Chapter 3. General Direction Statements and Strategies

Section **Page**

3.0 Introduction

In response to the final list of issues identified in Chapter 2, the subsection team developed general direction statements (GDSs) to address the issues, strategies to achieve the general directions, and desired future forest composition (DFFC) goals. GDSs take into account the direction provided in state statutes and rules; department policies, guidelines, and direction (e.g., *Directions 2000*[14] and *A Strategic Conservation Agenda 2009-2013*[15]*),* and management that will sustain the vegetative resources on state-administered forestlands in the AP Subsection. GDSs provide general direction such as: increase, decrease, maintain, or protect a certain condition, output, or quality. Strategies were developed for each of the GDSs to achieve the general direction.

In situations where there is currently an ability to measure and quantify progress, DFFC goals were identified. DFFC goals are long-term (50+ years) goals for the ultimate desired condition of DNR forest lands in the AP Subsection. Examples of DFFC goals are: cover type acres, age class distribution, amount of young and old forest, and cover type treatment levels (e.g., harvest level). DFFC goals, general direction strategies (Chapter 3), and cover type management recommendations (Chapter 4) were used to determine stand treatment levels and define stand selection criteria to identify a pool of stands from which to select stands to be treated during this 10-year plan. This step of the plan provides recommended treatment levels by cover type to move toward the DFFC goals and a 10-year stand treatment list, which will include information regarding locations, acres, and prescriptions for stands selected for treatment. The GDSs, strategies, and DFFC goals presented in this chapter guided the selection of stands and the application of treatments to stands selected for treatment.

[14] http://files.dnr.state.mn.us/aboutdnr/reports/directions2000.pdf
[15] http://www.dnr.state.mn.us/conservationagenda/index.html

In this chapter, the 20 GDSs and associated strategies are grouped under 12 forest resource management topic areas or categories. Some categories have several GDSs to address the associated issues while others have only one.

3.1 Biological Diversity, Forest Composition, and Spatial Distribution

GDS-1A. Old forest is located primarily along riparian areas and traditionally forested areas in the eastern portion of the Subsection.

Consideration of old forest during planning was done to:

1. Ensure an adequate representation of older stands and old forest components within even-aged cover types;
2. Address visual quality concerns and recreation desires;
3. Help maintain the integrity of forested riparian areas;
4. Complement or connect old-growth stands and other old patches;
5. Provide habitat for wildlife species and other organisms associated with old forest;
6. Provide for older growth stages of NPC types;
7. Provide large-diameter timber products;
8. Compliment the DNR's High Conservation Value Forest (HCVF) policy and Minnesota County Biological Survey (MCBS) sites of biodiversity significance; and,
9. Help contribute to carbon sequestration on state forest lands.

A forest stand of any particular even-aged managed forest cover type is considered old forest whenever its age exceeds the normal rotation age (NRA) agreed on by the landscape rotation age work group for that cover type. Determining the amount of old forest to be sustained in this Subsection required balancing many factors: timber productivity, economic impacts, historical forest conditions, habitat requirements, forest health, and timber quality. The goal is to provide a representation of older forest stands and old forest components that is sustainable over time, balanced with the need to provide a stable timber supply, increased timber productivity, and early successional forest habitat. Information about Minnesota's old-growth forest policy can be found at:

http://www.dnr.state.mn.us/forests_types/oldgrowth/index.html

The type and acreage of old-growth forests in the AP Subsection can be found in table 3.1c of this chapter.

Providing for adequate and sustainable amounts of old forest across the landscape over time requires:

1. Designating some current old forest to be maintained as old over time (e.g., as done in the old-growth designation process);
2. Designating forest that is held to an older forest condition (i.e., extended rotation forest); and,
3. Specifying situations under which forest managers will create or maintain old forest components within treated stands, based on site factors found there (e.g., some patch management; management within Minnesota County Biological Survey (MCBS) sites of biodiversity significance).

GDS-1A - Strategies

a. Determine the desired level of extended rotation forest for even-aged managed cover types.

The acreage and age of DNR timber lands to be managed as ERF was provided to the AP team by the interdisciplinary statewide ERF Workgroup. Forests managed as ERF are key to achieving DFFCs for the AP Subsection. Effective ERF (EERF), or "old forest", is the portion of ERF acreage that is actually over the normal rotation age (NRA) for the cover type. Forest stands designated as ERF can (and should) be in any age class, therefore there are cases where large numbers of acres must be designated ERF to achieve the identified old forest goal due to the current cover type age class distribution. Cover types typically managed under even-aged regimes are the focus of ERF designation – such a management designation is unnecessary for cover types managed under uneven-aged regimes.

Designated ERF stands are harvested in stages between NRA and maximum rotation age (MRA) to help achieve the desired tapered distribution in older age classes. The harvest-scheduling model was programmed to consider ERF acreage goals together with other goals when selecting stands.

Figure 3.1a. Extended rotation forest example.

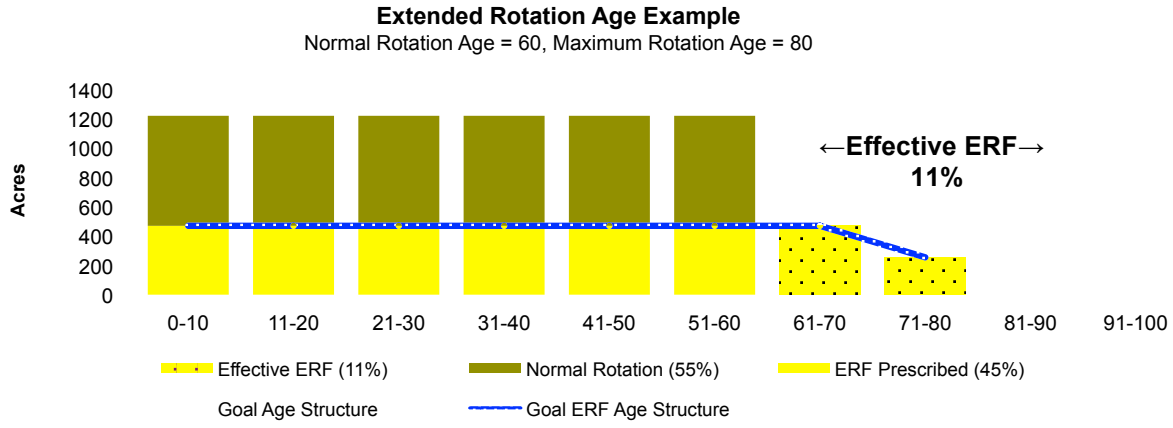


Table 3.1a. Current old forest acres for modeled even-aged managed cover types.

Cover type	Acres[16]	Ac >NRA[17]	% >NRA	Goal % >NRA[18]
Aspen/balm of Gilead	85,160	15,798	19%	3%
Black Spruce, Lowland	1,697	1,380	22%	11%-16%
Tamarack	3,754	1,329	35%	5%

[16] Managed Acres: Forestry and Wildlife lands considered available for timber harvest.
[17] Acres of managed forest older than the normal rotation age (NRA) established for the cover type.
[18] Old Forest percentage goal: Percent goal of cover type timber land acreage to be managed beyond the normal rotation age.

b. Select ERF stands in even-aged managed cover types so that when a balanced age class distribution is achieved, the desired amount of effective ERF will be provided.

Due primarily to existing imbalances in age classes in some cover types, there will be fluctuations in the amount of effective ERF until a balanced age class distribution is reached. After this, fluctuations may occur periodically because of major disturbances such as wind, flood, or fire. More severe fluctuations may occur in some cover types due to the relatively small number of stands that make up the total acres in the cover type. Table 3.1 b shows the percent of effective ERF at the beginning of each decade based on the prescribed ERF and treatment levels for the cover types. These estimates are based on modeling of proposed stand treatments over the next five decades.

Table 3.1b. State timber land percent old forest and effective ERF per decade by type for even-aged systems.

Cover type[19, 20]	Period (decade)						EERF%[21]
	1	2	3	4	5	6	
Aspen/balm of Gilead "T" and "O" stands ERF %	4.9%	3.6%	2.4%	2.2%	3.4%	3.0%	3.0%
Aspen/balm of Gilead "T" and "O" stands old forest%	30.2%	21.1%	9.1%	6.7%	7.8%	7.9%	
Aspen/balm of Gilead "S" stands old forest%	18.8%	13.2%	8.1%	1.6%	5.4%	5.6%	
Aspen/balm of Gilead "R" stands old forest%**	73.6%	22.4%	0	0	0	0	
Aspen/balm of Gilead "C" stands old forest%**	75.0%	72.8%	0	0	0	0	
Black spruce-lowland; low site index (SI<40) ERF %	7.3%	8.9%	10.4%	10.4%	32.1%	11.0%	11.0%
Black spruce-lowland; low site index (SI<40) old forest%	32.8%	30.9%	33.4%	27.8%	41.7%	18.2%	
Black spruce-lowland; high site index (SI=40+) ERF %	0	0	0	0	23.2%	16.0%	16.0%
Black spruce-lowland; high site index (SI=40+) old forest%	0	0	0	0	23.2%	16.0%	
Tamarack; low site index (SI<40) ERF %	4.3%	8.4%	5.0%	4.7%	8.4%	6.1%	5.0%
Tamarack; low site index (SI<40) old forest%	46.1%	46.0%	40.0%	24.7%	19.6%	9.1%	
Tamarack; high site index (SI=40+) ERF %	2.8%	0	0	3.6%	4.4%	4.4%	5.0%
Tamarack; high site index (SI=40+)old forest%	26.0%	23.7%	26.1%	29.5%	9.6%	7.9%	

[19] Aspen/balm of Gilead/offsite aspen (A/BG) stands have been divided into 5 subtypes "T", "O", "S", "R" and "C". For definitions of each aspen/balm of Gilead subtype see section 4.2 of Chapter 4.

[20] For "C" and "R" stands old forest is defined as >20 years of age.

[21] EERF% is represented by the aspen/balm of Gilead "T" and "O" stands only.

c. Manage forested riparian management zones primarily to reflect old forest conditions.

In the AP Subsection RMZs will be managed in accordance with the *MFRC Site-Level Guidelines* for longer-lived uneven-aged, mixed-species stands. This management will provide shade and moderate microclimate, coarse woody debris, microhabitat diversity, resiliency to natural catastrophes, bank stability, nutrient cycling, carbon and nutrient input. (see GDS-7A, strategies b and c).

d. Allow some stands to naturally succeed to long-lived cover types with, or without the use of harvest.

Field evaluation tools include use of the *Field Guide to the Native Plant Communities of Minnesota: The Prairie Parkland and Tallgrass AP Forest Province*[22] *(NPC Field Guide),* and associated ECS silvicultural interpretations.

e. Manage designated old-growth stands and old forest management complexes (OFMCs) according to DNR policy.

Complete and follow long-term management plans for designated old-growth stands and the surrounding acres in the OFMCs that are to be managed for old forest characteristics. Use the *DNR Old-Growth Forest Guidelines, Amendments 5 and 6* as a guide. High-quality native plant communities (NPCs) and other stands that meet old-growth criteria can be nominated for designation as old growth following the *DNR Old-Growth Forest Guidelines*.

Table 3.1c. Designated old-growth acres in the Aspen Parklands Subsection.

Cover type	Old-growth acreage goal (1994)	Old-growth acres designated[23]
Black ash	40	73
Lowland hardwoods	80	204
Oak	30	175
Northern hardwoods	0	0
White cedar	0	0
Red pine	0	0
White pine	0	0
White spruce	0	0
Total	150	452

[22] Minn. DNR, 2005, *Field Guide to Native Plant Communities of Minnesota: The Prairie Parkland and Tallgrass Aspen Parklands Province*. Ecological Land Classification Program, Minnesota County Biological Survey, Natural Heritage and Nongame Research Program. Minnesota Department of Natural Resources St. Paul, MN 55155.

[23] From a candidate pool of 670 candidate acres, 452 acres were designated as old growth and 218 acres were released from candidacy

f. Designate ecologically important lowland conifers according to Department direction.

Ecologically important lowland conifers (EILC) are examples of high quality NPCs that include productive and stagnant stands of black spruce, tamarack, and cedar. *Appendix E*: *Ecologically Important Lowland Conifers (EILC): Stand Designation Process* describes the method the team used to designate EILC for the Subsection. Table 3.1d summarizes the acres designated by cover type. The designated EILC stands will be reserved from treatment during this 10-year planning period, or until such time as designation or release decisions are made by the Department. *(DNR Memorandum, July 3, 2000, Old-Growth Forest Guidelines and Protection of Important Lowland Conifer Sites)*

Note: EILC acres will be included in cover type treatment acre calculations for this 10-year plan. Therefore, EILC designations will not cause a reduction in the treatment level in the black spruce, tamarack, and cedar cover types.

Table 3.1d. Acres designated as ecologically important lowland conifers (EILC)

Lowland Conifer Type	State Forestland Acres	EILC Acres Designated	Percent of Cover Type Designated as EILC
Tamarack	3,754	1,273	34%
Black Spruce Lowland	1,697	315	19%
Stagnant Spruce	842	0	0%
Cedar	215	71	33%
Stagnant Tamarack	45	0	0%
Stagnant Cedar	0	0	0%
Lowland Conifer Total	6,552	1,659	25%

g. Use silvicultural treatments that retain old forest components in some stands.

Examples of silvicultural treatments that can retain old forest components include:

1. Selection harvest (i.e., group selection and single tree selection);
2. Intermediate harvest (i.e., thinning);
3. Shelterwood harvest with reserves;
4. Seed tree harvest with reserves;
5. Variable retention harvest; and,
6. Variable density thinning.

(See Chapter 4, Cover type Management Recommendations and GDS-3A)

h. Consider the status of old forest within the Subsection when making decisions to add and offer unplanned wood for harvest.

GDS-1B. Species in greatest conservation need (SGCN) and key habitats are maintained or enhanced in the Subsection.

Minnesota DNR participates in the State Wildlife Grants Program (SWG), created by the US Congress in 2001. Congress mandated that to participate in the SWG Program, states, in partnership with other conservation agencies and organizations, must develop a Comprehensive Wildlife Conservation Strategy (CWCS) to identify and manage species in greatest conservation need (SGCN) and associated key habitats.

SGCN are defined as native animals whose populations are rare, declining, or vulnerable to decline and are below levels desirable to ensure their long-term health and stability. Minnesota's SGCN list includes 292 native animal species. Key habitats are defined as those habitats most important to the greatest number of SGCN in a subsection. Minnesota's CWCS identifies key habitats in terms of the DNR's three-volume Field Guide to Native Plant Communities. For a listing of SGCNs and key habitats known to occur in the AP Subsection, please visit the DNR's CWCS webpage:

http://www.dnr.state.mn.us/cwcs/subsection_profiles.html

By alerting resource managers and the public to SGCN and key habitats, activities can be reviewed and prioritized to complement Minnesota's CWCS.

GDS-1B - Strategies

a. Consider current SGCN and key habitat data in management activities in the Subsection.

DNR staff from all Divisions will have access to the most up-to-date SGCN and key habitat locations by coordinating with the Division of Ecological and Water Resources.

SGCN and key habitat data are collected to various degrees by MCBS, Natural Heritage & Nongame Research Program, and various other sources. As new data is compiled it is made available to DNR staff and applied to management decisions per the DNR's Interdisciplinary Forest Management Coordination Framework[24] (Coordination Framework).

The Coordination Framework is used to maintain or enhance SGCNs and key habitats. Ecological and Water Resources staff will deliver SGCN and/or key habitat management considerations to managers for use in making forest management decisions for stands selected for treatment, access routes, and other management or development activities per processes outlined in the Coordination Framework.

b. Select some ERF, OFMC, EILC, and patch stands based on their association with SGCNs and key habitats.

SGCNs and key habitats were considered during the selection of stands in ERF, OFMCs, EILC areas, and the designated patches.

GDS-1C. Vegetation composition will be managed according to ecological classifications to more closely reflect vegetation that developed under natural disturbance regimes.

[24] DNR Divisions of Forestry, Fish and Wildlife, and Ecological Resources: *Interdisciplinary Forest Management Coordination Framework*. St. Paul, Minnesota. December 2007.

The proposed cover type change goals reflect the AP SFRMP team's attempt to increase the acreage of cover types that have declined historically, while maintaining or enhancing important wildlife habitats and plant communities, and providing a sustainable level of forest products. The ecologic, economic, and social considerations used in developing the cover type change goals for this Subsection include:

1. Historic vegetation composition;
2. Historic disturbance regimes;
3. Native plant community information;
4. Wildlife habitat;
5. Insect and diseases;
6. Community productivity (e.g., match the species to the site using *NPC Field Guide*);
7. Increase availability of certain forest products ; and,
8. Recreational values.

GDS-1C - Strategies

a. Increase the acres of oak, oak savannah, lowland brush and prairie grasses using the following actions:

Use the *NPC Field Guide* as a tool to guide the on-site evaluation of stands for conversion from one cover type to another or managing for mixed species composition and stand structure.

Options available include:

1. Allow some stands to convert through natural succession;
2. Artificially convert some stands through mechanical site preparation, prescribed burning, planting, or seeding; and,
3. Harvest some stands to move toward the desired cover type and within-stand composition.

Conversions can be immediate, or can take place over the span of a rotation period through thinning, partial cuts, and intermediate treatments.

b. Forest composition goals and objectives are consistent with other landscape planning jurisdictions.

Department personnel have been involved with TNC of Minnesota planning efforts. Although the TNC plan differs in scope and scale from this plan, they share a number of goals and local and regional staff are committed to maintaining close relationships.

c. Consider current rare plant species in management activities in the Subsection.

Examples of plant species that have declined in the AP Subsection include species declining in and adjacent to the now rare oak woodlands:

- Blunt sedge (*Carex obtusata*);
- spike oat (*Helictotrichon hookeri*);
- long-stalked chickweed (*Stellaria longipes*); and,

some of the many now rare plants found in the unique calcareous fens in this Subsection:

- Sterile sedge (*Carex sterilis*);
- few-flowered spike-rush (*Eleocharis quinqueflora*);
- hair-like beak-rush (*Rhynchospora capillacea*); and,
- northern gentian (*Gentiana affinis*)

GDS-1D. Patch management will maintain or enhance existing large patches and increase the average patch size over time while considering natural spatial patterns.

There is broad consensus among scientists that managed landscapes are currently more fragmented and contain fewer large patches than landscapes where spatial patterns are determined primarily by natural disturbance and physical factors. Stand selection and treatment as part of the AP SFRMP process can significantly reduce habitat fragmentation and maintain and promote larger patches over time. The best available information on natural spatial patterns in this Subsection was used as a guide to understanding the distribution of patch sizes, cover type groupings, and age classes for patch management on state lands.[25] Although this plan considered management activities on other ownerships, patch management primarily focuses on identifying opportunities that exist on state land.

To guide patch management on state lands, a patch is defined as one or more adjoining stands that are relatively homogenous in structure, primarily in height and density, and are similar in vegetation cover and age. A future patch is defined as a group of adjoining stands that do not currently meet the patch definition, but that will be managed to enhance patch attributes over time.

Patches are defined by age, size, and general cover type grouping (Tables 3.1e-g). Patch ages are defined as old, intermediate, and young with an age range by category dependent on cover type. Patch sizes range from small (less than 40 acres) to large (greater than 640 acres). Patches may have smaller areas (e.g., 10-15 percent of the patch area) within them that are not in the same patch category as the main patch, such as inclusions, residual islands, legacy patches, corridors, and buffers.

Using Cooperative Stand Assessment (CSA) forest inventory data, the DNR conducted an initial patch assessment for state lands in the Subsection. Patches were created in a GIS data layer by dissolving common stand boundaries between stands of the same cover type group and age class. The initial patch assessment information was used as one of the tools for delineating the current patches and desired future patches on state lands in this Subsection as described in the following paragraphs.

[25]Minn. DNR. January 2008. Addressing Patch Management in SFRMP, page 38 in *SFRMP Process Guidebook IV*. (Draft).

Table 3.1e. Patch ages by cover type category.

Cover Type Groupings			Age Class Definition (In years)		
Code	Category	Sub-Category	Young	Inter.	Old
UC	Upland Conifer	jack pine, upland black spruce, and balsam fir	0-20	21-60	>60
		red pine and white pine	0-20	21-90	>90
		white spruce and upland white cedar	0-20	21-80	>80
LC	Lowland Conifer	tamarack, white cedar, and lowland black spruce	0-20	21-90	>90
UDA	Upland Deciduous Aspen	aspen, birch, and balm of Gilead	0-20	21-50	>50
UDO	Upland Deciduous Oak	northern hardwood and oak	0-20	21-80	>80
LD	Lowland Deciduous	ash and lowland hardwood	0-20	21-80	>80

Table 3.1f. Patch size classes for patch management in AP SFRMP

Size Class	Size Range (acres)
Class 1 - Large	Greater than 640
Class 2 - Medium Large	251 – 640
Class 3 - Medium	101 – 250
Class 4 - Small Medium	41 – 100
Class 5 - Small	Less than 40

Table 3.1g. Patch type codes for patch management in AP SFRMP

Patch Type Code	Description
PYUDA	Patch young upland deciduous aspen
PIUDA	Patch intermediate upland deciduous aspen
POUDA	Patch old upland deciduous aspen
PYUDO	Patch young upland deciduous oak
PIUDO	Patch intermediate upland deciduous oak
POUDO	Patch old upland deciduous oak
PYLD	Patch young lowland deciduous
PILD	Patch intermediate lowland deciduous
POLD	Patch old lowland deciduous
PYUC	Patch young upland conifer
PIUC	Patch intermediate upland conifer
POUC	Patch old upland conifer
PYLC	Patch young lowland conifer
PILC	Patch intermediate lowland conifer
POLC	Patch old upland lowland conifer

The following tables (Tables 3.1.h and i) provide a summary of the initial patch assessment for the AP Subsection. By patch size class, the AP landscape contains a greater proportion of medium to small forested patches. All AP upland forested cover type groupings show a lower abundance, in many cases a complete absence, of large patches across all age classes. Upland deciduous aspen is by far the most common forested cover type group in the AP Subsection. By age class, the majority of upland deciduous aspen patches are in the intermediate age class with a significant amount in the young age class, and the fewest in the oldest age class. The lowland conifer cover type group, although much smaller in acreage, is also dominated by intermediate age patches, but is more variable in terms of the distribution of patch sizes.

Mature and older growth stage large patches have benefits for some wildlife species and provide conditions that favor many native plant species over invasive and weedy plant species. Without attention to the maintenance or creation of large old patches they are likely to be lost through time.

Consideration of the initial patch assessment in stand-level decisions (e.g., grouping stands into harvest blocks based on the initial patch assessment) is an important component of providing for the range of patch conditions on the AP landscape. Opportunities to maintain and build large patches, both young and old, are of particular concern for the reasons previously stated. Small and medium sized patches of all age classes, although relatively common on the landscape today, also need attention so that they are retained or created on the landscape where desired and so that diversity of patch sizes is not lost over time in the effort to maintain and create large patches.

Table 3.1h. AP Subsection timber lands existing patch size class summary.

State Timber Land Acres	Class 1 Acres % of Timberland	Class 2 Acres % of Timberland	Class 3 Acres % of Timberland	Class 4 Acres % of Timberland	Class 5 Acres % of Timberland
99,414	3,211 3%	12,514 13%	20,383 21%	25,826 26%	37,479 38%

Table 3.1i. AP timber lands existing patch type summary.

Patch Type	Class 1 Large		Class 2 Medium Large		Class 3 Medium		Class 4 Small Medium		Class 5 Small		Tally of Patch Code in Subsection	Acres of Patch Code in Subsection
	Tally	Acres	Tally	Acres	Tally	Acres	Tally	Acres	Tally	Acres		
PYUDA	0	0	6	2,439	39	5,741	118	7,158	983	10,779	1,146	26,117
PIUDA	3	2,535	21	7,655	67	10,620	172	10,961	1,761	15,997	2,024	47,768
POUDA	0	0	1	363	11	1,759	63	3,799	478	6,312	553	12,233
PYUDO	0	0	0	0	0	0	0	0	4	40	4	40
PIUDO	0	0	0	0	7	980	12	664	99	1,366	118	3,010
POUDO	0	0	0	0	2	335	7	460	32	341	41	1,136
PYLD	0	0	0	0	0	0	0	0	7	90	7	90
PILD	0	0	1	334	1	131	16	914	99	982	117	2,361
POLD	0	0	0	0	0	0	2	129	22	371	24	500
PYUC	0	0	0	0	0	0	1	63	7	40	8	103
PIUC	0	0	0	0	1	107	1	52	39	214	41	373
POUC	0	0	0	0	0	0	1	44	7	87	8	131
PYLC	0	0	0	0	2	217	1	65	6	56	9	338
PILC	1	676	3	1,211	2	333	16	1,001	41	535	63	3,756
POLC	0	0	1	513	1	161	7	517	18	271	27	1,462
Total	**4**	**3,211**	**33**	**12,515**	**133**	**20,384**	**417**	**25,827**	**3,603**	**37,481**	**4,190**	**99,418**

“Designated” Patches

Maintaining and creating large (Class 1), medium large (Class 2), and medium (Class 3) forest patches in appropriate areas of this landscape is a priority of this plan. Patch management of other non-forested cover types was addressed through the priority open landscape area designation process and will be implemented through the application of the associated management agreement.

After analyzing the initial patch assessment data in relationship to other pertinent topics (e.g., forest management activities, rare species, forest interior wildlife species, species in greatest conservation need, key habitats, game species), the team, with input, review, and approval from field staff, identified 12 future patches for forest patch management emphasis. These 12 forested patches are in either upland deciduous (4) or lowland conifer (8) cover type groups and are intended to be managed on a normal or extended rotation schedule. These designated patches include 4 large patches, 4 medium large patches, and 4 medium sized patches. Not every patch has stands designated for treatment during this planning period.

Table 3.1j provides a brief summary of the 12 designated patches. A unique code identifies each patch within the AP FIM dataset that provides a general idea of the patch direction. An example of an AP designated patch code definition is as follows:

FPXYY: **F** = future patch (the group of stands do not currently meet patch definition; management is directed towards a desired future patch condition; if the group of stands do currently meet the patch definition the "F" is dropped from the code).
P = patch
X = short-term patch goal: **Y** = Young; **I** = Intermediate; **O** = Old
YY = patch type: **UD** = Upland Deciduous or **LC** = Lowland Conifer

Specific locations and the stands included in the 12 AP designated patches can be found in the AP 10-year FIM shapefile. A map showing general locations is in *Appendix M: Maps*.

Table 3.1j. AP Summary of designated patches.

Designated Patch Type	Patch Size Class	Tally	Acreage
FPILC	3	2	350
FPOLC	1	3	2,681
FPOLC	2	3	1,291
FPOUD	2	1	289
FPOUD	3	1	167
FPYUD	1	1	801
FPYUD	3	1	206
	Total	**12**	**5,785**

GDS-1D - Strategies

a. Apply management strategies that contribute to the long-term goal stated in (GDS-1D) above.

Group treatment activities within patches in close spatial and temporal proximity.

b. For stands outside of the designated patches, practice whole stand/community management to maintain or enhance existing patch size.

Look for opportunities to build or retain patches that are lacking on the landscape as displayed in tables 3.1h through 3.1j above.

When adding unplanned stands, consider their relationship to the initial patch assessment (i.e., Does the unplanned stand complement or hinder identified patch goals?).

c. When possible, cooperate with other landowners in patch management to maintain existing large patches and increase the average patch size across multiple ownerships.

Efforts should be made to work with other landowners to identify other large patches not identified during this process.

GDS-1E. Rare native plant communities are protected, maintained, or enhanced.

Minnesota's native species and ecosystems have been evaluated and assigned an S or G rank based on the conservation status rank system developed by NatureServe[26] and its member programs and collaborators. The resulting statewide (S) and global (G) ranks best characterize each community's relative rarity or risk of elimination on the statewide or global scale (Table 3.1k). Example of rare or threatened plant

Table 3.1k. Statewide (S) and global (G) conservation rank definitions for native plant communities (NPCs).

Rank	Definition
S1	**Critically Imperiled**—Critically imperiled in Minnesota because of extreme rarity or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation.
S2	**Imperiled**—Imperiled in Minnesota because of rarity due to very restricted range, very few populations, steep declines, or other factors making it very vulnerable to extirpation.
S3	**Rare or Uncommon or Vulnerable**—Vulnerable in Minnesota due to a restricted range, relatively few populations, recent and widespread declines, or other factors making it vulnerable to extirpation.
S4	**Apparently Secure**—Uncommon but not rare; some cause for long-term concern due to declines or other factors.
S5	**Secure**—Common, widespread, and abundant in Minnesota
G1	**Critically Imperiled**—At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.
G2	**Imperiled**—At high risk of extinction or elimination due to very restricted range, very few populations, steep declines, or other factors.
G3	**Vulnerable**—At moderate risk of extinction or elimination due to a restricted range, relatively few populations, recent and widespread declines, or other factors.
G4	**Apparently Secure**—Uncommon but not rare; some cause for long-term concern due to declines or other factors.
G5	**Secure**—Common; widespread and abundant.

Appendix J: Native Plant Communities in the AP Subsection provides a list of Native Plant Community (NPC) Types and Subtypes and associated Conservation Status Ranks known or likely to occur in the AP Subsection.

Note: As MCBS and native plant community interpretations progress across the AP Subsection S and G-ranks will be revisited and refined as justified[27].

Locations of the rare native plant community types and subtypes listed in *Appendix J* will be documented and may be assigned a relative rank for the quality of the NPC occurrence.

[26] NatureServe - In cooperation with the Network of Natural Heritage Programs and Conservation Data Centers. 2002. Element Occurrence Data Standard. Arlington, VA.

[27] Minn. DNR 2008. Conservation Status Ranks for Minnesota Native Plant Communities (October 2008). Minnesota Department of Natural Resources – Division of Ecological Resources. St. Paul, MN 55155.

Generally, NPCs are ranked for quality based on factors associated with size, condition, and landscape context. The relative quality of the NPC is assigned on a continuum from “A” through “D”, with an “A” rank indicating an excellent quality NPC, and a “D” rank indicating a poor quality NPC. The Conservation Status Ranks for S or G ranked communities do not address relative quality although it is generally true that “A” quality examples are rarer than lower quality examples for any given NPC type or subtype.

Because the MCBS is the primary source for NPC data and MCBS prioritizes survey efforts within MCBS sites, most documented locations of rare NPCs are within MCBS sites. However, as more NPC data is collected by other DNR Divisions and cooperators, more locations of rare NPCs outside MCBS sites will be documented.

GDS-1E - Strategies

a. Complete the Minnesota County Biological Survey (MCBS) in this Subsection.

Document known locations of NPCs with statewide and global ranks of critically imperiled (S/G-1) or imperiled (S/G-2), and those NPCs with S or G ranks of S/G-3 to S/G-5 that are rare or otherwise unique in the Subsection. Complete the quality ranking analysis for each of these plant communities. Make this data readily available for use by DNR personnel.

Table 3.1l. State and global imperiled or critically imperiled NPCs found in the AP Subsection and their associated ranks.

NPC	S-rank (State)	G-rank (Global)
FDw24	S2	
FPs63a	S2S3	G2G3
MHw36	S2	
OPp93a	S2	G2Q
UPn12a	S1	G2G3
Upn12b	S2	
UPn12c	S1	G2G3
Upn13		G1 or G2
UPn13b	S1S2	G2
UPn13c	S1	G1 or G1G2
UPn23a	S2	G2G3
UPn23b	S2	G2G3
UPn24b	S1	
WMp73	S3	G2G3
WPn53	S2	G2G3

b. Manage known locations of critically imperiled (S/G-1) or imperiled (S/G-2) NPCs, and those that are rare statewide or with limited occurrences in the Subsection to maintain their ecological integrity.

Where rare NPCs occur, vegetation management within and adjacent to these NPCs will protect, maintain, or enhance the ecological integrity of NPCs. Some NPCs of concern are best managed by avoidance, while others are best maintained or enhanced by using

appropriate harvesting or other management activities. Work closely with our state-wide and federal cooperators on all management activities that will affect these communities.

c. Ensure adequate training for Department personnel in the use of the *NPC Field Guide* and ECS silvicultural interpretations.

DNR personnel have been trained in the use of the "Field Guide to the Native Plant Communities of Minnesota: The Prairie Parkland and Tallgrass Aspen Parklands Province" for identification of NPCs. Additional materials, such as the DNR ECS silvicultural interpretations, will also be used to guide management.

GDS-1F. Maintain or enhance biodiversity on MCBS sites of biodiversity significance.

MCBS sites range from 10s to 1,000s of acres in size. These sites contain intact native plant communities, populations and/or concentrations of rare species, critical animal habitat, and/or functional landscapes representative of pre-European settlement Minnesota. The MCBS "site" provides a geographic framework for evaluating and communicating statewide and regional biodiversity significance. Important factors influencing MCBS site ranks include:

1. Rare species occurrences;
2. Native plant community (NPC) quality, rarity, and size; and,
3. Landscape context and presence/absence of landscape-level functions.

In order to provide a relative measure of how sites of *biodiversity* compare to each other, MCBS sites are ranked according to the four levels described below.

O - OUTSTANDING. These MCBS sites contain the best occurrences of the rarest species, the most outstanding examples of the rarest native plant communities, and/or the largest, most intact functional landscapes present in the state.

H - HIGH. These MCBS sites contain the "best of the rest," such as MCBS sites with very good quality occurrences of the rarest species, high quality examples of the rarest native plant communities, and/or important functional landscapes.

M - MODERATE. These MCBS sites contain significant occurrences of rare species and/or moderately disturbed native plant communities, and landscapes that have a strong potential for recovery.

B - BELOW MCBS MINIMUM BIODIVERSITY THRESHOLD (BMT) FOR STATEWIDE SIGNIFICANCE. These MCBS sites lack significant populations of rare species and/or natural features that meet MCBS minimum standards for size and condition. These include areas of conservation value at the local level, such as habitat for native plants and animals, corridors for animal movements, buffers surrounding higher quality natural areas, and open space areas.

Sites of biodiversity significance serve as ecological reference areas that help us:

1. Improve our understanding of ecosystem form and function;
2. Improve our understanding of Minnesota's native biodiversity;
3. Evaluate the effects of management on biodiversity, rare species, native plant communities, and ecosystem form and function; and,

4. Identify areas to be managed as high conservation value forests (HCVF).[28]

The MCBS site boundaries are influenced by land-use history and/or notable differences in landforms, native plant communities, rare species occurrences, and/or ecological classification system units (e.g., subsections).

MCBS biodiversity significance guidelines are applied statewide. Biodiversity significance rankings for some sites will be updated as survey work proceeds across the state to reflect new information and our growing understanding of Minnesota's native biodiversity.

The MCBS is currently at various stages within the AP planning area. Kittson, Marshall, Pennington, Red Lake, and Roseau counties have been completed. Polk, Clearwater and Beltrami counties are currently in-progress. See process description in Section 5.4 on page 5.15, *Preliminary Issues and Assessment:*

http://files.dnr.state.mn.us/forestry/subsection/aspenparklands/prelim_issues_assess.pdf

Based on MCBS survey work completed as of August 2010, Table 3.1m provides a summary of biodiversity significance and survey priority rankings for MCBS sites that include state lands. *Appendix M: Maps* contains a map of MCBS sites of biodiversity significance.

Table 3.1m. Summary of biodiversity significance rankings for MCBS sites that are associated with state administered lands (August 2010).

Rank	Number of MCBS Sites[29]	Total MCBS Site Acres	State Forest land Acres[30]	Timber Land Acres[31]	10-Year Stand Exam List Acres[32]
O	93	116,162	85,543	20,698	10,683
H	575	100,082	62,072	18,539	7,472
M	387	132,740	71,138	18,604	8,140
B	104	91,593	64,414	17,685	7,308
Total	**1,159**	**440,577**	**283,168**	**75,526**	**33,605**

The DNR has developed an interim approach that uses MCBS sites of outstanding and high biodiversity significance to help identify a pool of candidates sites to be managed as High

[28] DNR's commitment to manage for a broad set of objectives and forest resources coincides with Principle 9 in the Forest Stewardship Council™ (FSC)® Forest Management (FM) Standard, which requires certificate holders to identify High Conservation Value Forests (HCVFs) and manage such areas to "maintain or enhance" identified High Conservation Values (HCVs). FSC broadly defines HCVFs as *"areas of outstanding biological or cultural significance."*

[29] Includes all MCBS sites that comprise portions of State Administered lands within the planning area. Acres represented of MCBS sites includes those portions that extend outside of State Administered lands.

[30] Portions of MCBS sites that overlap *Forestland*, which consists of all DNR administered lands included in the forest inventory from aspen to stagnant conifers, muskeg, lowland brush, and lakes.

[31] Portions of MCBS sites that overlap *Timberland,* includes those cover types that are capable of producing merchantable timber and are available for timber management, meaning they are not withdrawn from management based on land administrator (ex. State Parks) or by reserve status such as old growth.

[32] Portions of MCBS sites that overlap stands on the 10 year Stand Exam list.

Conservation Value Forests (HCVFs). Within areas being managed as HCVFs, forest certification standards require the DNR to maintain or enhance all high conservation values identified for the site. These standards also require monitoring of the identified high conservation values, especially as management is applied, to insure that these values are maintained or enhanced over time.

Management activities such as timber and biomass harvesting, site preparation, access route construction and maintenance, and tree planting will occur on forestry and wildlife administered lands within MCBS sites following the guidance and directions contained in Chapter 3 – General Directions Statements and Chapter 4 – Cover type Management Recommendations. Management activities carried out on MCBS sites will emphasize the following strategies to help minimize the loss of the factors on which the MCBS sites were ranked.

GDS-1F - Strategies

a. Determine which MCBS sites are of greatest concern or importance for AP SFRMP over the 10-year planning period.

The MCBS sites of greatest concern or importance for AP SFRMP were determined to be those MCBS sites with state lands that have a biodiversity significance rank of Outstanding or High. These MCBS sites represent the best known occurrences of existing biodiversity significance, so they provide the greatest opportunity to sustain or minimize the loss to native biodiversity.

b. Consider the broader context and significance of MCBS sites as a whole when assigning management objectives, and designing silvicultural and other prescriptions.

Management decisions will incorporate connections between stand-level actions and their effect on a site's biodiversity significance. Final management objectives will be carried out consistent with the Coordination Framework.

c. Determine location and composition of stand conversions based on NPCs.

Managers will determine the NPC class for stands planned for conversion, site preparation, and development activities using the "Field Guide to the Native Plant Communities of Minnesota: The Prairie Parkland and Tallgrass Aspen Parklands Province". Additional information to help determine in which NPC class a stand is located will become available as MCBS completes NPC mapping for MCBS sites of outstanding and high statewide biodiversity significance, and as various other efforts continue to expand the collection and application of NPC data in Minnesota. Final management objectives will be carried out consistent with the Coordination Framework.

The *NPC Field Guide* and associated ECS silvicultural interpretations[33], *Appendix J: Native Plant Communities*, and other resources will help managers determine appropriate management direction for the identified NPCs.

[33] http://www.dnr.state.mn.us/forestry/ecs_silv/interpretations.html

Whenever possible and practical, commercial timber products should be utilized in conjunction with conversion of a site. Manage stand cover type conversions with less intensive site preparation.

d. Allow some stands to succeed to the next native plant community growth stage, with or without harvest or other management activity.

Most likely candidates for succession will be stands that contain adequate regeneration stocking levels and structural characteristics for the site to convert to a later growth stage. Other candidates would include stands whose location, condition, or rare species occurrences are critical factors to a site's biodiversity significance.

e. Emulate the within-stand composition, structure, and function of NPC growth stages when managing stands in MCBS sites.

Determine which species to harvest and retain and the spatial and temporal arrangement of them based on NPC succession and disturbance ecology. DNR Forestry's ECS silvicultural interpretations will be an important resource to assist in making the link between stand-level considerations and NPC ecology.

Examples include:

- Coarse woody debris and snags – species, size class distribution, spatial distribution, availability through time;
- Leave trees and legacy patch selection and design are influenced by how the NPC would have been disturbed under natural conditions;
- Diameter classes in uneven-aged managed stands reflect the range and abundance expected for the NPC;
- Use silvicultural techniques during forest management activities to recruit desired species through natural regeneration – leave trees that are likely to produce seeds, leave and remove trees that help create/maintain microclimate conditions favorable to seedling establishment and growth; and,
- Use silvicultural techniques that take advantage of opportunities to increase recruitment of desired species from adjacent stands of the same and adjacent native plant communities

f. Apply variable retention harvest techniques during harvest.

The main objectives of variable retention are to retain the natural range of stand structure and forest functions. With retention systems, forest areas to be retained are determined before deciding which areas will be cut. Standing trees are left in a dispersed or aggregate form to meet objectives such as retaining NPC form and function, old-growth structure, habitat protection, and visual qualities. Variable retention retains structural features (e.g., snags, large woody debris, and live trees of varying sizes and canopy levels) as habitat for a host of forest organisms. (See legacy patches recommendations in *MRFC Voluntary Site-level Forest Management Guidelines, Wildlife Habitat Section, pages 43-47.)* During harvest, retain tree species and diameters present at older growth stages, in clumps or dispersed, to more closely replicate pattern after natural disturbance. Include retention of large, downed logs. For example: Leave legacy patches throughout the stand; islands of residual vegetation that include tree species present at older growth stages.

g. Designate some stands as ERF to provide old forest conditions.

ERF designated stands will help maintain old forest conditions within MCBS sites and will retain older growth stages on the landscape for longer periods of time than stands managed as normal rotation forests. When ERF stands are harvested within MCBS Sites make efforts to retain the older forest components that are present in the stand or retain features that allow older forest components to continue developing.

h. Increase the use of prescribed fire as a management technique in fire-dependent NPCs.

Prescribed fire will be used in fire dependent communities to restore, maintain, and enhance the diversity of these systems. The restoration of a fire dependent community may require the unit to be burned more frequently and more intensely than what was historically documented, however once a community has been restored to the desired growth stage, managers will maintain that community by burning close to the historic fire return interval and intensity. Managers will also adjust the seasonality of prescribed fire applications to achieve the fire effects necessary to maintain the native plant community. For example, grassland fires historically occurred throughout the snow-free dormant and growing seasons under a wide variety of conditions. Managers of these systems should attempt to vary the time of year under which a unit is burned, so that they maintain a site's diversity. The variation in season and on the ground conditions under which a piece is burned creates a mosaic of burned and unburned areas, variable fire intensity, and helps to maintain species diversity by not favoring certain species.

i. Locate roads to minimize fragmentation of a MCBS site.

Roads contribute to an increase in ecosystem fragmentation and an increase in terrestrial invasive species abundance. All efforts should be taken to minimize new road construction and enlarging existing roads/trails within MCBS sites.

j. Apply special management recommendations for known rare features.

Rare features include rare plants, rare animals, and their habitats. Additional rare feature locations are likely to be discovered in the Subsection. Management activities will be carried out in a manner that protects, maintains, or enhances rare features according to DNR policy and state statute.

k. Defer management of some stands that have been identified as having important unique features for further assessment (e.g., EILC, nominated natural areas, and rare or representative ecosystems).

Reasons that may lead to a recommendation to defer a stand from treatment include nominated old-growth, rare native plant communities, rare species habitat, or significant negative impacts to a site's biodiversity significance.

l. Consider timber productivity, Trust Fund responsibilities, and other forest management priorities when managing stands in these MCBS sites.

Land status and timber productivity will be considered while implementing the other strategies on stands identified for management. Areas will follow DNR policy regarding replacing stands that are deferred from treatment. Other Divisions will have an opportunity to review proposed preliminary MCBS sites as described in the *Coordination Framework*.

MCBS sites that have been recommended to be managed as HCVFs will be managed to maintain or enhance identified high conservation values. MCBS sites that are not formally identified to be managed as HCVF are no longer subject to the noted certification standards (i.e., maintain, enhance, and monitor HCVs). However, the GDS-1F Strategies will continue to apply to these sites. In addition, many high conservation values will be maintained under other existing DNR policy and state statutes. DNR's approach to managing and monitoring HCVFs will continue being developed and refined over the life of the plan,

m. Department personnel will communicate with other landowners, as opportunities arise, to inform them of the significance of these MCBS sites and management options that could be implemented to address the biodiversity objectives of these MCBS sites.

The intent of this strategy is to provide information on the MCBS sites and cooperate in land management across ownerships in the landscape when possible and agreed upon by the landowners affected. It is not meant to imply or mandate how other landowners should manage their lands.

For example:

1. DNR staff will implement stand-level management activities that achieve landscape-level biodiversity goals and objectives across ownerships;
2. When assisting private landowners with woodland stewardship plans, information on the biodiversity significance of these MCBS sites and recommended management strategies will be provided; and,
3. MCBS personnel will communicate and deliver information about priority MCBS sites of biodiversity significance to other landowners within these MCBS sites.

3.2 Age Class Distribution

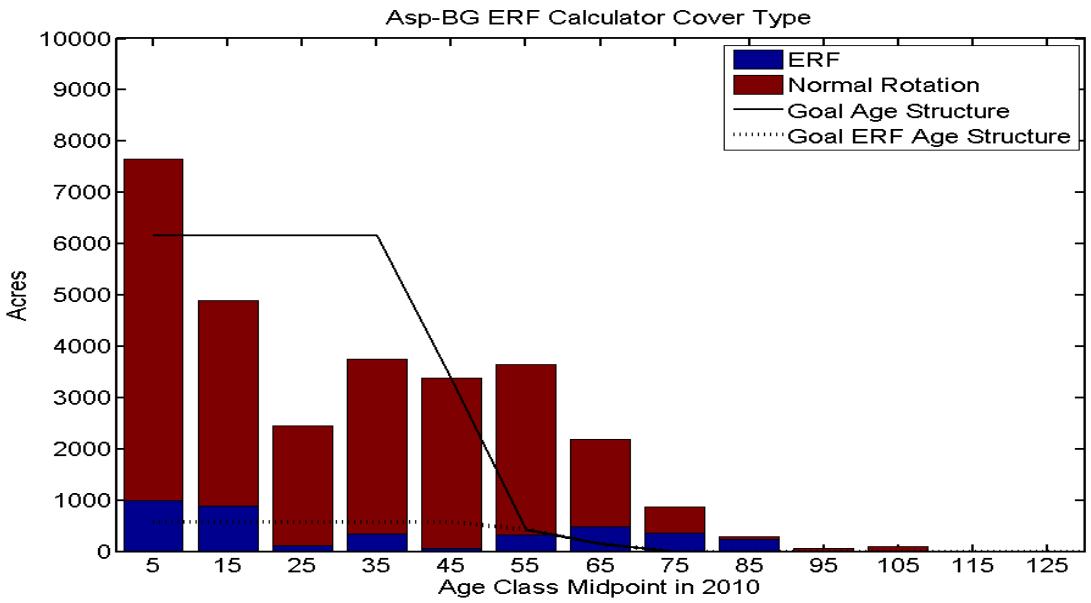
GDS- 2A. Even-aged managed cover types will move toward a balanced age class structure.

A balanced age class structure has relatively equal acres in each 10-year age class out to the normal rotation age. A goal is to provide an even flow of wildlife habitat and timber harvest. A steady supply of these resources over time is important to wildlife, recreation, the forest products industry, and the local economies that depend on them.

The current age class distributions of the aspen/balm of Gilead cover types vary by the category with more acreage in the young age classes for “T” and “O” stands and the “S”, “R” and “C” stand acreage concentrated in the middle age classes. The age class distributions for the lowland conifer SI groups are currently imbalanced and contain mostly middle and older aged stands. Because of the relatively small total acreage of these lowland conifer groups and the size of individual stands, it is not possible to fully balance these age class distributions over time but improvements can be made in the future. After the first two decades of accelerated harvest, a goal is to minimize large fluctuations in the overall harvest level to the extent possible.

Figure 3.2.a, for example, shows the current age class distribution of the aspen/balm of Gilead cover type “T” and “O” stands and the desired future forest composition (DFFC) or goal of an even age class distribution. The graph includes current conditions and goals for both cover type acres managed under normal rotation ages and extended rotation ages.

Figure 3.2a. Comparison of current aspen/balm of Gilead "T" and "O" stands age class distribution to the desired age class distribution.



The following strategies will be implemented to move even-aged managed cover types toward a balanced age class distribution.

GDS-2A - Strategies

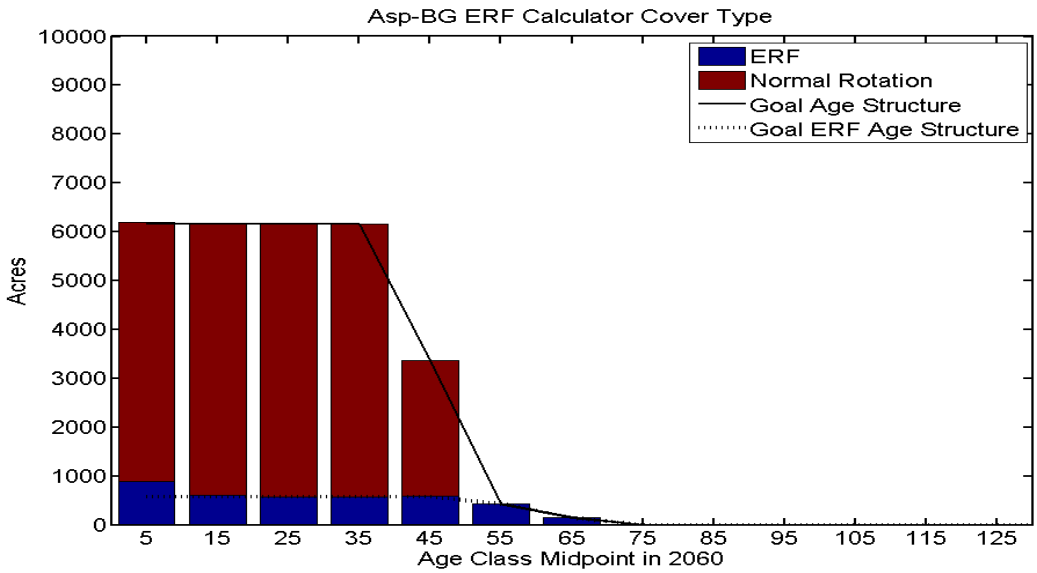
a. Target the selection of stand treatment acres to the appropriate age classes.

The Remsoft model was used to attempt to balance age classes by selecting stands from specific age classes based on criteria developed during the planning process, including normal rotation age, maximum rotation age, and ERF percentage. Achieving a balanced age class distribution for the lowland conifer SI groups was not possible for reasons mentioned above.

GDS-2B: ERF stands in even-aged managed cover types will move towards a declining age class structure from the normal rotation age to the maximum rotation age.

DNR guidance to AP SFRMP teams requires the development of a declining age class structure from normal rotation age to the determined maximum rotation age for each even-aged managed cover type. Figure 3.2b shows an example for the aspen/balm of Gilead cover type "T" and "O" stands DFFC for the AP Subsection.

Figure 3.2b. Desired age class structure for the aspen/balm of Gilead cover type.



The ERF goal for this cover type is to have 3 percent of the acres over NRA (effective ERF) with a declining age class distribution from NRA (45 years) out to the MRA (65 years). Figure 3.2b illustrates the tapering off of the age class distribution after age 40 because of the actual NRA being 45 (i.e., the mid-point of a ten-year age class). Achieving the desired declining age class structure requires harvest to occur between the NRA and the MRA.

ERF stands, when they are beyond the NRA (3 percent of the cover type acreage in this example), will provide old forest habitat, recreational opportunities of older forests, and opportunities for large-diameter timber product management.

The following strategies will be used to achieve the desired declining age class structure in even-aged managed cover types:

GDS-2B - Strategies

a. Prescribe ERF stands within even-aged managed cover types so that each age class will be represented to produce a sustainable amount of old forest over time.

Area field staff selected stands to designate as ERF to meet ERF goals. These selections were then reviewed and approved by the AP SFRMP team. Old forest conditions in even-aged managed cover types will be achieved by designating some stands in each of these cover types for ERF management. In addition to evenly distributing the designation of ERF stands among age classes, spatial considerations (e.g., patch management) will be used to develop and maintain desired old forest conditions. See GDS-1A.

b. Target ERF treatment acres to the appropriate age classes to move toward the declining age class structure after normal rotation age.

The Remsoft model provided for the achievement of old forest conditions by harvesting appropriate acreages from each age class of ERF over normal rotation age. The remaining un-harvested acres will contribute to old forest conditions until they reach the maximum rotation age.

GDS-2C. NPCs will be managed to include representation of all historically occurring growth stages.

Growth stages incorporate both horizontal and vertical developmental stages (stand structure changes over time) and successional stages (species composition changes over time) that occur after a disturbance. For example, in the Northwestern Wet Aspen Forest (WFw54) NPC, there are three growth stages (young, mature, and old).[34] In the past, growth stages developed through natural disturbances such as wind and fire. Now, growth stages additionally are emulated through forest and habitat management activities such as timber harvest, prescribed burns, shearing, and forest development activities.

These growth stages are very important to the wildlife species that inhabit these plant communities. Wildlife habitat and the species occurrence can vary with growth stage, for example, woodcock may use the early growth stage of WFw54 for feeding while the mature and old growth stages would likely be more important as white-tailed deer and elk winter cover. Forest songbird populations will change in WFw54 as the community matures, and will become more diverse as the structure becomes more complex with time.

The plan will not establish acreage goals for growth stages by ecosystem type or native plant community. The strategies in the plan will provide representation of all NPC growth stages. Stands can also be managed to maintain the existing growth stage or assist in moving the stand to the next older or youngest growth stage. Strategies for NPCs are listed below. In addition, the *NPC Field Guide*, and the ECS silvicultural interpretations can provide options for accomplishing these goals.

GDS-2C. - Strategies

a. Determine growth stages of stands selected for treatment in the AP Subsection.

Stands in this plan will be classified to NPC per DNR policy. Encourage the use of growth-stage information in developing stand management prescriptions.

b. Strive to emulate the within-stand composition, structure, and function of NPC growth stages when managing stands.

Focus on NPCs where enough information was available to describe growth stages.

c. Consider the contribution of non-timber land cover types (e.g., stagnant conifer types), inoperable stands, and reserved areas (e.g., old growth, SNAs, state parks) in providing representations of growth stages.

[34] Minn. DNR, 2005, *Field Guide to Native Plant Communities of Minnesota: The Prairie Parkland and Tallgrass Aspen Parklands Province*. Ecological Land Classification Program, Minnesota County Biological Survey, Natural Heritage and Nongame Research Program. Minnesota Department of Natural Resources St. Paul, MN 55155.

d. Designate representative sample areas (RSAs) and high conservation value forests (HCVFs) per DNR direction.

e. Apply ECS silvicultural interpretations to management decisions.

GDS-2D. Young, early-successional forest will be represented as it historically occurred.

The 0-30 age group of aspen and balm of Gilead cover types represents young, early successional forest in the context of this GDS. The desired long-term cover type acres and balanced age class distribution for T, O, S, and R stands in these cover types will determine the amount of young forest planned to be sustained over time. Currently, these two cover types comprise 85,958 acres. Because of the goal to increase the acreage of grass and brush cover types in these Subsections, the long-term result of applying the plan strategies will be that these early successional cover types will comprise 69,731 acres. Currently, the 0-30 age group of aspen and balm of Gilead cover types comprise 50 percent of the total acres in these two cover types. When a balanced age class is achieved, and conversions have been accomplished, the 0-30 age group will comprise 78 percent of the total acres in these two cover types. See tables 3.2a-c, following:

Table 3.2a. AP early-successional forest cover types – acres by decade.

AP Early-Successional Forest Cover type Acres						
Cover type	**Current**	**1st Decade**	**2nd Decade**	**3rd Decade**	**4th Decade**	**5th Decade**
Aspen/BG	85,958	77,830	70,109	69,948	69,871	69,731

Table 3.2b. AP acres of young forest in early-successional cover types by decade

AP Young Forest – Acres of Cover Type Under 30 Years Old						
Cover type	**Current**	**1st Decade**	**2nd Decade**	**3rd Decade**	**4th Decade**	**5th Decade**
Aspen/BG - T&O	15,003	18,819	20,079	18,571	18,460	18,509
Aspen/BG - S	7,518	10,630	12,488	13,306	11,051	11,051
Aspen/BG - R	13,008	22,025	24,595	24,595	24,595	24,595
Aspen/BG - C	7,761	3,874	0	0	0	0
Total	43,290	55,348	57,162	56,472	54,106	54,155

Table 3.2c. AP percent of young forest in early-successional cover types by decade.

AP Young Forest – Percentage of Cover Type Under 30 Years Old						
Cover type	**Current**	**1st Decade**	**2nd Decade**	**3rd Decade**	**4th Decade**	**5th Decade**
Aspen/BG T&O	51%	65%	70%	65%	65%	65%
Aspen/BG - S	45%	64%	75%	80%	67%	67%
Aspen/BG - R	53%	90%	100%	100%	100%	100%
Aspen/BG - C	50%	51%	0%	0%	0%	0%
Total	50%	71%	82%	81%	78%	78%

Regulated harvest of aspen and balm of Gilead cover types will ensure that young, early-successional forest will be adequately represented over time. Stands retained in these cover types will be managed to move towards a more balanced age class structure than currently exists, which will provide a more consistent amount of young forest over time. Most of the harvest in these cover types will occur through clearcut methods. Harvest prescriptions and other habitat management treatments will attempt to mimic the wildfires and wind events that occurred naturally. Maintenance of existing large patches and creation of additional large patches in the future will be accomplished by grouping of harvest activities and using a variety of harvest sizes. For aspen and balm of Gilead the emphasis will be on maintaining an adequate amount of young age classes on the landscape through a regulated harvest level.

GDS-2D - Strategies

a. Move aspen and balm of Gilead cover types toward a balanced age class structure.

b. Maintain young, early successional forest in a variety of patch sizes to provide habitat for the associated species.

A variety of harvest sizes will be used while maintaining existing large patches and creating opportunities for large patches in the future by grouping of harvest activities.

3.3 Within-Stand Composition and Structure

GDS-3A. Species, age, and structural diversity within stands will be representative of the native plant community and growth stage.

Diverse stands are more resilient to perturbations than less diverse stands. A stand with a mix of species and ages provides habitat for a wider variety of associated species while providing a diversity of forest products. The net economic, social, and ecological values and functions of most stands are related to the composition of trees, shrubs, ground flora, and structural characteristics. Structural characteristics include the sizes (diameter and height), abundance and distribution of overstory trees understory vegetation, and their arrangement (scattered or clumped) within the stand. Structural characteristics also include the presence or absence of snags and coarse woody debris and how these features are distributed through space. Retaining large-diameter structures provide micro-sites for seed germination, cavities for nesting and den sites, and important escape and nesting cover within stands.

Some plant communities can naturally exhibit low species diversity. Low tree species diversity can be natural and has occurred historically in peatlands and in association with large-scale disturbances, particularly fire.

GDS-3A - Strategies

a. Use selective harvesting to encourage diversity of species, ages, and stand structures.

See the cover type management recommendations in Chapter 4.

b. Implement the *MFRC Site-Level Guidelines* designed to maintain a diversity of tree species within a stand.

The *MFRC Site-Level Guidelines* provide direction on retaining leave trees and snags, conifer retention and regeneration and timber stand improvement (TSI) activities, among others.

c. Use the *NPC Field Guide* [35], site index (SI), soils data, and ECS silvicultural interpretations to aid in determining the species composition and structure most appropriate for the site.

d. Reserve seed trees in harvest areas and site preparation areas, where possible.

Resistance to windthrow, insect and disease risks, and the quality, number, and distribution of seed trees must all be considered when selecting seed trees. This may be accomplished by:

1. Timber harvesting techniques and site preparation methods that expose mineral soil may be used on some sites to facilitate natural seeding; and,
2. Select seed trees that have the potential to survive to produce seeds.

e. Use the least intensive site preparation methods possible to ensure success.

Site preparation can create conditions favorable to invasive species and alter structural diversity in the ground layer. Striving to minimize site preparation intensity will minimize these threats.

f. Use harvest systems or methods that protect advance regeneration. Retain conditions that favor regeneration and understory initiation.

When it is desirable to protect the existing seedlings and saplings in a stand, timber sale regulations will specify outcomes to protect these regenerating trees. In some cases, portions of the stand will be delineated to protect regeneration by restricting harvest activity in those areas. To enhance seedling recruitment of some species, a partial canopy may be retained to meet needed moisture and light requirements of the seedlings.

g. Identify some stands where succession is allowed to occur to encourage development of within-stand diversity. Movement to the next successional stage may be achieved with or without harvest.

Use field evaluation of stands to determine if a stand should be allowed to succeed to the understory species. This strategy will meet some of the forest composition change goals. Consult the *NPC Field Guide* and ECS silvicultural interpretations for help in reaching these decisions.

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[35] Minn. DNR, 2005, *Field Guide to Native Plant Communities of Minnesota: The Prairie Parkland and Tallgrass Aspen Parklands Province*. Ecological Land Classification Program, Minnesota County Biological Survey, Natural Heritage and Nongame Research Program. Minnesota Department of Natural Resources St. Paul, MN 55155.

h. Manage seeded stands to represent the array of plant diversity.

Seeded stands will be managed to meet forest management and biodiversity goals. This may be accomplished by:

1. Accepting lower stocking levels of seeded species if other desirable species are present;
2. Planting or seeding mixed species appropriate to the site; and,
3. Use the least intensive site preparation necessary to successfully regenerate the site, while favoring retention of the existing ground-layer plant species.

i. Use ERF in some even-aged managed stands to encourage greater structural diversity.

j. Encourage fruit and mast-producing species.

Follow the *MFRC Site-Level Guidelines* for retaining and enhancing hard and soft mast (fruit) production.

3.4 Timber and Biomass Productivity

GDS-4A. Timber and biomass productivity will be increased

Timber productivity refers specifically to the capacity of land to grow timber volumes, but the term also encompasses the quality of wood produced. DNR Forestry lands, a small portion of the lands in this Subsection, are required to be managed for multiple uses including timber but also wildlife habitat, recreational opportunities, watershed protection, aesthetic, historical and ecological values. However, 98% of the DNR land in this Subsection is managed by DNR Wildlife, which, by statute, must be managed primarily for wildlife habitat. Timber harvest can be part of the overall habitat management strategy on Wildlife lands but not a primary goal. Timber quality and productivity, therefore, would be a secondary benefit on Wildlife lands.

Increasing the timber productivity on State Forest lands is a way to maintain or increase current harvest volumes and improve timber quality, while continuing to manage most state lands in this Subsection with little emphasis on timber. Increases in timber productivity can be achieved during this 10-year plan by establishing new aspen management regimes based on age classes and focusing productivity efforts on those age classes most likely to produce timber products, reducing exposure to intense fire, increasing intermediate stand treatments, converting to site-appropriate species, and continuing to protect soil productivity by applying the *MFRC Site-Level Guidelines*.

GDS-4A - Strategies

a. Manage the aspen cover type under five management regimes: Timber (T) (45 years and older), Short-Rotation (S) (age 20-44), Regeneration (R) (under age 20), as well as Other (O) and Conversion (C) (to be converted from aspen type to oak or other non-forest cover type)

The aspen cover type was divided into management regimes, based on desired future conditions and conversion feasibility, to better meet wildlife habitat composition and structure needs as well as timber and biomass demands. Timber (T) and Short-Rotation (S) age classes will be managed primarily through harvest of timber or biomass products, while Regeneration (R) stands will be managed through biomass harvest or by non-consumptive treatments such as mowing, shearing or fire. Other (O) and Conversion (C) stands may offer an opportunity for harvest as part of the treatment leading to converting the stands to another cover type.

b. Minimize damage to forests from prescribed fires and wildfire.

Wildfires and prescribed burning can damage the cambium which, if it doesn't kill the tree, leads to rot, char and reduced quality. Adjust boundaries of prescribed burn units to exclude large blocks of land managed as Timber (T) and Short-Rotation (S) stands. Work to reduce fire intensity so that negative impacts to forests are minimized and quality and marketability are maintained.

c. Harvest even-aged managed non-ERF stands at their normal rotation age

Timber quality and quantity declines as older age classes lose merchantable volume to decay and mortality before harvest. This negatively impacts logging and forest products industries as the decrease in useable volumes results in higher stumpage rates for timber producers and higher procurement, chemical, and waste management costs for the forest products industries. Timber producers buy state timber in a competitive bidding process, which drives up base stumpage rates during times of decreasing timber availability. Forest products industries compete in a global market where the associated costs of using low-quality wood are an important factor in their ability to remain competitive.

Harvesting at normal rotation age captures volume at peak quality and growth rate, providing optimum value and productivity. However, deviations from the normal rotation age may be required to best move stands towards the desired balanced age class distribution.

d. Thin or selectively harvest in some birch, red pine, lowland hardwoods, ash, and oak stands to capture mortality and/or increase growth rates.

These treatments may be prescribed for both normal rotation stands and ERF stands. Thinning in jack pine types may be considered on appropriate NPCs, with the intention of meeting specific SFRMP management objectives. The amount of thinning will depend on whether stands meets merchantability criteria based on a field examination, and whether there are markets for the timber or biomass products.

e. Increase productivity of stands managed for timber through silvicultural treatments.

Some forest types could benefit from application of silvicultural techniques designed to improve productivity. Dense stands can benefit from careful thinning to improve tree morphology and stand genetic characteristics. Thinning, whether pre-commercial or intermediate, will be consistent with the *MFRC Site-Level Guidelines* and will maintain adequate dead and down material for wildlife resources, protect riparian areas and preserve legacy patches.

Application of other silvicultural treatments designed to increase site productivity, such as release from competition, seeding, interplanting or site preparation, will be consistent with the *MFRC Site-Level Guidelines*.

Minimize the use of pesticides (e.g., herbicides and insecticides). When they must be used to control competing invasive vegetation or exotic forest insects and diseases on state lands, the following operational standards will be followed:

1. DNR Operational Order No. 59 - Pesticides and Pest Control;
2. Division of Forestry - Pesticide Use Guidelines;
3. Pesticide Labels;
4. Material Safety and Data Sheets for each pesticide and adjuvant being used or recommended; and,
5. *MFRC Site-Level Guidelines* relating to pesticide use

f. Respond to insect and disease problems to reduce negative impacts to timber productivity and quality. Monitor infestations of invasive species and, if necessary, treat in accordance with DNR invasive species guidelines.

GDS-4B. Biomass productivity will be maintained or enhanced.

Biomass fuel is an emerging market in Minnesota. Alternative energy sources are expected to grow statewide as energy production moves away from fossil fuels. Currently, biomass consumers are established only in some localized parts of northeast and east-central Minnesota. Biomass harvest in northwest Minnesota is limited to chipped or hogged logging and mill residues.

Open landscape vegetation such as prairie grasses, brush, and aspen suckers can be viable fuels for energy production, whether burned to produce steam for electricity or used for production of cellulosic ethanol. Open landscapes are commonly managed by mowing, burning or shearing, but some could be treated through biomass harvest. Dedicated biofuel harvesting equipment is still in the developmental stage.

Harvesting biomass at too frequent an interval can reduce site productivity by depleting soil nutrients and weakening plant vigor to the point where regeneration begins to decline. MFRC site level guidelines are in place for biomass harvesting on both forests and brushlands. These guidelines focus on how to protect the functions and values of resources during biomass harvesting activities. Implemented guidelines should minimize loss of site productivity.

GDS-4B - Strategies

a. Treat some stands through biomass harvest, in accordance with MFRC site level guidelines for biomass harvest.

3.5 Harvest Levels

GDS-5A. Treatment levels move cover types toward the desired age class structure.

SFRMP treatment levels reflect the number of acres that will be divided into annual stand examination lists and field visited over the 10-year period. After field visits, treatments may include timber harvest or wildlife habitat projects, inventory alteration (i.e., correcting or updating forest inventory data), forest development without harvest, or deferring treatment (treat in a future planning period).

Treatment levels were developed for this plan by considering the other GDSs, and specifically the following factors:

1. Age class imbalances for even-aged managed cover types;
2. Acres over rotation age;
3. Representation of young and old forest;
4. Planned increases or decreases in cover type acreages through conversion;
5. Wildlife habitat goals;
6. Supply of timber; and,
7. Criteria for uneven-aged management and thinning

Table 3.5a. Rotation ages for even-aged managed forest cover types.

Cover Type	Cover Type Subgroup	Merchantable Age*	Normal Rotation Age[36]	Maximum Rotation Age*
Aspen/balm of Gilead	"T" stands	35	45	65
Aspen/balm of Gilead	"O" stands	35	45	65
Aspen/balm of Gilead	"S" stands	35	45	45
Aspen/balm of Gilead	"R" stands	31/5	45/20	45/20
Aspen/balm of Gilead	"C" stands	31/NA	45/NA	45/NA
Tamarack	SI = 40 & above	50	80	120
Tamarack	SI<40	70	100	160
Black Spruce Lowland	SI<40	80	100	160
Black Spruce Lowland	SI = 40 & above	70	90	120
Oak	NA	35	80	170
Jack Pine	NA	35	50	70
White Spruce	NA	30	70	100
Balsam Fir	NA	40	50	60
Birch	NA	35	45	55
Red Pine	NA	30	100	150

[36] Merchantable and rotation ages were established for the first decade of the plan's implementation (1st number) and for subsequent decades (2nd number) (if applicable).

GDS-5A - Strategies

Following are descriptions and/or examples of how the above factors were considered.

a. Even-aged cover types

Age class imbalances
The long-term goal (DFFC) is to move toward a balanced age class distribution for modeled even-aged cover types with a declining distribution for the ERF designated stands in the lowland conifer groups and the aspen and balm of Gilead "T" and "O" stands. This goal was compared to the current age class distribution for all even-aged managed cover types. A Remsoft harvest-scheduling model was used to schedule harvest over the next 50 years for forest cover types with significant acreage managed under even-aged silvicultural systems. Treatment levels were developed to move the current age distributions closer to goals by the end of the 50-year planning period. At that time, most even-aged managed cover types will be closer to a balanced age class structure (see Figures 3.5a and 3.5b). Due to existing imbalances and the other considerations below, a balance will not always be achieved in 50 years.

Figure 3.5a. Current age class distribution of the aspen/balm of Gilead cover type "T" & "O" stands in the AP Subsection.

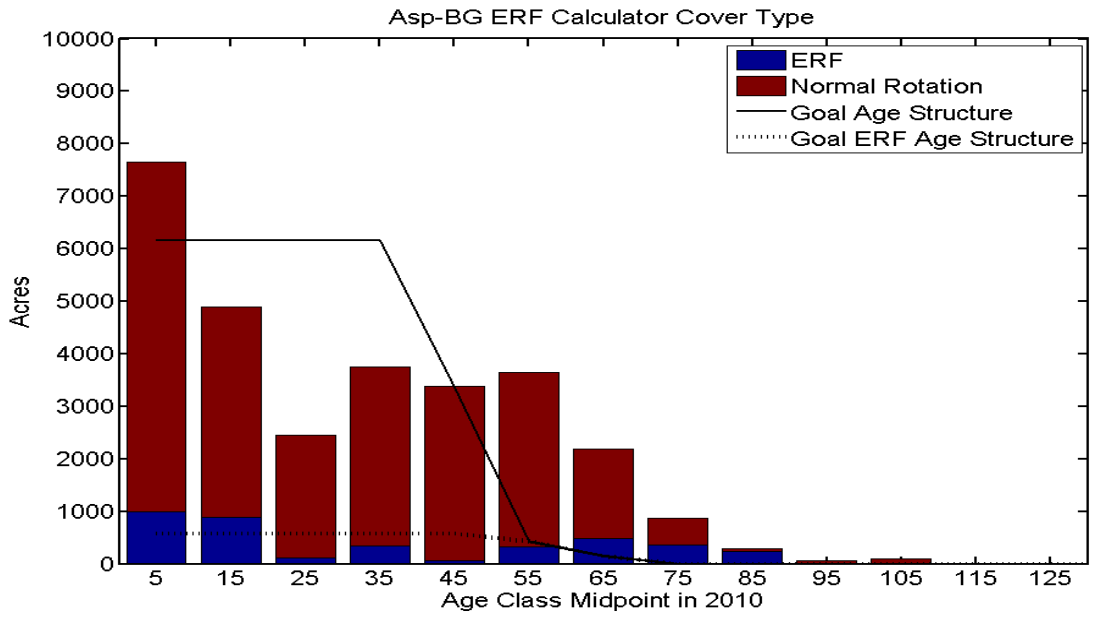
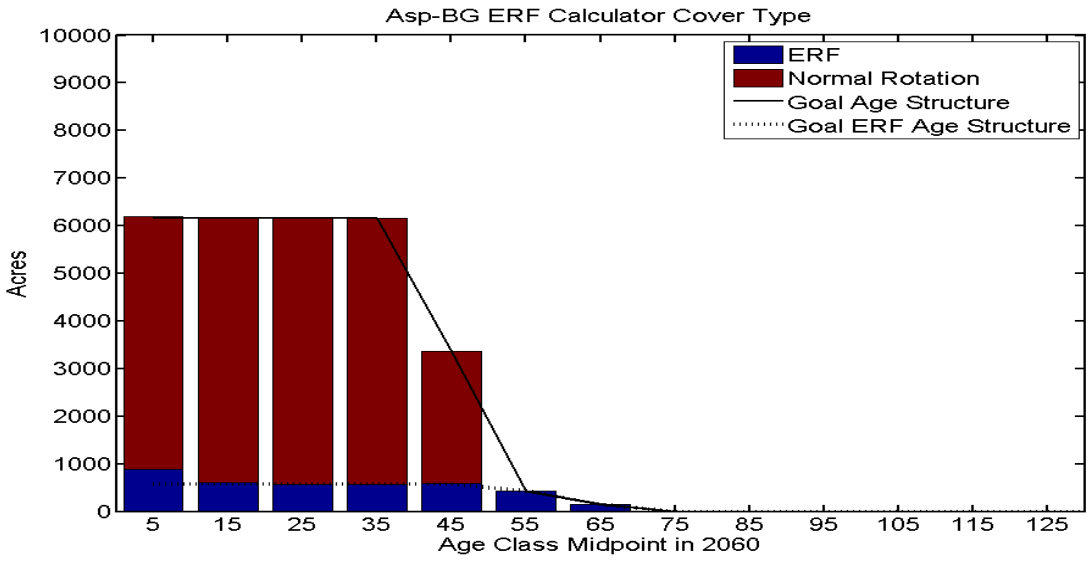


Figure 3.5b. Estimated aspen/balm of Gilead cover type "T" and "O" stands age class distribution in 2060 in the AP Subsection.



Treating stands older than normal rotation age

For SFRMP purposes, the *maximum rotation age* is the estimated maximum age at which a cover type will retain its biological ability to regenerate to the same cover type and remain commercially viable as a marketable timber sale. The Remsoft model, while generating the 10-year stand exam list, was allowed to select or skip stands that will reach or exceed maximum rotation age during 10-year planning period to optimize volume and generate even flow of timber over time. Table 3.5c focuses on acres of timber land over rotation age in the Subsection.

In most even-aged managed cover types, there are currently some acres beyond the normal and ERF rotation ages established by this plan. Several different ERF rotation ages were used for each cover type, as a way of achieving the desired declining age class distribution beyond the normal rotation age. Treatment levels were developed to address many of these acres in the next 10 years. This will effectively bring the average treatment age closer to the normal rotation age for the even-aged cover types. For some cover types in succeeding decades, the average treatment age increases as a result of holding stands longer to better balance the age class distribution over time. See Tables 3.5b and 3.5c.

Table 3.5b. Acres over rotation age by cover type.

Cover type	Rotation class	Planned rotation ages	Acres over planned rotation age**
Aspen/balm of Gilead	Normal	45	15,798
Aspen/balm of Gilead	ERF max*	65	3,091
Birch	Normal	45	88
Birch	ERF max*	55	11
Jack pine	Normal	50	36
Jack pine	ERF max*	70	16
White spruce	Normal	70	0
White Spruce	ERF max*	100	0
Balsam fir	Normal	50	72
Balsam fir	ERF max*	60	20
Tamarack – SI ≥40	Normal	80	519
Tamarack – SI ≥40	ERF max*	120	16
Tamarack – < 40	Normal	100	810
Tamarack – < 40	ERF max*	160	0
Black spruce, lowland – SI ≥40	Normal	90	0
Black spruce, lowland – SI ≥40	ERF max*	120	0
Black spruce, lowland – < 40	Normal	100	380
Black spruce, lowland – < 40	ERF max*	160	36

* The oldest age that even-aged managed ERF stands can be held.

** This table does not include acres currently under timber sale contract.

Table 3.5c. Average stand treatment age for modeled even-aged managed cover types.

Cover type	Average treatment age (years) by planning period (decade)				
	1	2	3	4	5
A/BG “T” & “O” stands (normal)	55	63	45	44	44
A/BG “T” & “O” stands (ERF)	70	87	70	56	55
A/BG “S” stands (normal)	47	53	49	35	45
A/BG “S” stands (ERF)	NA	NA	NA	NA	NA
A/BG “R” stands (normal)	42	24	20	20	20
A/BG “R” stands (ERF)	NA	NA	NA	NA	NA
A/BG “C” stands (normal)	43	33	NA	NA	NA
A/BG “C” stands (ERF)	NA	NA	NA	NA	NA
BSL; < 40 (normal)	145	168	141	117	112
BSL; < 40 (ERF)	0	0	0	148	150
BSL; SI ≥40 (normal)	0	70	83	75	85
BSL; SI ≥40 (ERF)	0	0	0	95	100
Tamarack; < 40 (normal)	140	136	143	137	110
Tamarack; SI ≥40 (ERF)	0	145	158	135	110

Maintaining Old Forest
In most even-aged cover types, there are currently more acres of old forest than the amounts of effective ERF established in this plan (see GDS-1A). However, due to the age class imbalance, planning for desired amounts in the future was a part of treatment level considerations. In some cover types, the amount of prescribed ERF that is over normal rotation age (effective ERF) will not meet the established effective ERF goals (DFFC) in some future decades (see Table 3.5d). In these cases, holding non-ERF stands past the established normal rotation age ensures higher levels of old forest on the landscape, as well as helping to balance the age classes. Some cover types exceed the old forest desired future condition in the later decades because of the need to hold some stands past normal rotation age to move more quickly toward meeting the goal of balancing the age classes.

Table 3.5d. Percent Old Forest per decade by cover type for even-aged systems.

Cover type	Old Forest percent by planning period (decade)					
	1	2	3	4	5	6
A/BG “T” and “O” stands	30.2%	21.1%	9.1%	6.7%	7.8%	7.9%
BSL; < 40	32.8%	30.9%	33.4%	27.8%	41.7%	18.2%
BSL; SI ≥40	0	0	0	0	23.2%	16.0%
Tamarack; < 40	46.1%	46.0%	40.0%	24.7%	19.6%	9.1%
Tamarack; SI ≥40	26.0%	23.7%	26.1%	29.5%	9.6%	7.9%

Maintaining young forest
Moving toward and eventually maintaining a balanced age class distribution in the aspen/balm of Gilead “T” stands, as well as maintaining the “R” and “S” stands in younger age classes, will ensure that young forest (0-30 years old) exists on the landscape over time (see GDS-2D for specific discussion about young, *early successional* forest). In most cover types, higher levels of young forest will occur after the initial decade, due to accelerated treatment.

Planned increases/decreases in cover type acres
The first decade and long-term (50-year) desired future forest condition calls for decreases in the aspen/balm of Gilead cover types, primarily, due to conversions to non-forested cover types. Smaller decreases will also occur over time in the red pine and ash/lowland hardwoods cover types. Conversion treatments will be based on NPC site classifications, and will result in increases in the lowland brush, upland brush, lowland grass, upland grass, and oak cover types. Conversion treatments are not planned to occur proportionately throughout the 50-year period, because of considerations for habitat goals and stand age; rather, they will be concentrated in the first two decades. See Table 3.5e for cover type conversion goals for the AP Subsection.

Table 3.5e. Cover type conversion goals for the AP SFRMP.

Cover Type(s) / Group	2010 Acres	10-Year DFFC		50-Year DFFC	
		DFFC Acres	Percent acreage change	DFFC Acres	Percent acreage change
Grass/Brush	181,083	188,816	+4.3%	196,646	+8.6%
A/BG[37] (all categories)	85,958	77,825	-9.5%	69,726	-18.9%
Hybrid poplar	5	0	-100%	0	-100%
Ash/Lowland Hardwoods	3,101	3,101	maintain	2,801	-9.7%
Tamarack SI ≥40	1,996	1,996	maintain	1,996	maintain
Tamarack SI<40	1,758	1,758	maintain	1,758	maintain
Black Spruce Lowland SI <40	1,161	1,161	maintain	1,161	maintain
Black Spruce Lowland SI ≥40	536	536	maintain	536	maintain
Oak	967	1,367	+41.4%	1,716	+77.5%
Northern Hardwoods	233	233	maintain	233	maintain
Cedar	215	215	maintain	515	+139.5%
Jack Pine	166	166	maintain	166	maintain
White Spruce	148	148	maintain	148	maintain
Balsam Fir	98	98	maintain	98	maintain
Birch	94	94	maintain	94	maintain
Red Pine	80	80	maintain	0	-100%
White Pine	4	4	maintain	4	maintain
Totals	277,603	277,603		277,603	

Supply of Timber

A Remsoft harvest-scheduling model was used to achieve a sustainable treatment level, taking into consideration any planned increases or decreases in each cover type over the next 50 years. While 10-year treatment levels will vary above or below the sustainable level until the age classes are balanced, adjustments were made in some decades to reduce these variations. The long-term goal is to provide a relatively stable supply of timber from state lands.

The following tables (Tables 3.5f-h) summarize treatment levels in acres by decade, applying all AP planning factors.

b. Uneven-aged management and thinning

All uneven-aged and some even-aged managed cover types will be managed using selective harvest treatments. The uneven-aged managed cover types include ash/ lowland hardwoods, northern hardwoods, and white pine.

[37] Conversions were allocated to DNR Wildlife and Forestry administrative areas based on aspen/balm of Gilead "C" and "O" category acreages, adjusted with ecological information, cover type acreage DFFCs, and Remsoft model selections. For details see *Appendix F: Cover type Conversion Goal Process*.

Cover types that may be thinned include red pine, white pine, ash, and lowland hardwoods. All stands that meet thinning criteria will be field-visited for possible selective treatment. All ash stands will be visited in the first ten-year period, whether or not they meet the thinning criteria, but efforts will be concentrated on the higher site-index stands first, >SI 55, as per DNR ash management guidelines. See Chapter 4 for specific stand treatment recommendations.

Table 3.5f. 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 ≥ 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 ≥ 40	374	0	50	30	244	50
Total	**137,208**	**36,339**	**31,009**	**23,009**	**23,669**	**23,182**

Table 3.5g. Treatment levels for uneven-aged managed cover types for AP SFRMP.

Cover Type	Previous Decade[38] Volume Harvested	2012-2021 (1st decade of plan implementation) Treatment Acres
Ash/Lowland Hardwoods[39]	250 cords (~25 acres)	2,062
Northern Hardwoods	50 cords (~5 acres)	0
White Pine	0	0

Table 3.5h. Thinning treatment levels for AP SFRMP.

Cover Type	Previous Decade[37] Volume Harvested	2012-2021 (1st 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

[38] 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.

[39] All ash stands will be site-visited during the first decade of the planning period.

c. Biomass harvesting

In the AP Subsection, biomass volume is available from three sources: tops and limbs from traditional harvests, whole tree biomass from "R" stands, and biomass harvests in non-timber types (e.g., brushlands). This is an emerging market in response to demand for alternative energy production, and Minnesota DNR policy is changing in response to this evolving market. Biomass harvesting, whether from forest lands or brushlands, will consider soil and nutrient concerns, NPC management recommendations, and will be conducted according to the MFRC Biomass Harvesting Guidelines.

- **Tops and limbs from traditional harvests**
  Based on the harvest volume estimates for this 10-year plan, potentially 290,000 green tons of biomass could be available as tops and limbs from traditional timber harvests.

- **Whole tree biomass from "R" stands**
  In the first decade, treatments in "R" stands will likely be traditional commercial harvests. Older "R" stands were targeted for treatment in the first decade to meet the current demand for stumpage, and also due to the current lack of demand for biomass in the Subsection. "R" stand treatments in future decades will occur at younger stand ages and treatments will gradually shift from traditional harvests to biomass harvests, if a market exists. In the second decade approximately 13,000 acres of "R" stands will be available for treatment with an average stand age between 20 and 30 years old. 12,800 acres of "R" stands will be available for treatment per decade for decades three through five with stand ages ranging from ten to twenty years old. The team estimates that the biomass volume available from "R" stands in future decades is 200,000 to 300,000 green tons per decade.

- **Biomass harvests in non-timber types**
  Treatments will occur in non-timber types such upland and lowland grass and brush. Follow-up treatments of "C" stands may also include biomass harvests in the later stages (i.e. decades 2-5) of plan implementation. These stands are often treated by shearing, mowing and prescribed burning. Biomass harvest will be another option to treat these sites if markets are developed in the future. Establishing treatment levels for non-timber types is outside the scope of this plan so an estimate for biomass available from non-timber types will not be generated. (For additional details of biomass harvest potential, see the openland and brushland cover type write-ups contained in Chapter 4 of this draft plan.)

d. Stands Reserved or Deferred for Further Evaluation

A total of 1,658 acres were identified by the AP SFRMP team to be reserved or deferred during the 10-year planning period as EILC. Stands designated as EILC, if they are released from the reserved or deferred status, will become available for active management after evaluations are completed. Evaluation procedures for EILC stands are being developed in a separate process as this plan goes to print (2011). Because these deferred acres were included in the cover type treatment level calculations, the proposed treatment levels recommended in this plan were not affected by the deferrals.

Table 3.5i. Summary of AP deferred stands acres by cover type.

Lowland Conifer Type	State Forestland Acres	EILC Acres Designated	Percent of Cover Type Designated as EILC
Tamarack	3,754	1,273	34%
Black Spruce Lowland	1,697	315	19%
Stagnant Spruce	842	0	0%
Cedar	215	71	33%
Stagnant Tamarack	45	0	0%
Stagnant Cedar	0	0	0%
Lowland Conifer Total	6,552	1,659	25%

e. Acres comparison between the past plan and the recommended SFRMP treatment levels

Past forest resource management plans were based on Division of Forestry area administrative boundaries while this SFRMP is based on ECS subsection boundaries. The proportion of each of the Forestry area's cover type acres, was used to calculate the estimated portion of past area plans' treatment acres by cover type in the Subsection. These estimates were used for comparing the past cover type acres treatment levels to those recommended in this SFRMP. Table 3.5g (above) provides a comparison between the past harvest levels for uneven-aged management by cover type and those recommended in this SFRMP (i.e. 2012-2021). Table 3.5j (below) provides a comparison between the past harvest levels for even-aged management by cover type and those recommended in this SFRMP.

Table 3.5j. Projected AP even-aged treatment volumes compared with past harvest levels

Cover Types Even-aged	Proposed Treatment [40] (cords) FY 2012-2021	Past volumes [41](cords) FY 2000-2009
Aspen/BG	393,674	220,000
Tamarack (both site indexes)	3,254	600
Black Spruce Lowland (both site indexes)	3,973	200
Oak	22,312	100
Cedar	3,847	0
Jack Pine	1,476	2,250
White Spruce	6,126	500
Balsam Fir	30,149	450

[40] Volume estimates were generated via Remsoft modeling – all stands on the stand exam list are presumed to make a sale. Remsoft estimates volumes by extrapolating typical volumes generated for secondary species in stands using state-wide FIA data. The Aspen Parklands team believes that these volume estimates are high. The team believes that a significant number of stands will not be sold (based on past experience) due to the quality of timber in some stands and the distance to markets.

[41] Cords of timber sold in the Subsection over the past 10 years (actual sales).

Birch	22,928	400
Red Pine	2,025	200
Total	489,764	224,700

f. Volume comparison between the past plan and the recommended SFRMP treatment levels.

Minnesota DNR develops annual planned treatment levels on a cover type acreage basis. This SFRMP Estimate for harvest volumes (FY 2012-2021), provided in 3.5j, is an estimate produced by the Remsoft harvest-scheduling model, based on treatment acres, yield equations,[42] treatment method,[43] and cords per acre based on forest inventory data and preliminary prescriptions. Volume estimates were generated via Remsoft modeling. All stands on the stand exam list are presumed by Remsoft to make a sale. Remsoft estimates volumes by extrapolating typical volumes generated for secondary species in stands using state-wide FIA data. The AP Team believes that the secondary species composition does not reflect the species composition of the Subsection and their volume estimates are high. The team also believes that a significant number of stands will not be sold (based on past experience) due to the quality of timber in some stands and the distance to markets. Thus, the volume estimate is a rough estimate because not all treatment acres are suitable, or result in timber sales; the treatment method (prescription) may change after the field examination of the stand; and the forest inventory volume data (cords per acre) is typically not as accurate as the more intensive appraisals that are completed for timber sales. The previous decade volume given for comparison (FY 2000-2009) is based on actual average volume sold per year.

GDS-5B. Harvest of non-timber products will be managed to maintain biodiversity and sustainability.

Non-timber forest products, also known as special forest products, can be categorized into five general areas: decorative materials, foods, herbs, medicinal materials, and specialty items. Non-timber forest products include, but are not limited to: boughs, decorative trees (e.g., Christmas trees), spruce tops, birch tops, *Lycopodium spp.* (also referred to as princess pine or ground pine), diamond willow, bark, burls, conks, mushrooms, berries, Labrador tea, rose hips and blossoms, seedlings, cones, nuts, native plant seed, aromatic oils, and extractives.

The social importance, ecological role, and function of special forest products resources are only beginning to be understood. Improving our species-specific knowledge, as well as broadening forest inventories and developing appraisal methods for most types of non-timber forest products, will make determining sustainable harvest levels possible in the future. Currently, special product permits or informal timber sales are issued for some non-timber forest products (e.g., balsam boughs and decorative trees) to ensure that harvest operations do not damage the site's potential for future production. Harvest of non-timber forest products may be restricted on some state-administered lands such as WMAs, aquatic management areas (AMAs), and SNAs.

[42] Walters, David K. and Alan R. Ek. Whole Stand Yield and Density Equations for Fourteen Forest Types in Minnesota; Department of Forest Resources, University of Minnesota, 1530 North Cleveland Avenue, St. Paul, MN 55108.

[43] For all thinnable types, volume yield was assumed to be 10 cd/acre, and all uneven-aged systems used 33% of nominal Walters and Ek volumes.

The following strategies will be used to protect the long-term availability of these forest resources.

GDS-5B Strategies

a. Consider known traditional gathering areas when managing other forest resources.

For example, consider forest management effects on known areas such as those traditionally used for gathering maple syrup (sugarbush areas) or gathering wild rice (ricing camps) when planning forest management activities.

b. Supervise and enforce special product permit regulations to ensure that the site's capacity for future production is not jeopardized.

Consider managing or using some forest stands for non-timber forest products, such as diamond willow, berry patches, or dogwood.

c. Consider the known locations of important wildlife habitats, rare native plant communities or species, and the possible impacts of non-timber forest products harvest practices before issuing special product permits.

d. Forest managers should proceed judiciously when issuing special products permits for species where limited knowledge and understanding constrains our ability to know if we are managing these groups of species sustainably (e.g., commercial harvest of mushrooms, *Lycopodium spp*, and native plant seed).

3.6 Wildlife Habitat

GDS-6A. Vegetation will be managed at multiple scales to provide habitat for nongame species.

Nongame[44] species are an important biological health indicator for prairie, brushland, forest, and wetland communities and are important to society for their inherent values. Legal statutes, public expectations and desires of interest groups, and DNR internal policies require the consideration of nongame species in the management of state-administered lands. One objective of the DNR strategic plan Directions 2000 (Minnesota DNR 2000) calls for "healthy self-sustaining populations of all native and desirable introduced plant, fish, and wildlife species, especially those species listed as threatened or endangered."

The Subsection is important to the tourism industry in Minnesota[45, 46]. Many tourists appreciate and seek out opportunities to observe nongame species during trips to this area. They have a chance to see a number of species that are rare elsewhere, such as the gray wolf, Franklin's gull, marbled godwit, and snowy owl.

[44] In this plan, *nongame species* include amphibian, reptile, mammal, and bird species that are not hunted or trapped.

[45] U.S. Fish and Wildlife Service. 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. *National Overview.* Issued May 2007.

[46] U.S. Fish and Wildlife Service. Wildlife Watching in the U.S.: The Economic Impacts on National and State Economies in 2006. Addendum to the 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation Report.2006-1.

There are hundreds of nongame wildlife species known or predicted to occur within this Subsection[47]. Each species has different habitat requirements, some of which conflict. Individual consideration of management needs for each species is therefore impossible to accomplish with a single approach across the planning area[48].

Several management techniques will be considered to ensure that the Subsection is managed to maintain and enhance the habitat of nongame species.

A *coarse filter* approach (Hunter, 1990[49]) emphasizes management of forests from a local to landscape scale to maintain the integrity of ecosystem processes; to maintain components of the range of historic habitats and age classes; and to retain or enhance structural attributes within habitats. In using a coarse filter approach, it assumes that a broad range of habitats encompassing the needs of most species will be met, and their populations will remain viable on the landscape. Habitat analysis and management emphasis in this plan were primarily done at this level.

A *fine filter* approach considers the specific habitat needs of selected individual species that may not be met by the broader coarse filter approach. Providing habitat at this level will be guided primarily by department policies and guidelines that provide recommendations for habitat management at this finer level for a number of species, such as state or federal listed species (e.g., bald eagle).

A *meso filter* focuses on conservation of critical ecosystem elements such as structures (logs, snags, pools, springs, streams, reefs, and hedgerows) and processes (fire, flooding) that would be missed by a coarse or fine filter.

An example of how these three scales work would be that a meso filter would focus on coarse woody debris (CWD), the processes that created the CWD, and the features it provides to associated biodiversity; a coarse filter would focus on the ecosystem in which the CWD exists; and a fine filter would focus on a species that may use the CWD.[50]

GDS-6A - Strategies

a. Provide old forest within forest management areas and riparian corridors.

Old forest includes stands that are beyond the normal rotation age established for the cover type. Several nongame species within the Subsection are associated with old forest and old forest conditions such as large-diameter trees and/or uneven-aged successional stages. Examples of species are great gray owl, hairy woodpecker, and northern flying squirrel. Designation and maintenance of areas to be managed for old forest conditions across the landscape over time will ensure available habitat for many of these species. Extended

[47] Minnesota DNR. 2009. *AP Subsection Preliminary Issues and Assessment*. Pp 7.3-7.11.
[48] Minnesota Department of Natural Resources, 2006. *Tomorrow's Habitat for the Wild and Rare: An Action Plan for Minnesota Wildlife*, Comprehensive Wildlife Conservation Strategy. Division of Ecological Services, Minnesota Department of Natural Resources.
[49] Hunter, M.L. 1990. *Wildlife, Forests, and Forestry: Principles of Managing Forests for Biodiversity*. Prentice-Hall Inc., Englewood Cliffs, N.J.
[50] Hunter, Malcolm L. Jr. A Mesofilter Conservation Strategy to Complement Fine and Coarse Filters. Cons. Bio. Vol.19, No. 4. August 2005.

rotation forests, Ecological Important Lowland Conifers, and designated old-growth forest are examples.

b. Provide young forest distributed across the landscape.

Young forest in this plan refers to stands that are 0-30 years old. Numerous nongame species within the Subsection are associated with young forest or young forest condition such as seedling and/or sapling successional stages. Examples of species are golden-winged warbler, red-tailed hawk, and gray wolf. Areas managed for young forest conditions will provide early successional habitat across the subsection.

c. Provide native prairie distributed across the landscape.

Many nongame species (bobolink, meadow lark, short-eared owl) are associated with and often completely dependent upon native and restored grasslands. Restoration to native prairie (considering site specific NPC evaluations) will ensure that this important habitat is available. Conversion and restoration efforts should focus on creating connecting corridors of native prairie habitats, since existing prairie parcels are often fragmented.

d. Provide brushland habitat across the landscape.

Brushlands (upland and lowland) are an important habitat for many nongame species associated with open landscapes. Chestnut-side warbler, golden-winged warbler, alder flycatcher and other species depend upon brushlands for reproduction and brood rearing. Mechanical harvest/regeneration and prescribed fire should be used to help maintain brushlands with diverse stand ages.

e. Provide a variety of patch sizes across the landscape that better reflect patterns produced by natural disturbances, and attempt to maintain existing large patches.

Providing a variety of patch sizes that better reflect the patterns created by natural disturbance factors and efforts to reduce the effects of habitat fragmentation will help provide habitat for nongame species with different patch size requirements.

f. Manage to retain the integrity of riparian areas and provide protection for seasonal and permanent wetlands.

Many nongame species are associated with forested wetlands or the riparian forest interface. These areas also serve as movement corridors. Consideration for the health and integrity of riparian areas and protection or mitigation of other wetlands will serve to provide such needs.

- Apply the *MFRC Site-Level Guidelines* relating to riparian areas and seasonal and permanent wetlands.

g. Provide for the needs of species that depend on perches, cavity trees, bark foraging sites, and downed-woody debris.

A number of species rely on tree perches, existing tree cavities or available trees that can be excavated to provide a cavity, insect foraging sites on dead or dying trees, or downed

trees or slash for roosting, nesting, or cover. Historically, natural processes provided these habitat needs. Today, the frequency and size of these processes have declined.

- Use the *MFRC Site-Level Guidelines* relating to leave trees, snags, and coarse woody debris to provide these important habitat features.

h. Provide for the needs of species associated with conifer stands and mixed conifer/hardwood stands.

A number of nongame species found within the Subsection have some association or dependence on coniferous trees, whether within conifer-dominated stands or in various mixes of conifer/hardwood stands[51] (see *Appendix K: Wildlife Species List/Habitat Relationships for the Aspen Parklands Subsection*). Several conifer species (white spruce, black spruce, and tamarack) have declined from historic levels in the Subsection.[52] The following strategies will be used to meet coniferous habitat needs:

1. Increase northern white cedar through active management in appropriate NPCs;
2. Maintain the presence of some conifers as a component of other cover types;
3. Follow the conifer retention guidelines found in the *MFRC Site-Level Guidelines;*
4. Apply the Cover type Management Recommendations (Chapter 4).

i. Provide for creation and maintenance of within-stand diversity.

Managing for a mix of tree species and ages along with a diversity of structural characteristics (e.g., tree diameter, tree height, and scattered or clumped distribution) in some stands will provide conditions for species that require within-stand diversity.

j. Manage to favor native plant communities and retain elements of biodiversity significance.

Habitat for nongame species associated with highly diverse native plant communities will be provided by the following strategies:

1. Identify and manage high-quality and/or rare native plant communities so they are maintained or enhanced.
2. Use the *NPC Field Guide* and associated ECS silvicultural interpretations to manage some stands to reflect the composition, structure, and function of native plant communities and natural disturbance processes.
3. Maintain or increase biodiversity, where ecologically appropriate, within areas of statewide biodiversity significance.

k. Consider Natural Heritage Program data and other rare species information during development of both the 10-year and annual stand examination lists.

Natural Heritage Program data will be available and considered during the 10-year and annual stand examination selection process. Before groundwork begins, field staff will check the database for known locations of rare nongame species in stands planned for

[51] Green, J.C. 1995. *Birds and Forests: A Management and Conservation Guide*. Minnesota Department of Natural Resources.
[52] Minnesota DNR. 2009. *AP Subsection SFRMP Preliminary Issues and Assessment*, Table 3.4.

treatment and, if present, will seek advice from appropriate staff or refer to established guidelines or considerations on avoiding negative impacts to these species.

I. Apply the DNR management recommendations for habitats of nongame species (e.g., gray wolves, bald eagles, marbled godwit) as described in DNR guidelines and policies.[53]

Follow recommendations in the *Forestry Wildlife Habitat Management Guidelines*[54] manual and apply considerations provided in Ecological and Water Resources Rare Species Fact Sheets.

GDS-6B. Vegetation will be managed at multiple scales to provide habitat for game species.

Game[55] species are an important indicator of biological health and are important to society for their recreational, economic, and inherent values. Legal statutes, public expectations, the desires of interest groups, and DNR internal policies require the consideration of game species in the management of state-administered lands. The DNR strategic plan, *Directions 2000,* states that an "objective is healthy, self-sustaining populations of all native and desirable introduced plant, fish, and wildlife species"; and for "populations of fish, wildlife and plant species to sustain recreational opportunities." [56]

Public lands in the Subsection draw many hunters and trappers to the area each fall. White-tailed deer, waterfowl, black bear, and sharp-tailed and ruffed grouse hunting traditions are long-standing and important to local economies. Trappers target thriving populations of fisher, beaver, bobcat and mink.

The Subsection is important to the tourism industry in Minnesota. Many tourists appreciate and seek out opportunities to observe white-tailed deer, elk, black bear, waterfowl, sharp-tailed grouse, sandhill cranes, and prairie chickens during their trips to this area.

Ecologically, there have been historic and more recent changes to the Subsection that have affected game species and their habitat:

1. Changes in the abundance of trees, age structure of the forest, and structural and species diversity;
2. Changes in native plant communities (e.g. invasion of aggressive native and non-native species, drainage, etc.);
3. Loss of larger patches and connections between such patches;
4. Increased habitat fragmentation from agriculture, roads, trails, and development; and
5. Alteration of historic fire disturbance events.

Many game species are known or predicted to occur within the Subsection and each has different habitat requirements, some of which conflict. Individual consideration of management needs for each species is therefore impossible to accomplish with a single approach across the planning area. To ensure that the Subsection is managed to maintain

[53] Minnesota DNR. 2009. *AP Subsection SFRMP Preliminary Issues and Assessment*, Table 7.2, pgs. *7.11-7.13.*
[54] Minnesota DNR. 1985. *Forestry-Wildlife Guidelines to Habitat Management*.
[55] In this plan, *game* species include those terrestrial species that are hunted and trapped.
[56] Minnesota DNR. 2000. *Directions 2000: The Strategic Plan.* St. Paul, MN.

and enhance the habitat of game species, a number of management techniques will be considered using both a coarse and fine filter approach.

GDS-6B - Strategies

a. Provide young forest distributed across the landscape.

Young forest in this plan refers to stands that are 0-30 years old. Many game species within the Subsection are associated with young forest or young forest conditions such as seedling and/or sapling successional stages (see *Appendix K: Wildlife Species List/Habitat Relationships for the Aspen Parklands Subsection*). Some examples of these species are white-tailed deer, black bear, snowshoe hare, ruffed grouse, and woodcock. Areas managed for young forest conditions will provide a distribution of young forest habitat across the Subsection.

b. Provide old forest distributed across the landscape.

Old forest includes stands that are beyond the normal rotation age established for the cover type. Several game species within the Subsection are associated with old forest and old forest conditions (i.e., large-diameter trees, snags and multiple age classes) (see *Appendix K: Wildlife Species List/Habitat Relationships for the Aspen Parklands Subsection*). Examples of these species include fisher, wood duck, hooded merganser, and white-tailed deer. Designation and maintenance of areas to be managed for old forest conditions across the landscape over time will ensure available habitat for these species. Designated old-growth forest, EILC, and ERF stands are examples of strategies that provide old forest values across the landscape.

c. Provide native prairie distributed across the landscape.

Many game species (prairie chicken, mallard, sharp-tailed grouse) are associated with native and restored grasslands. Restoration to native prairie (considering site specific NPC evaluations) will ensure that this important habitat is available. Conversion and restoration efforts should focus on creating connecting corridors of native prairie habitats, since existing prairie parcels are often fragmented.

d. Provide brushland habitat across the landscape.

Brushlands (upland and lowland) are an important habitat for many game species associated with open landscapes. White-tailed deer, elk, sharp-tailed grouse, woodcock and other species depend upon brushlands for reproduction, cover, and foraging areas. Mechanical harvest/regeneration and prescribed fire should be used to help maintain brushlands with diverse stand ages.

The AP team utilized DNR's Brushland Assessment document[57] and review by field staff to identify and approve the following priority open landscape LTAs within the planning area:

1. Beach Ridges;
2. Strandquist Lake Plain;
3. Goodridge Lake Plain;
4. Blooming Valley Lake Plain;
5. Landcaster Lake Plain;
6. Fourtown Peatlands;
7. Roseau Lake Plain;
8. Roseau River Lake Plain;
9. Dohrman Ridge;
10. Duxby Lake Plain.
11. New Folden Lake Plain;
12. Thief River Falls Lake Plain;
13. Mud Lake Plain;
14. Bronson Lake Plain;
15. Berner Lake Plain;
16. Ross Peatlands;
17. Gentilly Lake Plain;
18. Brooks Lake Plain;
19. Thief Lake Peatlands; and,

e. Provide a balanced age class structure in cover types managed with even-aged silvicultural systems.

A balanced age class structure leads to relatively equal acreages in each age class out to the normal rotation age. To provide an even flow of early successional forest habitat over time, it is necessary to avoid large fluctuations in harvest levels within the aspen and balm of Gilead cover types. Future sustainability of game species habitat will be enhanced by addressing current age class imbalances to move toward a future balanced age class structure.

f. Provide for the needs of species associated with conifer stands and mixed conifer/ hardwood stands.

Although conifer abundance in the Subsection is naturally low, a number of game species found within the Subsection have some association with coniferous trees for food and/or cover needs (see *Appendix K: Wildlife Species List/Habitat Relationships for the Aspen Parklands Subsection*). Several conifer species (white spruce, black spruce, and tamarack) have declined from historic levels in the Subsection.

g. Provide for creation and maintenance of within-stand diversity.

Managing for a mix of tree species and ages along with a diversity of structural characteristics (e.g., tree diameter, tree height, and scattered or clumped distribution) in some stands will provide conditions for species that require within-stand diversity.

h. Continue to manage special management areas for the benefit of game species.

Most management benefiting game species in the Subsection will occur as a result of decisions designed to meet multiple objectives, the application of which will move across the landscape over time (coarse filter). In some cases, areas have been and will continue to be selected with the intent of maintaining the areas over time to provide specific game species benefits (fine filter). Following are examples of areas selected for specific game species management:

[57] *An Assessment of Open Landscapes for the Management of Brushland Wildlife Habitat in Northern and Central Minnesota* (MDNR Wildlife Resource Assessment Report 1, 2002).

1. Manage priority open landscape areas (OLAs) for the benefit of wildlife species (e.g., sharp-tailed grouse, prairie chicken, sandhill crane):

    - Utilize available information and review by field staff to identify and approve open landscape projects within designated OLAs in the planning area;
    - Coordinate across Divisions on management prescriptions for selected stands within OLAs in a manner that enhances open landscape habitat conditions (e.g., create larger blocks of even-aged cover types managed with a clearcut prescription, minimize snag and leave tree presence in the interior of harvest blocks, discourage conifer planting);
    - Coordinate across Divisions on management projects designed to enhance open landscape conditions in OLAs (e.g., prescribed burns, shearing, or mowing of brush).

3.7 Riparian and Aquatic Areas

GDS-7A. Vegetation management will protect or enhance riparian areas

Riparian areas encompass the transition zone between the terrestrial and aquatic habitats that occur along lakes, streams, and open-water wetlands. A *riparian management zone* (RMZ) is that portion of the riparian area where site conditions and landowner objectives are used to determine management activities that address riparian resource needs. Riparian areas are among the most diverse parts of an ecosystem. The management of riparian areas can influence water quality, water temperature, erosion rates, and deposition of woody debris in lakes and streams and the overall diversity of wildlife and plant species found in the watershed. Riparian areas provide corridors and connecting links of habitat for plant and wildlife species. Well-managed riparian areas are critical to protect, maintain, or enhance aquatic and wildlife habitats, aesthetics, recreation, water quality, and forest products.

This Subsection sits on the prairie-forest border. The habitat in this transition zone includes forested land, brushland and openland. Vegetation managed and retained in riparian areas will be appropriate for the native plant community identified, which may include a range of forest and non-forest types of various age classes within and adjacent to these riparian areas.

GDS-7A - Strategies

a. Apply the *MFRC Site-Level Guidelines* relating to riparian areas as appropriate for the habitat type.

Some examples from the guidelines are:

1. Manage for longer-lived, uneven-aged, mixed-species stands within the RMZ to provide:
    a. Shade and moderated microclimate
    b. Coarse woody debris
    c. Microhabitat diversity

   d. Resiliency to natural catastrophes
   e. Bank stability
   f. Nutrient cycling and carbon and nutrient input;
2. Avoid creating large cleared areas within the RMZ;
3. Maintain a filter strip between the water body and harvest area;
4. Approach water crossings at or near right angles to the stream direction, and use measures to minimize streambank disturbances; and,
5. Manage for longer lived conifers.

DNR personnel check the application of riparian guidelines as a part of timber sales supervision and inspections. Also, MFRC site-level monitoring will periodically sample sites in this Subsection as part of the monitoring program at the statewide level. The objective of this statewide monitoring program is to evaluate the implementation of the *MFRC Site-Level Guidelines* through field visits to randomly selected, recently managed sites distributed across the various land ownerships (state, county, national forest, tribal, forest industry, non-industrial private lands, etc.) in the state.

b. Manage to maintain or increase old forest in riparian areas where appropriate as indicated by *NPC Field Guide* and historical data.

Old forests provide the best source of woody debris in aquatic systems and habitat for a wide variety of wildlife species. Longer rotation age reduces the frequency of future harvest activities and may provide opportunities for a wider variety of forest products. Old forest management complexes and EILC stands in riparian areas will be managed to maintain or increase old forest conditions.

c. Using the *NPC Field Guide* and associated ECS silvicultural interpretations, manage for species and habitat types appropriate for the site.

d. Follow recommendations in Tomorrow's Habitat for the Wild and Rare.

This document identifies Species in Greatest Conservation Need and associated Key Habitats.

GDS-7B. Vegetation management will protect or enhance wetlands.

Wetland areas include lowland forested areas (such as black ash, black spruce, tamarack, and white cedar cover types), lowland brush and lowland grass cover types, and seasonal ponds. These areas are protected using different site-level forest management guidelines than those required for riparian areas adjacent to lakes, streams, and rivers or permanent open water ponds.

GDS-7B - Strategies

a. Apply the *MFRC Site-Level Guidelines*.

Some examples of recommendations from the guidelines are:

1. Maintain filter strips;

2. Avoid disturbances such as ruts, soil compaction, excessive disturbance to litter layer, and addition of fill;
3. Use timber sale planning and administration to ensure that skidding and other equipment operations in upland stands take place outside of small non-open water wetlands and seasonal ponds. Meet with permittee/operator on site before the start of the permit activities to review details of the wetlands and protection measures within the sale area, and periodically visit the site during the harvest operation; and,
4. Leave-tree guidelines recommend selecting leave trees in clumps, islands, or strips centered around or that coincide with small non-open water wetlands and seasonal ponds.

DNR personnel will check the application of wetlands and seasonal pond guidelines as a part of their timber sales supervision and inspections.

b. Areas will consider landforms and topography in their work areas that have seasonal ponds and small open-water wetlands, and address those features in site-specific prescriptions that are developed during the stand examination field visit.

Identification of landforms and topographic features important for vernal pools, or seasonal wetlands, will help in their identification year-round.

For a discussion of key habitats and species in greatest conservation need, go to GDS-1B.

3.8 Pests, Pathogens, Exotic Species, and Climate Change

GDS-8A. Limit damage to native plant communities from insects, disease and invasive species to acceptable levels where feasible.

Native insects and disease organisms are usually well-balanced with their respective hosts. While a few hosts may die while the insect and disease populations are sustained, the populations co-exist. Insects and diseases can influence ecosystem dynamics, promote diversity of species and generate elements of community structure that are important as habitat and in nutrient cycling, such as snags and coarse woody debris.

Epidemic populations of insect pests, however, can cause high levels of mortality and can have significant ecological and economic consequences. There will not be an attempt to eliminate native insects and diseases or their processes from the landscape, but rather to limit impacts on individual sites to an acceptable level that allows goals for wildlife habitat, timber production, biodiversity, water quality, aesthetics and recreation to be realized.

Natural resource managers are concerned about the introduction and establishment of exotic and invasive insect, disease, and plant species. Invasion of ecosystems by exotic species can cause significant economic losses and expenditures for control because they destroy or displace native plants and animals, degrade native species habitat, reduce productivity, pollute native gene pools, and disrupt ecosystem processes (e.g., hydrological patterns, soil chemistry, moisture-holding capability, susceptibility to erosion, and fire regimes). Examples of exotics with known adverse effects on Minnesota natural resources include: Dutch elm disease, gypsy moth, European buckthorn, and the emerald ash borer.

The emerald ash borer is expected to eventually cause mortality of almost all black and green ash, deforesting many wet forest sites. It will likely take several decades to infest the 950 million ash trees that are currently growing in Minnesota but will cause significant long term changes in this plant community.

There is potential for significant adverse impacts from other species already present in the Subsection, such as spotted knapweed, common tansy and leafy spurge. Resource managers will seek to limit the introduction and impacts of new invasive species, and minimize the impact of control measures on vulnerable native species.

Climate change effects may impact long term management of some ecological communities and foster spread of some insects, diseases and invasive species.

GDS-8A - Strategies

a. Identify and monitor harmful insect, disease, and exotic species populations as part of the Forest Health Monitoring Program, and document their occurrence on state-managed lands.

Monitoring known insect and disease pests, conditions conducive to outbreaks, and populations of harmful exotic plants can provide useful information for predicting potential outbreaks and documenting and predicting range expansion. Early identification and risk assessment of new exotic species introductions improve potential to develop and implement appropriate responses. Involve private landowners and local units of government in gathering and disseminating information to help determine when and where preventive measures to limit impacts or control action must be taken.

Mutually established protocols for data collection and information sharing among federal (U.S. Environmental Protection Agency, U.S. Department of Agriculture) and state agencies improve capacity to respond to the spread of established exotic species into new areas, new species introductions, and outbreaks of established pests and diseases.

b. Follow Minnesota Department of Natural Resources Operational Order 113 (Invasive Species) to minimize the spread of invasive exotic species during resource management activities.

Resource management activities have significant potential as an avenue for unintentional introductions of exotic plants, especially in less developed portions of the Subsection. Examples include road maintenance or construction, shearing, or timber harvest. Each DNR Division has developed guidelines to minimize the spread of invasive species. Establishing and promoting practices that minimize these introductions will slow the spread of harmful exotics and reduce associated losses.

c. Manage insect, disease and invasive species problems, as appropriate.

Information gathered and provided by the agencies mentioned above is used as a basis for decisions regarding where and when insect, disease, and invasive species problems require action involving vegetation management. Intervention plans will be developed collaboratively *before* pest outbreaks (e.g., the strategic plan for the cooperative management of gypsy moth in Minnesota involving Minnesota DNR, Minnesota Department of Agriculture, USDA-APHIS, and USDA-FS). These plans detail appropriate integrated pest

management strategies, circumstances under which strategies can be appropriately and effectively used, responsibilities, and cost-sharing arrangements. Containment and eradication measures will seek to minimize impacts from these species, while also minimizing the impact of control measures on vulnerable native species.

If pesticides are needed to control insects, diseases, and invasive species on state lands, the following operational standards will be used:

1. DNR Operational Order No. 59 - Pesticides and Pest Control;
2. DNR Operational Order No. 113 – Invasive Species and DNR Divisional Invasive Species Guidelines Divisions of Forestry and Fish and Wildlife - Pesticide Use Guidelines;
3. Pesticide Labels - Refer to Material Safety and Data Sheets for each pesticide and adjuvant being used or recommended; and,
4. *MFRC Site-Level Guidelines* relating to pesticide use.

d. Manage stands to reduce the potential impact of insects, diseases and invasive species.

1. Emphasize the use of non-pesticide treatments, such as residual treatments or fire in management for prevention of insect, disease, and invasive species outbreaks;
2. Develop management plans and stand treatment prescriptions using recognized insect, disease, and invasive species management sources, while considering ecological processes and impacts to native species; and,
3. Provide information and training to equipment operators regarding techniques that minimize damage to leave trees or other residual areas.

e. In ERF stands, a higher level of impact from native insect and disease infestations may be accepted as long as it does not jeopardize the ability to regenerate the stand to the desired cover type or the management goals of the surrounding stands.

ERF will enhance old forest conditions within this Subsection. As a general rule, as stands are allowed to age, the incidence and impact of stem decay and root rot increase. However, retaining the potential to regenerate the stand will be a primary objective, except in stands where conversion to another type is planned.

GDS-8B. Minimize the negative impacts caused by wildlife on forest communities.

Wildlife species such as deer, hare, porcupine, beaver, and other rodents impact forests and plant regeneration through browsing, stem damage, and girdling. Solutions require an understanding of the dynamics of herbivory, seasonal wildlife movements, population structure, population control tools and their effectiveness, and proven repellents or exclusion methods. Keys to success include coordination between department staff, adequate funding, and sharing information regarding successful exclusion or abatement methods. The management strategies below attempt to minimize adverse impacts.

GDS-8B - Strategies

a. Improve field staff knowledge about the complexity of factors that affect solutions to preventing or reducing resource damage caused by wildlife. Do this through training and/or field level coordination on sites where problems exist.

1. Conduct training sessions addressing the factors that affect damage, potential solutions, and prevention based on research and experience;
2. Coordinate field visits at problem sites with DNR Area Wildlife staff and the appropriate land manager;
3. Collect information from damaged sites for database entry and analysis of wildlife damage; and,
4. Use the expertise of the DNR – Section of Wildlife's Depredation Program and research units when regeneration plans call for use of repellents or exclusion techniques.

b. Consider the potential for wildlife impacts to planted or natural regenerating trees before damage occurs. Coordinate on preventative strategies before planting or timber sales begin.

Work with DNR Area Wildlife staff to identify sites where significant damage may occur before forest management activities occur. Where necessary, incorporate plans for post-sale damage mitigation into forest regeneration and development plans.

c. Focus forest regeneration efforts in areas less likely to be negatively impacted by wildlife species.

1. Consider regeneration through seeding rather than planting nursery-grown seedlings;
2. Avoid unprotected plantings of susceptible species near known seasonal deer concentration areas; and,
3. In mixed species plantations, scatter susceptible species amongst less susceptible ones.

d. On sites where damage from wildlife species is anticipated, use mitigation techniques to reduce damage when planting susceptible tree species.

1. Consider regeneration through seeding rather than planting nursery-grown seedlings;
2. Favor planting on sites where edge (irregular boundaries) is minimized;
3. Plant larger sites;
4. Plant susceptible species away from the edge of the site;
5. Use protective measures such as fenced exclosures, bud capping, repellents, tree shelters, etc.; and,
6. To more efficiently implement protection control measures, clump plantings and/or locate them to be easily accessible.

GDS-8C. Vegetation will be managed to promote resilient communities in an attempt to mitigate the effects of global climate change.

Minnesota DNR recognizes that climate change, also known as global warming, is occurring at a rate that exceeds historical levels, and that the rate is likely to continue to increase. A growing body of evidence overwhelmingly supports the conclusion that climate change is real and will have serious implications for people and the natural world upon which we depend.

Scientists believe the predicted climate change will affect the size, frequency, and intensity of disturbances such as fires, windstorms, and insect outbreaks. It will affect the survivorship of existing plant and animal species and the distributions of plants and animals. Even at modest levels, independent studies are finding mounting evidence that the current climate change influences plant and animal ranges and behavior.[58] Some plant and animal species may not be able to adapt to the rate of change. Increases in the reproductive capability and survivorship of exotic species, insect pests, and pathogens will impact forests and wildlife. Certain tree species, such as black spruce, balsam fir, birch, and jack pine will respond negatively to increased soil warming and decreased soil moisture in. Carbon sequestration by forests and wetlands may be affected because of accelerated decomposition rates.

Management will be based on our current knowledge and adjusted based on future research findings. Although there are uncertainties about the effects of climate change on forest vegetation at the Subsection scale, the following strategies will be used to help monitor and mitigate the predicted effects of climate change on vulnerable species and native plant communities.

GDS-8C - Strategies

a. Maintain or increase species and structural diversity across the Subsection.

The native plant community composition and within-stand diversity goals of this plan will provide for more variety in species across the Subsection. Genetically diverse plant communities are more resilient in the face of invasion, catastrophic disturbance, and climate change, and better able to utilize a broader range of site conditions. Maintaining species diversity at multiple scales can reduce the risk of widespread, stand-replacing insect and disease outbreaks that could result from accelerated climatic change.

Structural diversity includes size, abundance and distribution of overstory and understory vegetation, the presence and abundance of snags and coarse woody debris, and the way these features are arranged within the stand.

Plant communities with species and structural diversity will provide habitat to a greater number of species than a plant community with uniform diversity. This variety will help the forest to survive changing conditions as well as serve as a reproductive source for forest plant and animal migration.

[58] Root, T. et al., *Fingerprints of Global Warming on Wild Animals and Plants*, Stanford University, Nature-January 2, 2003; and Parmesan, Camille, A Globally Coherent Fingerprint of Climate Change Impacts Across Natural Systems, University of Texas.

The following are examples of tactics to increase species and structural diversity:

1. Planned increases in the upland and lowland grass, upland and lowland brush, white cedar and oak cover types;
2. Manage balsam fir and white spruce as secondary species where appropriate for the native plant community;
3. Identification of ERF stands;
4. Site visit all ash stands to identify opportunities to increase stand diversity;
5. Follow site level guidelines for leave tree and snag retention;
6. Utilize the Department's ECS to identify and manage communities by mimicking the appropriate natural disturbances; and,
7. Utilize the MCBS data to identify and manage for biological diversity in areas identified as having high or outstanding biological significance.

b. Maintain connectivity that permits the migration of plants and animals as climate changes the landscape.

Maintaining native plant community spatial patterns where patches of vegetation are connected will allow the flow of plants, animals, and processes (e.g., seed dispersal) between suitable habitats. The ability of species to move to a new more hospitable site is a critical survival tactic. The following are some of the techniques that have been used during the planning phase to address this strategy:

1. Stands selected for patch management were located to increase their effective patch size or to increase connectivity between patches and adjacent NPCs; and,
2. ERF stands were grouped on the landscape and placed around old-growth stands and along riparian corridors.

The following are some methods for addressing this strategy during plan implementation:

1. Where available, MCBS sites of biodiversity significance are used as a means to identify, quantify, compare, and monitor NPC spatial patterns as they relate to AP SFRMP direction;
2. Classification of stands to NPC and application of ECS silvicultural interpretations provide a means to maintain NPC spatial patterns on managed lands;
3. Plan harvests to minimize road construction and landings; and,
4. Stand management incorporates actions that minimize the potential for invasive species establishment.

c. Evaluate site conditions with respect to climate change when selecting tree species for regeneration.

Use the *NPC Field Guide*, associated silvicultural references, existing tree distributions, and modeled future tree distributions when selecting the species most appropriate for the site.

d. Use the concept of carbon sequestration to remove carbon dioxide (the most significant anthropogenic greenhouse gas) from the atmosphere.

Climate models (e.g., *Hadley Centre for Climate Prediction and Research-UK, carbon cycle models*) predict that, as future atmospheric carbon dioxide concentrations increase, global

temperatures will increase. All vegetation has the ability to remove carbon dioxide through photosynthesis and store it as carbon. Forests and peatlands store carbon for long periods of time. The storage of carbon is called *carbon sequestration*.

e. Apply the *MFRC Site-Level Guidelines* for tree species at the edge of their range (*Rationale for Guidelines Section, Wildlife Habitat, pages 26-35*).

3.9 Visual Quality

GDS-9A. Minimize management impacts on visual quality in sensitive areas.

Scenic beauty is a primary reason people choose to spend their recreation and vacation time in or near natural areas. Where forests are near recreational trails, lakes, waterways, public roads, and highways, consider impacts of forest management activities to the visual quality of the site during and after management activities.

GDS-9A - Strategies

a. Apply the *MFRC Site-Level Guidelines* on visual quality on all vegetative management activities.

The MFRC guidelines contain many recommended forest management techniques that will minimize the impacts of vegetative management activities on visual quality. *Directions 2000* (*Objective 3.3*)[59] states that the "DNR will apply the appropriate guidelines so that visual quality is not adversely impacted during forest management activities." Several examples of the recommended techniques included in the guidelines are listed below:

1. Minimize visibility of harvest areas by limiting the apparent size of the harvest area;
2. Avoid management operations during periods of peak recreational use whenever possible;
3. Locate roads and trails to minimize visibility from nearby vantage points, such as scenic overlooks, streams, and lakes;
4. Encourage long-lived species and other visually important species (e.g., paper birch) along high visual quality identified roadways. This will minimize the frequency of management activities. It will also provide larger-crowned, larger-diameter trees that improve forest aesthetics; and,
5. Reduce visual penetration with appropriate curves in the road alignment.

DNR Forestry staff checks the application of visual quality guidelines as a part of timber sales supervision and inspections. Roads have been classified based on visual quality ratings. Classifications can be viewed on the DNR web site at:

http://www.dnr.state.mn.us/forestry/visual_sensitivity/index.html

b. Provide for public notice on large scale wildlife habitat management projects that have the potential to negatively impact visual quality in the Subsection.

[59] Minnesota Department of Natural Resources, *Directions 2000: The Strategic Plan*, Objective 3.3, p22.

3.10 Access to State Land

GDS-10A. Access routes are well planned and minimize new construction.

Access routes are needed to effectively manage stands identified for treatment during this 10-year plan. The overall density of access routes in specific geographic areas can be minimized through planning and cooperation with other landowners in the Subsection. The access routes that are selected must be developed in a way that protects or minimizes the negative effects on other natural resources.

GDS-10A - Strategies

a. Use existing roads, access routes or corridors of disturbance where feasible.

b. Follow Minnesota statutes and guidelines and DNR policies for forest roads.

1. Follow the *MFRC Site-Level Guidelines* for road design, construction, maintenance, reconstruction, and closure;
2. Follow the guidelines and policies relating to roads and trails in the *DNR Forestry Road Manual* and the *Forestry-Wildlife Habitat Management Guidelines (page 50)*; and,
3. Use the *DNR Site-Level Design and Development Guidelines for Recreational Trails* for guidance on post-sale treatment.

c. Apply the department direction regarding access roads across EILC and other areas that have been reserved (or deferred) from treatment during the 10-year plan.

Evaluate on a case-by-case basis (DNR Forestry administrative area review by Forestry, Fish and Wildlife, and Ecological and Water Resources staff) as access is needed in these areas, applying the following principles (in order):

1. Avoid access routes across EILC areas, if possible. For example:
   - Use other reasonable access routes that don't involve EILC stands if they are available (e.g., go around the EILC area if it is small); and,
2. If the only reasonable access to stands to be treated is across EILC areas, then strive to minimize impacts. For example:
   - Use seasonal/temporary access versus a permanent road. (Since EILC are in lowland areas, this road access would typically be seasonal winter roads.);
   - Use narrow corridors;
   - Use routes causing the least disturbance; and,
   - Use only during frozen ground conditions that support the equipment using it.

d. Follow strategies identified under other General Direction Statements that apply to roads throughout the planning, development, and disposition of forest roads.

- GDS-1F: Maintain or enhance biodiversity on MCBS sites of biodiversity significance.

- GDS-3.9A: Minimize management impacts on visual quality in sensitive areas.

e. Complete a timber access plan.
After the 10-year stand exam list was compiled, field personnel completed a timber access plan. The purpose of the timber access plan is to identify any new road and any temporary access needed to access stands identified in SFRMP for field visit and/or treatment. The new access plan will help in assessing road access/fragmentation/density concerns. It will also provide post-sale treatment intentions on the estimated new access/temporary access locations. Existing roads or previously used corridors of disturbance will be followed whenever feasible. For new roads and temporary access, the road classification (whether it is winter or summer access), miles of new road, and proposed post-sale treatment will be documented.

Appendix O: *New Access Needs* lists miles, season of use, and type of access for stands identified as needing new access during the planning period.

The proposed post-sale treatment information on new roads and trails can be used for planning the maintenance, closure (e.g., gate, sign, slash, or berm), abandonment, or reclamation (e.g., with natural or planted vegetation) of the access route. Limiting unplanned secondary usage should also be considered in post-sale road planning. The timber sale appraiser will refine the proposed road access and post-sale treatment plan as part of the design of the timber sale. Final adjustments may be made at the pre-sale meeting between the timber sale administrator and the permittee.

Most temporary roads will not be maintained after harvest is completed. These access routes should be used again for future forest management activities instead of disturbing new areas.

3.11 Cultural Resources

GDS-11A. Cultural Resources will be protected.

A cultural resource is an archaeological site, cemetery, historic structure, historic area, or traditional use area that is of cultural or scientific value. Cultural resources are remaining evidence of past human activities. To be considered important, a cultural resource generally has to be at least 50 years old. A cultural resource may be the archaeological remains of a 2,000 year-old Indian village, an abandoned logging camp, a portage trail, a cemetery, food gathering sites such as ricing camps and sugarbushes, or a pioneer homestead. They often possess spiritual, traditional, scientific, and educational values. In addition to federal and state laws that protect certain types of cultural resources, the *Voluntary Site-Level Forest Management Guidelines* provide information and recommendations to assist private and public land managers in taking responsible actions when cultural resources are encountered.

GDS-11A - Strategies

a. Annual Stand Exam lists are reviewed by state archeologists; recommendations for mitigation are implemented as part of sale design.

b. Wildlife management projects are reviewed by DNR staff and, if appropriate, forwarded to a state archeologist for mitigation of potential negative effects.

All land management activities on Wildlife Management Areas require a cultural resource evaluation as per Section 106 of the National Historic Preservation Act of 1966. This act requires state and federal agencies that receive federal funds to consider the effects of their actions on historic properties. Area Wildlife Managers are required to review all activities to determine if that activity is considered an undertaking (project that could affect historic property). Those activities considered an undertaking are submitted to a State Historic Preservation Office contract archeologist to determine if cultural resources are present that may be adversely impacted.

3.12 Natural Disturbance Events

GDS-12A. Natural disturbance events will be promptly evaluated to determine the management needed to address their impacts.

By promptly evaluating known disturbance events (e.g., fire, wind, or insects and disease), land managers will be able to quickly recommend what, if any, management activities are necessary to mitigate the impacts of the event. Depending on the scale of the event and potential positive or negative impacts, management recommendations will range from no action to salvage harvesting and/or prescribed burning. Where quick action is needed to salvage harvest timber from damaged stands, the annual plan addition process with public review will be used.

GDS-12A - Strategies

a. The AP Team will evaluate large-scale (100's to 1000's of acres) disturbance events to determine appropriate action.

If large-scale disturbance events occur during the 10-year plan, the core team will assess the extent and significance of the event on the structure and condition of managed lands in the Subsection. The team will propose management actions to be implemented within the area impacted by the event and determine whether adjustments to the short-term harvest levels are needed.

When large-scale disturbance events involve multiple ownerships, the DNR will cooperate in assessment and implementation of management actions with other agencies and landowners, when possible. To better inform the public of planned large-scale salvage harvest, a press release will be completed that includes information on the disturbance and the planned management actions.

b. Local land managers will evaluate and determine appropriate actions for small-scale (10s of acres) disturbance events.

After small-scale disturbances, local DNR Forestry and Wildlife managers will do a timely evaluation of the disturbance area and take the appropriate action needed to address the situation.

3.13 Other Jurisdictions

GDS-13A. Vegetation management will be coordinated across ownership boundaries.

There is a patchwork of ownership in the AP, including land owned by counties, watershed districts, private landowners, federal and state agencies, and conservation organizations. Land managers often have different ideas and goals for the lands they manage. On the other hand, plant communities often cross property lines and wildlife species know no property boundaries. To maintain habitat connectivity and maintain large patches for wildlife, land managers must work together across ownerships toward common goals to manage the land. The team considered other planning efforts in the Subsection while developing this vegetation management plan.

GDS-13A - Strategies

a. Land managers will work with local government units, federal agencies, state agencies, and conservation organizations to develop coordinated conservation plans.

b. Utilize existing coordinated conservation plans to guide and prioritize vegetation management.

Tomorrow's Habitat for the Wild and Rare: An Action Plan for Minnesota Wildlife and the *Conservation Area Plan for the Tallgrass Aspen Parkland* are just two of the existing conservation plans that serve to guide land managers in vegetation management.

c. Land managers will contact and work with willing landowners adjacent to state-administered land and beyond, as appropriate, to coordinate and assist in vegetation management activities.

d. DNR staff collaborate via the Agency's Coordination Framework.