapter 3.

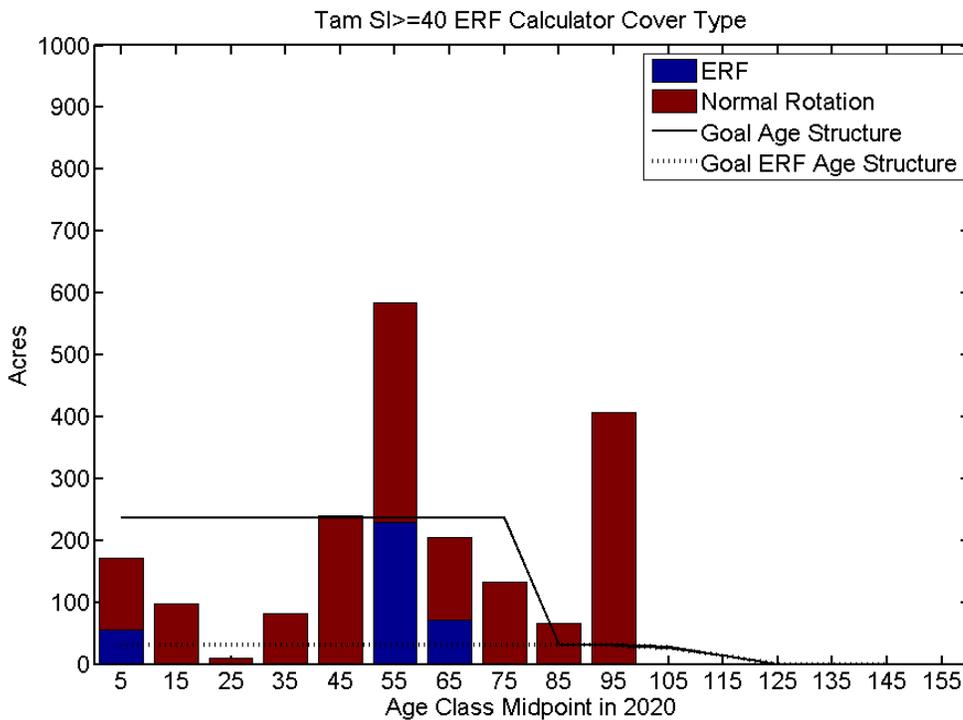
Lowland-conifer stands that have been designated as EILC will be reserved from harvest during this 10-year plan period or until such time as a DNR old-growth lowland-conifer policy is developed, but they will be included in harvest-level calculations.

1. **Normal rotation forest:** Two site-index groups were used with two corresponding NRAs. The objective is to move the age classes in each of the site-index groups toward a more balanced structure.
2. **Extended rotation forest:** The selection of older-age stands will be emphasized to help move the subset of ERF stands towards a desirable declining age-class structure. The long-term goal is to retain 5 percent of the cover type over the NRA and to provide a declining age-class structure out to the maximum harvest age.

#### Figure 4.6c. Projected age-class distribution for low SI (<40) tamarack in 2020.



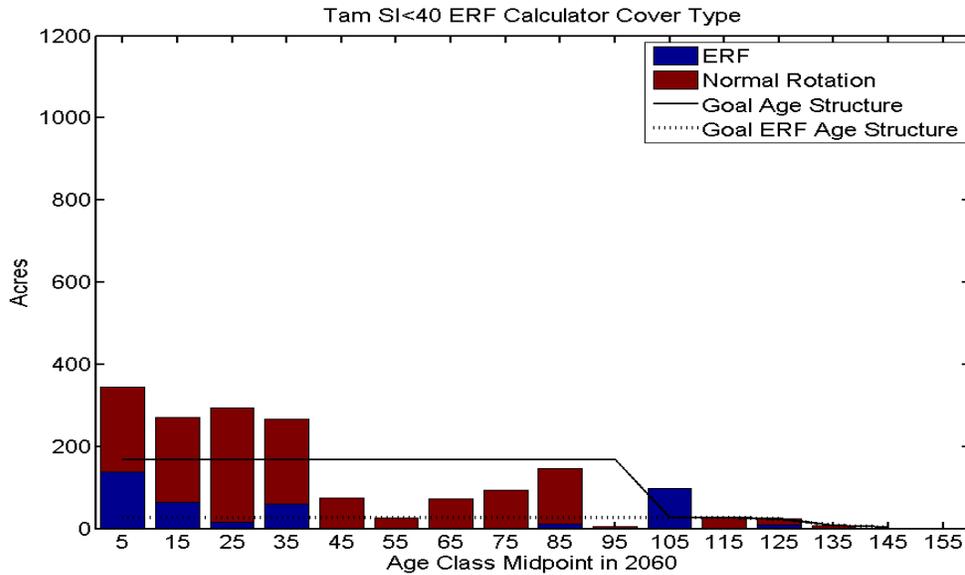
**Figure 4.6d. Projected age-class distributions for high SI ( $\geq 40$ ) tamarack in 2020.**



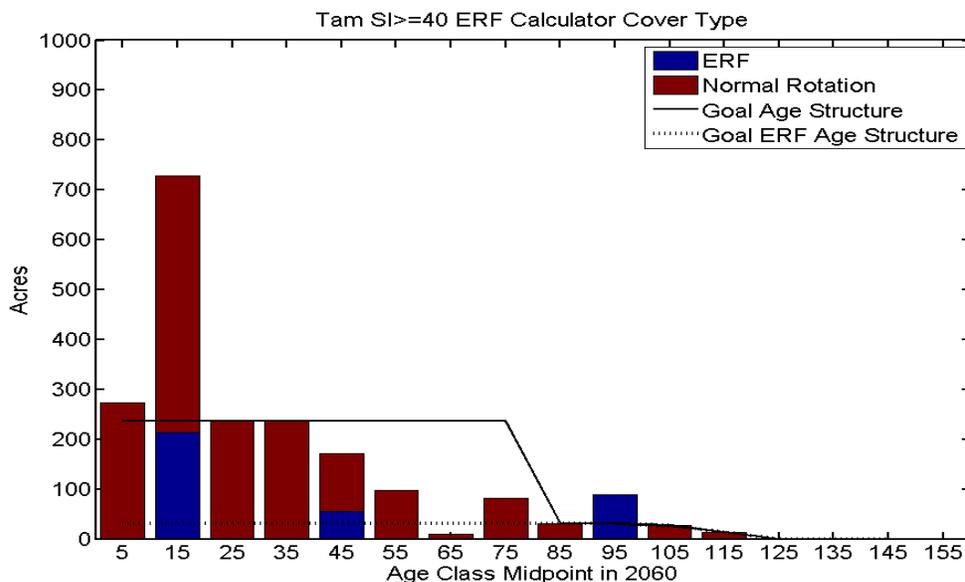
**4.6E Stand treatment summary**

Tables in GDS-9A of Chapter 3 show the modeled treatment levels (acres), old forest percentage, effective ERF percentage, and the average treatment ages for the next five decades. There is variation from decade to decade because of the current age-class distribution of the cover type. Based on modeling of treatment levels by decade, Figures 4.6e and 4.6f show the projected age-class distributions in 2060 for the tamarack cover type.

**Figure 4.6e. Projected age-class distributions for low SI (<40) tamarack in 2060.**



**Figure 4.6f. Projected age-class distributions for high SI ( $\geq 40$ ) tamarack in 2060.**



### 4.7 Paper Birch, Northern Hardwoods, White Pine, Norway Pine, Jack Pine, Black Spruce Upland, White Spruce, Balsam Fir, and White Cedar

Due to the limited acreage for the cover types described in this section the Remsoft model was not used to select stands for treatment during this planning period. Area Forestry and Wildlife staff have been provided Table 4.7 and a description of cover type management directions for each cover type.

**Table 4.7. Non-modeled cover type management.**

	Paper Birch	Northern Hardwoods	White Pine	Red Pine	Jack Pine	White Spruce	Balsam Fir	White Cedar
Type Acres	94 acres	233 acres	4 acres	80 acres	166 acres	148 acres	98 acres	215 acres
0-20 years	0 acres	4 acres	1 acre	1 acre	101 acres	0 acres	0 acres	0 acres
21-50 years	82 acres	53 acres	3 acres	79 acres	30 acres	148 acre	26 acres	0 acres
51+ years	12 acres	175 acres	0 acres	0 acres	35 acres	0 acres	72 acres	215 acres
Stand Composition or Origin	natural	natural	plantations	plantations	natural and artificial regeneration	plantations	natural	natural
50 year DFFC	94 acres	233 acres	4 acres	0 acres	166 acres	148 acres	98 acres	515 acres
Future Age Class Dist.	maintain or improve	maintain or improve	NA	NA	maintain or improve	NA	maintain or improve	maintain or improve
Future Stand Composition	NA	NA	increase diversity (oak)	convert type (oak)	NA	increase diversity (oak/aspens)	NA	NA
Mgmt. Direction	Even age	Uneven age	Thin	Thin->Final	Even age	Thin	Even age	Even age
Final Harvest Method	Clearcut w/ reserves	Shelterwood	Clearcut	Clearcut	Clearcut w/reserves	Clearcut w/reserve	Clearcut w/reserves	Clearcut w/reserves
Regeneration Methods	natural seeding and sprouting	natural seeding and sprouting	natural seeding	NA	natural or artificial	natural seeding	natural seeding	natural seeding
Preferred Selection Criteria	select if above normal	select if above 80	select all	select all	select if above normal	select all	select if above normal	as I&D requires
ERF	56 acres ERF	NA	All ERF	0 acres ERF	0 acres ERF	0 acres ERF	47 acres ERF	All ERF

## 4.8 Brushland (upland and lowland)

### 4.8A Current condition

**a. Cover-type acres:** In 2010 the current upland or lowland brush cover type comprised 89,820 acres of the state-managed acres in the Subsection.

**b. Age-class distribution:** Unlike commercial forest types, information on the age of upland and lowland brush cover type stands is not collected through Cooperative Stand Assessment (CSA) or monitored consistently. Generally, stand age for these brush types would be considered the time since the last major natural disturbance or management activity (shearing, mowing, prescribed burning, or herbicide treatment). Managed brushlands are generally 0-20 years old and a portion of unmanaged brushlands may be older than 30 years.

One potential surrogate for stand age is the shrub density information collected through CSA. The 1990 Draft of the Long Range Plan for Brushland Habitats (MNDNR Division of Fish and Wildlife) thought brush density was indicative of stand openness and consequently, the successional stage. Stands in advanced stages of succession should be dominated by high or medium density brush; high density would also indicate decadence.

In this Subsection, brush density codes were available for 41,471 acres of the brush acreage. Sixty-three percent of this acreage had moderate brush density and 33% was listed as heavy density.

**c. Stand composition:** Species composition and density of upland and lowland brush cover types can be highly variable and is dependent on NPC, natural disturbances, management history, presence of invasive or exotic species, drainage, etc. In this Subsection, most of the acreage is lowland brush (82,692 acres), which is generally dominated by willow and alder species. Upland brush stands tend to be more variable in shrub composition but often include American hazelnut.

**d. Native plant communities:** Information about Aspen Parklands NPCs in which upland and lowland brush stands are typically found is located in the *NPC Field Guide*. Consult this reference when determining sites appropriate for upland and lowland brush emphasis.

### 4.8B Future direction

**a. Cover type acres:** Brushland acres will increase as “C” stands selected from the A/BG cover type group are treated and converted. The 50-year goal for grass, brush and oak savannah is to increase these types by 15,563 acres from the A/BG cover type “C” stands. Approximately half of this increase will occur in the first decade. The exact increase in brushland habitat will depend upon site specific goals based upon an evaluation of NPC information.

**b. Age-class distribution:** Managed upland and lowland brush stands are generally burned, mowed, grazed, or could support a biomass harvest on a 5 to 20-year rotation to promote vigorous growth and maintain open landscapes. A significant portion of the upland and lowland brush acres in this Subsection will have an older age structure due to access problems, low shrub densities, and/or wildlife habitat goals. Future timing of management

activities may be adjusted on a site specific basis if new ecological information suggests a longer or shorter interval would be more appropriate.

**c. Stand composition:** The future stand composition goal in brushlands is to maintain the range of species in the appropriate amounts that would normally be present in the associated NPC.

#### 4.8C Stand management

**a. Management direction:** Currently, brushlands are primarily managed for wildlife habitat through treatments such as shearing followed by a prescribed fire a year later. Biomass harvest may play an important role in management of these sites in the near future. Existing management treatments and new biomass harvest techniques should be evaluated to prevent loss of species richness, loss of soil function and other negative impacts to these sites.

**b. Final harvest methods:** For any planned biomass harvest in brushlands, follow the biomass harvesting guidelines contained in the MFRC voluntary site-level forest management guidelines. These biomass guidelines contain guidance on reserve areas, type of structural habitat components to retain, and operational considerations when shearing or harvesting brush. A recent Brushland resource assessment in Minnesota estimated an average high density brush site contains 8.3 dry tons/acre while a medium density site contains 5.3 dry tons/acre.

#### 4.8D Stand selection criteria

**a. Preferred stand selection criteria:**

For initial biomass harvest sites, consider offering larger sites with good access and high to medium density brush that are closer to biomass markets.

### 4.9 Openland (upland and lowland grass)

#### 4.9A Current condition

**a. Cover type acres:** In 2010 the current upland or lowland brush cover type comprised 91,263 acres of the state-managed acres in the Subsection.

**b. Age-class distribution:** Age classes for upland and lowland grass cover types are not collected and monitored as timber cover types are. Stand age for grasses generally refers to the timing between burning, mowing, or grazing and is currently tracked differently by each land manager. Age class can also refer to the time since planting for restored or enhanced stands.

**c. Stand composition:** Species composition for upland and lowland grass stands can be highly variable and is dependent upon: Presence or absence of non-native species; Whether or not it is a virgin (untilled) native grassland; Years since restoration or enhancement; Hydrology; Soils; etc. Virgin native prairie stands, for example, can have more than 200 different grass and forb species; whereas a wet prairie invaded by reed canarygrass may have fewer than 20. Tree and shrub species have become much more

common on upland and lowland grasslands in this Subsection since human settlement due primarily to encroachment from reduced fire prevalence and interval.

**d. Native plant communities:** Information about Aspen Parklands NPCs in which upland and lowland grass stands are typically found is located in the *NPC Field Guide*. Consult this reference when determining sites appropriate for upland and lowland grass emphasis.

#### 4.9B Future direction

**a. Cover type acres:** Grassland acres will increase as “C” stands selected from the A/BG cover type are treated and converted. The 50-year goal for grass, brush, and oak savannah is to increase these types by 15,478 acres from the A/BG cover type “C” stands. Approximately half of this increase will occur in the first decade. The exact increase in grass, brush, and oak savannah will depend upon site specific goals based upon an evaluation of NPC information.

**b. Age-class distribution:** Managed upland and lowland grass stands are generally burned, mowed, or grazed on a 3 to 5-year rotation to promote vigorous growth and stimulate seed production. Future timing of management activities may be adjusted on a site specific basis if new ecological information suggests a longer or shorter interval would be more appropriate.

**c. Stand composition:** The future stand composition goal in grasslands is to maintain the range of species in the appropriate amounts that would normally be present in the associated NPC as described by the Department’s ECS system.

#### 4.9C Stand management

**a. Management direction:** Grasslands are primarily managed for wildlife habitat and for their intrinsic value. Prescribed fire rotation intervals and timing should be evaluated on a site by site basis to prevent loss of species richness. Managers often harvest seed from native and restored/enhanced grasslands to generate revenue or to restore/enhance other grassland sites. A closely monitored grazing program should also be considered as a management tool when feasible. Restorations and enhancement projects should strive to plant at least a 25 species grass/forb mixture. Each site should be evaluated to assess proper management practices to help maximize diversity.

**b. Timing of harvest:** Recent research evaluating the use of grasslands for biofuel production may lead to increased consumptive demand on these cover types. Additional information is needed to determine the long-term implications of fire timing/intervals and seed and biomass removal from grasslands.

**c. Management methods:** Grasslands should be managed through grazing, haying, seed collection, mechanical treatment and prescribed burning. Where using prescribed fire, managers should continue to follow a 3 to 5-year rotation until site specific information indicates a more suitable interval. Seed harvest is often conducted the fall following a spring fire. Intense, short-duration, rotational grazing by bison is preferred, but difficult to accomplish. Managers primarily use cattle on a rotational grazing system, resting the grasslands from 1-3 years. Biomass harvest prescriptions are currently being investigated to determine impacts to long-term maintenance of grasslands.