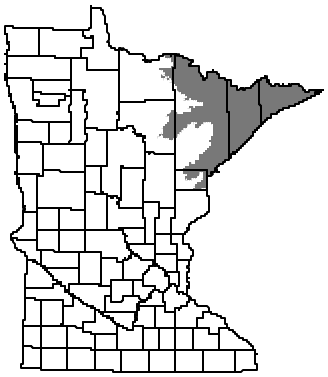
Minnesota Forest Resources Council
Landscape Program

RECOMMENDED
DESIRED OUTCOMES, GOALS AND STRATEGIES

NORTHEAST LANDSCAPE REGION



A REPORT TO THE
MINNESOTA FOREST RESOURCES COUNCIL

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LP-0303a

Prepared by: MFRC Staff
Northeast Regional Landscape Committee
MFRC Landscape Committee

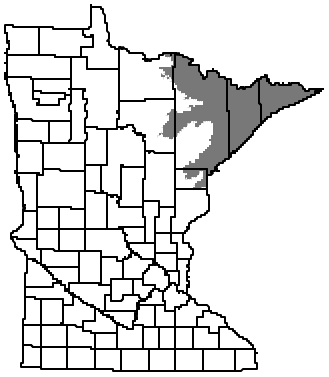
INTRODUCTION

The Minnesota State Legislature enacted the Sustainable Forest Resources Act (SFRA) in 1995, which established the MN Forest Resource Council (MFRC) and formalized the state's policy to:

- pursue the sustainable management, use, and protection of the state's forest resources to achieve the state's economic, environmental, and social goals;
- encourage cooperation and collaboration between public and private sectors in the management of the state's forest resources;
- recognize and consider forest resource issues, concerns, and impacts at the site and landscape levels;
- recognize the broad array of perspectives regarding the management, use, and protection of the state's forest resources and establish processes and mechanisms that seek and incorporate these perspectives in the planning and management of the state's forest resources.

The MFRC Landscape Program establishes landscape committees on a regional basis to implement these state policies at the landscape level throughout the State.

The committee for the Northeast Landscape Region, which includes Cook, Lake, St. Louis, and Carlton counties (approximately 7.4 million acres), was the first in the state to organize. In 1997 the Northeast Regional Landscape Committee began working to find agreement on how best to achieve long-term forest sustainability by determining the desired future forest conditions and developing goals and strategies to achieve the agreed-upon desired future conditions.



According to participants, the landscape planning processes have developed useful scientific approaches and information and valuable tools for landscape assessment; fostered working relationships with a diverse set of people; produced landscape direction for agencies and other landowners on a voluntary basis; developed strategies for implementing this landscape direction; and facilitated better communication among diverse groups. Also, the landscape planning processes have helped land managers recognize that individual land management choices must be viewed in the context of those of their neighbors and that the multiple management objectives of the various land managers can provide for a diverse and balanced landscape condition in terms of ecological health and biodiversity.

This report summarizes the work of the Northeast Regional Landscape Committee (the Committee) from 1997 through 2003.

PROCESS SUMMARY

The Committee was organized in June, 1997 with over 60 people expressing interest in participating. Currently there are over 35 people on the mailing list and a core, active group of 15-20 attending bi-monthly, all day meetings (see appendix 1, mailing list). The Committee established three "work groups" of approximately 10 people to work on assessment information, coordination and outreach activities. These work groups meet as needed.

The Committee was breaking new ground on how to do landscape-level planning and analysis so a great deal of learning occurred and new information for a landscape scale had to be developed. Early in the process the Committee chose to follow an ecologically based process based on native plant communities rather than forest cover types and on site productivity/potential rather than what currently exists on the site. Also, the Committee decided to complete the ecological analysis first and then determine the economic impact of any proposed changes. The Committee did not develop explicit social and economic goals.

A brief description of the steps the Committee followed is given below:

Current Trends and Conditions Assessment (1997-99)

Existing information on the social, ecological and economic aspects of the landscape were identified by the Assessment Work Group and compiled by staff. This document served as a starting point for discussion, definition of new information, and initial issue identification (refer to MFRC web site at www.frc.state.mn.us for the assessment). The questions of the sustainability of current trends and conditions was discussed and not agreed to by the Assessment Working Group. A minority report was prepared and submitted that current trends and conditions were not sustainable.

Issue Identification (1999)

The Assessment Work Group of the Committee completed the *Current Conditions and Trends Assessment* for the Northeast Landscape Region and reported the following findings:

- Parcelization of private forestland, especially along lakeshores, has increased over the last 20 years but the extent of the trend is not known.
- Existing vegetation inventory systems are primarily focused on collecting timber management data, not ecologically based data; such data does not serve the purpose of an ecological assessment.
- There has been a large change in timber age class and species composition over time, but it is not known what this means for sustainability.
- The question of whether timber harvesting trends over the last 10 years is sustainable is not resolved by the information in the assessment.
- Information does not make linkages between economic and environmental quality, social satisfaction, and community well-being.

Ecological Analysis (1999-2001)

New ideas about ecosystem management were emerging. Haufler, Mehl, and Roloff published their work on the coarse-filter approach (Haufler et al. 1999), and Frelich published his work on an ecological model for forests based on the "Range of Natural Variability" (RNV) (Frelich 1998, 1999, 2000). Both models played an important role in the ecological analysis of the forestlands of the Northeast Landscape Region.

Jonathan Haufler described his concept in his 1996 paper as follows: "The approach is based on a tool called an ecosystem diversity matrix, which provided a framework for a description of historical disturbance regimes, existing landscape conditions, required conditions to support biodiversity, and desired future landscape conditions."

In 1998 Lee Frelich described his approach to modeling the forests of northern Minnesota with this introduction: "The forests of northern Minnesota have been shaped by three primary factors: climate, unique soil and landform combinations, and disturbance. A given combination of disturbance regime (simply a description of the types, severities, and frequencies of disturbances that occur in a given region), soil type and climate generally leads to forests with a characteristic range of composition, age structure and physical structure."

Frelich modeled the landscape age structure of different forest types in the Northern Superior Uplands Section of northeastern Minnesota under the natural disturbance regime in effect during presettlement times (1600-1900), and using recent studies of disturbance ecology (Frelich 2002). He based the forest types on data from land surveyor records and a recent classification of the new native plant communities by Minnesota DNR Natural Heritage and County Biological Survey staff. Eight plant communities were described (see appendix 2 for Frelich model description).

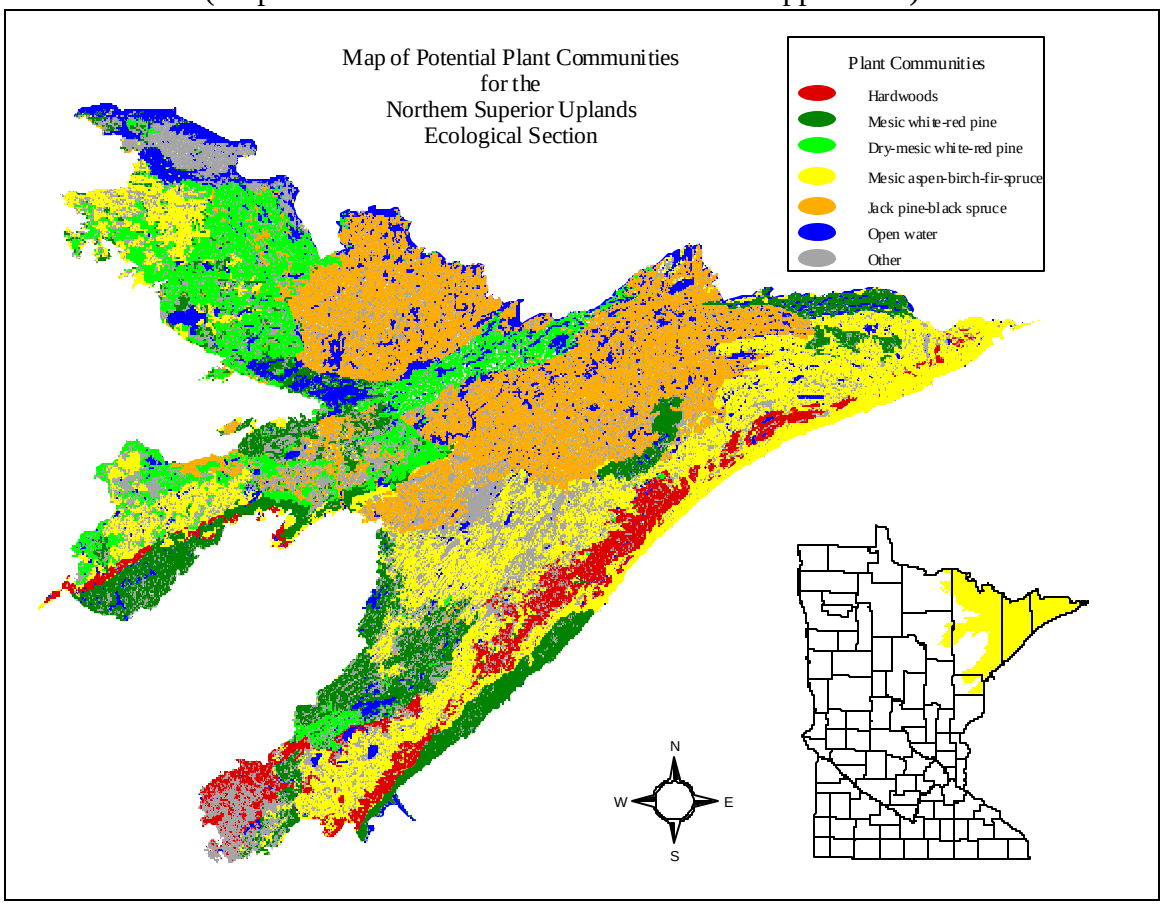
The following plant community map represents the ecological potential of the area, it does not represent what forest cover types are currently occupying the area. The following table illustrates the difference for the 141- 200 year age class in the dry-mesic red and white pine plant community. The current acres of forest cover type is based on forest inventory data of what is currently occupying the area. The potential acres is what could occupy the area under natural disturbance and successional pathways.

Cover Type	Current Acres	Potential Acres
Red/white pine	400	63,600
Paper birch/spurce fir	200	
Jack pine	200	

The goals and strategies (refer to section on Recommended Goals and Strategies, page 9) are based on moving the landscape from current toward potential over time.

Potential Ecological Plant Communities

(adapted from L. E. Frelich model - refer to appendix 3)



The Committee used the Range of Natural Variation as a tool to determine the ecological goals and strategies for the Northeast Landscape Region. Ecological analysis of the Northern Superior Uplands (NSU) landscape was carried out at the Natural Resources Research Institute (NRRI) (White and Host 2000; White, Host, and Brown 2001; Brown and White 2002). By combining Frelich's NSU forest types with current forest data along with specific information about the local physiography, geology, and hydrology in the landscape area, a map was created that shows the predominant (or highest probability) forest type for each geographic area. This work was based on the assumption that the predominant forest type in a specific geographic area is likely to remain stable over time and that changes occur in the age structure and species composition <u>within</u> each forest type (see appendix 3 for mapping methodology).

The ecological analysis of the Northeast Landscape Region did not include a spatial analysis of recommended patch sizes or how vegetation is spatially located on the landscape. This aspect of the ecological analysis is being conducted by the MFRC "Spatial Analysis Project". The project is scheduled for completion in June, 2003 will produce a variety of models and tools to begin to analyze spatial

patterns on the landscape. The Committee will then decide how to conduct a spatial analysis for the Landscape.

Desired Future Forest Condition (2000-2002)

The desired future forest condition established by the Committee is based on the assumption that if the forest is maintained closer to a natural condition it is likely to be sustainable in an ecological sense, meaning the long-term persistence of all components of the ecosystem and the functioning relationships among the components. Therefore, one main goal of the ecological analysis was to determine the natural condition of the forest and compare this to the current condition (see appendix 4 and 5 for reports).

Goals and Strategies (2001-2002)

Using the information generated by comparing the current conditions to the RNV conditions of the forest, small groups of the Committee developed management goals and strategies for five of the native plant communities. Addressing the question of what is the desired condition of the future forest and how to achieve it (over a period of 100 years), each group developed alternatives, at least one of which demonstrated movement toward a natural disturbance regime. Goals were not developed for the lowland conifer, rich swamp, and jack pine-aspen-oak, either because data was not available or because the forest type occurs only in a very limited geographical area.

After each small group developed their goals and strategies (the mesic-aspen-birch group did not reach complete agreement on their goals and strategies), NRRI analyzed how the recommended management strategies would alter the composition and structure of the forest type. Each small group then presented their results to the Committee as a whole for discussion and approval.

Social and Economic Analysis (2000-2002)

An analysis of the overall economy of northern Minnesota, published in July 2001 by Lichty et al., found that the region is economically diverse (see appendix 6 for web address of report). While very dependent on natural resources, primarily the mining and forest product industries, a significant share of the region's economy is provided by the tourism industry, services, and government, followed by manufacturing, trade, and construction.

The UMD Bureau of Business and Economic Research (BBER) modeled potential impacts to the current economy of northeastern Minnesota if the wood supply were to change in volume and species mix due to ecological considerations (appendix 7). The study analyzed possible bottlenecks for forest products industries if appropriate species of trees are not available. The project analyzed various scenarios in the short term (10-20 yrs) to determine the impact from changing forest species mixes on the paper industry as well as on other wood product industries. BBER used the economic modeling software and data system known as IMPLAN to show bottlenecks in supply given changes in demand.

For northeastern Minnesota, five scenarios were modeled in addition to the current harvest level. 1990 Forest Inventory and Analysis volume per acre by

species were used to estimate volume for scenarios 1 and 2 (*Average Tree Species Volume Estimates for Northern Superior Uplands Ecosystem Types Based on 1990 FIA plot Data*, Mark A. White, Natural Resources Research Institute, University of Minnesota, Duluth, May 9, 2002). Current harvest volume was determined by using three year averages of data collected by "USFS North Central Research Station (NCRS) pulpwood mill surveys and DNR sawmill surveys; and growth data from 1990 FIA survey by NCRS" (*Input data for IMPLAN Model*, Chad Skally June 12, 2002, Revised July 9, 2002). Scenario 3, 4, 5 used volume estimates based growth and mortality.

- **Scenario 1:** Moving landscape toward desired forest conditions.
- **Scenario 2:** Harvest levels are above scenario 1 for the next 10-20 years, then decline; landscape moving toward desired forest conditions.
- **Scenario 3:** Total growth minus mortality based on 1990 FIA data.
- **Scenario 4:** Total growth minus 50% of the mortality based on 1990 FIA data.
- **Scenario 5:** Harvest all annual growth for all species; assumes all mortality is captured.

DESIRED FUTURE FOREST CONDITION

The Northeast Regional Landscape Committee desires a forest that:

- approximates/moves toward the range of variability (the spectrum of conditions possible in ecosystem composition, structure, and function considering both temporal and spatial factors) for plant communities naturally living and reproducing in northeastern Minnesota.

- has spatial patterns (size and location of openings) that are consistent with the ecology of northeastern Minnesota.

- provides diverse habitat to maintain natural communities and viable populations (the ability of a wildlife or plant population to maintain sufficient size to persist over time in spite of normal fluctuations in numbers) for the plant and animal species in northeastern Minnesota.

The Committee recognizes that the desired future forest condition is a long-term condition and can only be achieved by moving in incremental steps while giving full consideration to the social and economic impacts that may occur.

RECOMMENDED GOALS & STRATEGIES

The following recommended goals and strategies are for the long-term (100+ years) management of the Northeast Landscape Region and relate directly to the first bullet statement of the desired future forest condition:

- approximates/moves toward the range of variability (the spectrum of conditions possible in ecosystem composition, structure, and function considering both temporal and spatial factors) for plant communities naturally living and reproducing in northeastern Minnesota.

Goals and strategies for the remaining two bullets in the desired future forest condition will need further analysis by the Committee when spatial analytical tools become available and monitoring data is analyzed:

- has spatial patterns (size and location of openings) that are consistent with the ecology of northeastern Minnesota.
- provides diverse habitat to maintain natural communities and viable populations (the ability of a wildlife or plant population to maintain sufficient size to persist over time in spite of normal fluctuations in numbers) for the plant and animal species in northeastern Minnesota.

The following recommended goals and strategies are for the long-term (100 years+) management of the northeast landscape. Refer to the small group reports on each plant community for detailed descriptions and analysis (see appendix 8 for small group reports).

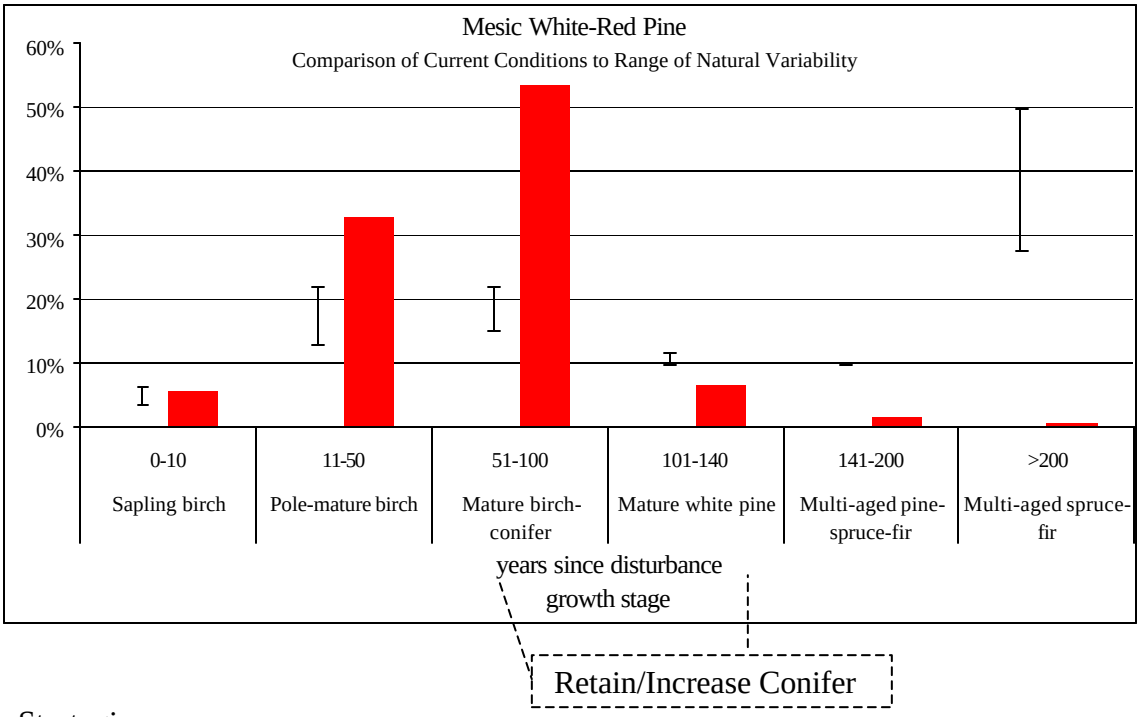
Mesic White-Red Pine (671,000 acres; 12% of landscape)

Ownership:

Private:	38%
County:	28%
Federal:	20%
State:	9%

Long-term Goals:

- Increase the white and red pine component.
- Increase the 101+ growth stage of red and white pine.



Strategies:

- Harvest aspen and birch out of the mature birch-conifer growth stage (51-100 yrs) for the first 30 years. implement conifer retention where conifers are present.
- Harvest aspen and birch out of the mature birch-conifer growth stage (51-100 yrs) and birch out of the mature white pine growth stage (101-140 yrs) from year 30 to year 130 implement conifer retention where conifers are present.
- Salvage trees damaged by wind disturbance in growth stages over 50 years implement conifer retention where conifers are present.

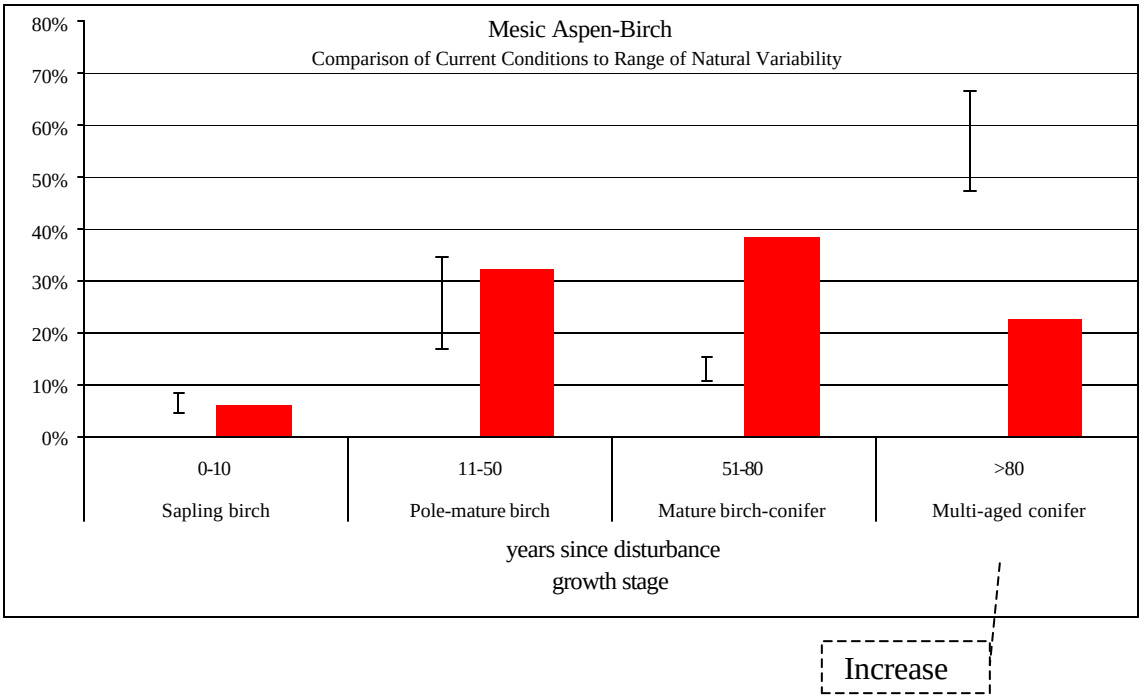
Mesic Aspen-Birch (875,000 acres; 20% of the landscape)

Ownership:

Private:	34%
County:	11%
Federal:	36%
State:	19%

Long-term Goals:

- Increase the 81+ multi-aged conifer growth stage.
- Increase the white pine, white spruce, and tamarack component.



Strategies:

- Seed-tree cuts from non white pine stands that have an existing mature white pine component allowing for white pine regeneration; encourage spruce/fir regeneration to protect pine.
- Harvest by mimicking natural patterns of disturbance using regeneration harvest with variable retention of residuals as the primary tool in the 40-60 year age class
- Identify additional acres in 51-80 yr mature birch-conifer growth stage and underplant white pine consistent with composition for growth stage (4-8 % of all stems).
- Select harvested areas with good potential for upland tamarack and encourage tamarack (need to determine silvicultural prescription).
- Select acres in 11-50 year pole mature birch and 51-80 year mature birch conifer growth stages for underplanting white spruce at rates that are representative of it's natural range (5-9% of all stems).

- Identify and manage approximately half of the 51-80 year mature birch-conifer growth stage for structural features found in the 81+ year growth stage (need to further evaluate the feasibility of doing this).

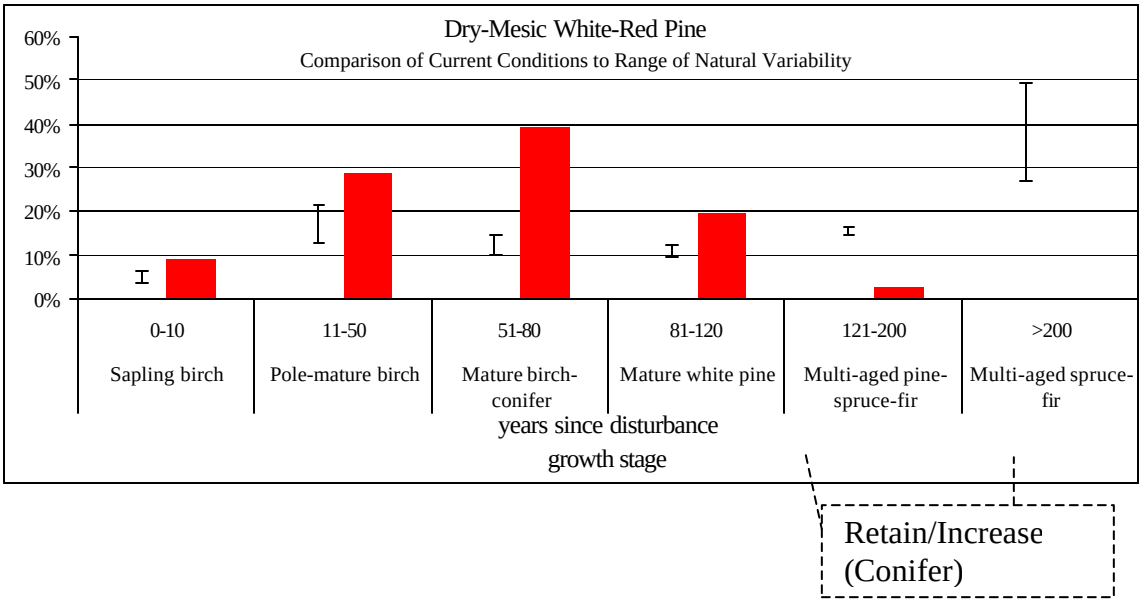
Dry-Mesic White-Red Pine (641,000 acres; 11% of the landscape)

Ownership:

Private:	36%
County:	15%
Federal:	31%
State:	18%

Long-term Goals:

- Increase the red and white pine and white spruce components.
- Increase the older growth stages (121+yrs).



Strategies:

- Concentrate harvest activities in the mature birch-conifer growth stage (51-80 yrs) with emphasis on restoring pine on stands currently dominated by deciduous species especially aspen.
- Identify areas that will be managed to enhance the mature white pine, multi-aged pine-spruce-fir and multi-aged spruce-fir growth stages
- Emphasize maintenance of stands that are currently dominated by white and red pine
- Underplant with red and white pine toward the older end of the pole-mature birch stage
- Underplant white spruce in pole mature birch growth stage (11-50 yrs).

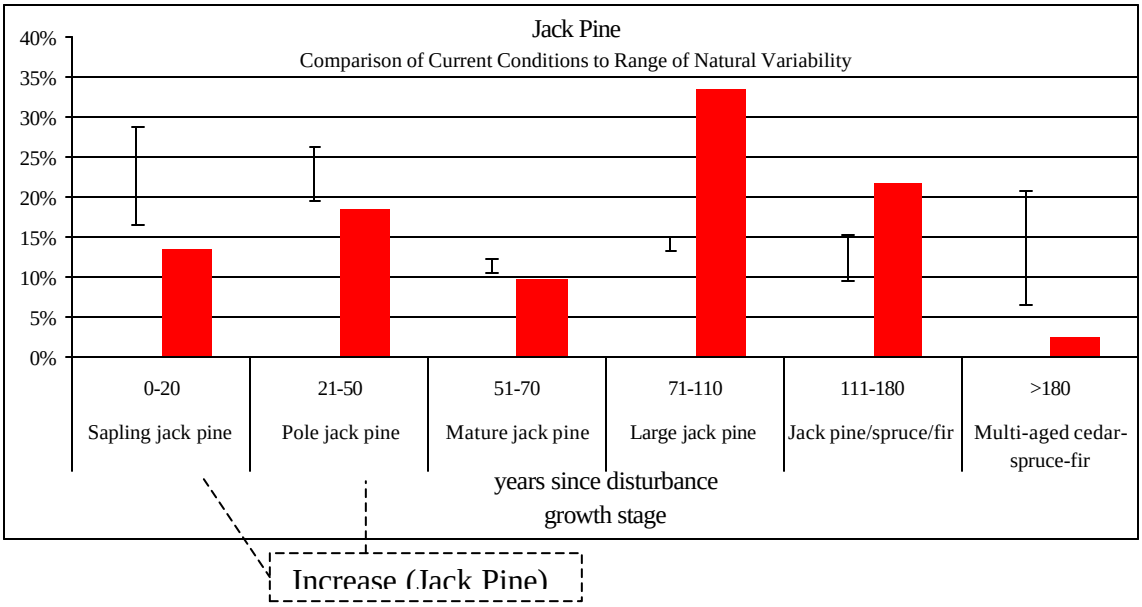
Jack pine – Black spruce (1,069,900 acres; 21% of the landscape)

Ownership:

Private:	10%
County:	2%
Federal:	26% Outside BWCA
	56% BWCA
State:	6%

Long-term Goals

- Increase jack pine component throughout the entire plant community



Strategies:

- Maintain jack pine composition where it currently exists in areas being treated.
- Ecological goals should be accomplished in BWCAW through natural fire if policy allows.
- Harvest in the large jack pine, mature jack pine, and pole jack pine growth stages and restore jack pine through a variety of methods as site dictates (seeding, planting, prescribed fire).

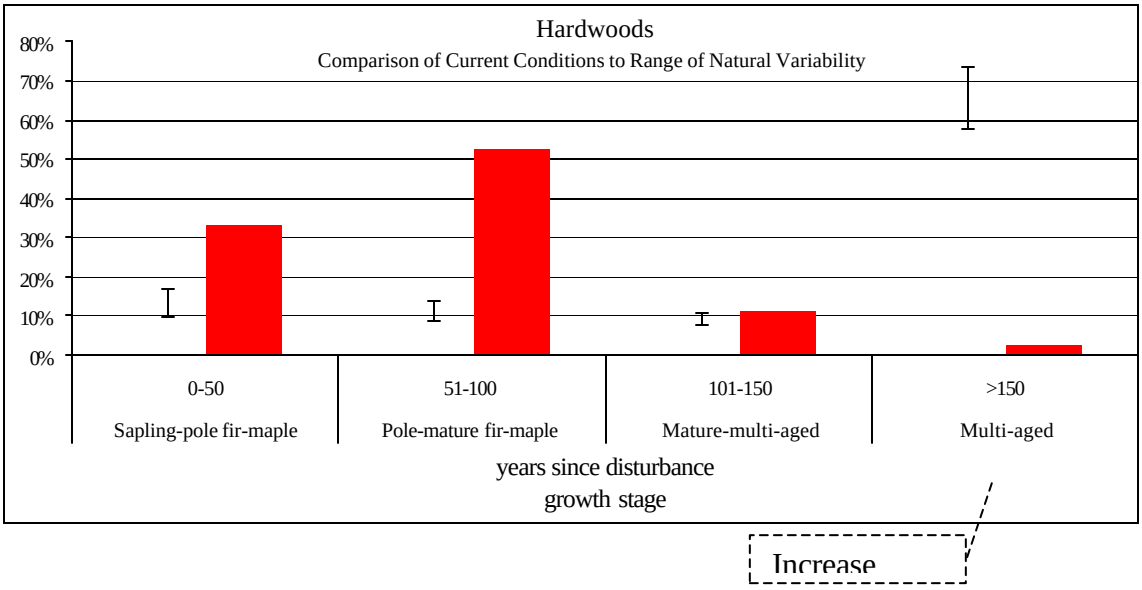
Northern Hardwoods (246,000 acres; 10% of the landscape)

Ownership:

Private:	35%
County:	23%
Federal:	24%
State:	18%

Long-term Goals:

- Increase the white pine, yellow birch, white spruce and white cedar components.
- Move every growth stage toward RNV over the next 150 years.



Strategies:

- Apply uneven-aged management in pole-mature fir-maple growth stage (51-100 yrs) to increase characteristics of multi-aged growth stage (150+ yrs).
- Allow unmanaged acres from the mature multi aged growth stage to succeed to the multi-aged growth stage.
- Apply even-age management in pole-mature maple growth stage (51-100 yrs) to maintain younger age classes

COORDINATION FRAMEWORK

At their June, 2002 meeting, the Coordination Work Group discussed how coordination will be done on a landscape scale. Their ideas along with the input from the Council's Landscape Committee at their January, 2003 meeting form the basis of the following coordination framework for the Northeast landscape Region.

The Coordination Work Group consists of the landowners in the Northeast Landscape Region as well as any members of the Northeast Regional Landscape Committee who chose to participate. The primary purpose of the Coordination Work Group is to coordinate the voluntary implementation of the landscape goals and strategies across the landscape.

The Coordination Work Group will meet on a quarterly basis, as needed, to:

- Look at existing plans and see how they fit with landscape goals – example National Forest Plan, DNR Subsection etc. Highlight the opportunities for cooperation and the areas of challenge.
- Determine how much each landowner can voluntarily contribute toward the landscape goals on a yearly basis.
- Look for ways to cooperate and coordinate on the ground management activities to achieve landscape goals.
- Analyze the cumulative effects of current and planned activities across the landscape.
- Assist MFRC Staff in collecting necessary monitoring information as described in the "Monitoring Framework" section of this report.

MONITORING FRAMEWORK

The MFRC Landscape Committee agreed that a high quality monitoring system is needed at five-year intervals to measure progress and analyze the rate of change relative to the landscape goals and strategies, as well as to measure long-term progress toward desired conditions. The MFRC Landscape Committee recommends that the historical context (Range of Natural Variation) be used as the benchmark and the current condition as a baseline. Each five-year assessment will use the current condition as a baseline and measure it against the RNV benchmark. Rate of change will be a comparison with the previous five year baseline to the current five year baseline.

The MFRC Landscape Committee recommends that the following measures and measuring protocols be used as part of the monitoring process:

Measurement	Protocol
Acres of each major forest plant community by species. Acres of each major forest plant community by growth stage.	The following technical papers (appendix 3,4,5) will be used: • *Mapping Range of Natural Variation Ecosystem Classes for the Northern Superior Uplands: Draft Map and Analytical Methods.* Mark A. White and George E. Host. August 9, 2000. • *Northeast Landscape - Range of Natural Variation Analysis: Methods, Data and Analysis.* Mark A. White, George E. Host, Terry N. Brown. January 25, 2001. • *Northern Superior Uplands: A Comparison of Range of Natural Variation and Current Conditions*. Terry Brown and Mark White. February 26, 2002
Acreage goals for each major forest plant community specified in public agency land management plans and in other plans if available.	MFRC Staff andCoordination Work Group review plans and compile acreage goal summary for landscape
Harvest goals for each major forest plant community specified in public agency plans and in other plans if available.	MFRC Staff and Coordination Work Group review plans and compile acreage goal summary for landscape
Acres affected by specific silvicultural practices	GEIS Silviculture Technical Paper and 1996 Survey Report (appendix 9, 10) should be

	used as a baseline. MFRC Staff and Coordinating Work Group compile data for landscape
Number of land managers trained at silvicultural workshops	MFRC Staff and Coordination Work Group survey agencies, organizations and companies and compile data
Number of conifer seedlings produced by species at Minnesota tree nurseries.	DNR nursery records

The Minnesota Forest Resources Council will have overall responsibility for implementing the monitoring framework, including:

- Preparing the five year monitoring report.
- Keeping landowners, agencies, non-government organizations, private consultants, participants in the Regional Landscape Committees and the general public informed of the results of implementation and monitoring activities in the landscape.

The MFRC Landscape Committee recognized that models will change and improve in the future, and that landscape goals should be adjusted based on improved models.

APPENDIX

1. Mailing list of Northeast Regional Landscape participants

1. Range of Natural Variability in Forest Structure for the Northern Superior Uplands. Lee E. Frelich. September 13, 1999

2. Northeast Landscape Range of Natural Variation Analysis: Methods, Data and Analysis. Mark A. White, George E. Host and Terry Brown.

3. Mapping Range of Natural Variation Ecosystem Classes for the Northern Superior Uplands: Draft Map and Analytical Methods. Mark A. White and George E. Host. August 9, 2000.

4. Northern Superior Uplands: A Comparison of Range of Natural Variation and Current Conditions. Terry Brown and Mark White. February 26, 2002 (Introduction, Methods and one plant community)

5. Executive Summary, Northern Minnesota Forestry Analysis. Richard Lichty et al. July 2001. UMD Bureau of Business and Economic Research

6. Executive Summary, Forestry Bottleneck Analysis. September 2002. UMD Bureau of Business and Economic Research

7. Small group reports on goals and strategies for each plant community.

8. Summary, Sections, 1,2; Silvicultural Systems, A Background Paper for a Generic Environmental Impact Statement on Timber Harvesting and Forest Management in Minnesota; Jaakko Poyry Consultants, Inc, December, 1992

9. Executive Summary, Sections 1,2; Status of Minnesota Timber Harvesting and Silvicultural Practice in 1996 - A Report to the Minnesota Forest Resource Council. Klaus J. Puettman, Charles R. Blinn, Helen W. McIver and Alan Ek.

Minnesota Forest Resources Council – Landscape Program
NE Landscape – Technical Papers

LITERATURE

- USDA Forest Service. 1994. An Ecological Basis for Ecosystem Management. General Technical Report RM-246
- Haufler, Mehl, Roloff. 1996. "Using a coarse-filter approach with species assessment for ecosystem management". Wildlife Society Bull. 24:200-208
- Frelich, Lee E. 2002. Forest Dynamics and Disturbance Regimes: Studies from Temperate Evergreen-Deciduous Forest. Cambridge University Press. 266 pp.

PAPERS AND CONTRACTS – Mapping; Natural Disturbance and Succession (RNV)

- Natural Disturbance and Variability of Forested Ecosystems in Northern Minnesota. Lee E. Frelich. June 17, 1998
- Natural Disturbance and Variability of Forested Ecosystems in Northern Minnesota: a Brief Summary. Lee E. Frelich. June 17, 1998
- Forest Type and Age-class Distribution in the BWCAW. Steve Friedman and Lee E. Frelich. June 17, 1998
- Range of Natural Variability in Forest Structure for the Northern Superior Uplands. Lee E. Frelich. Sept. 13, 1999
- Model by George Host that gave numbers to Frelich's ecosystems and growth stages (available in A CD – various Power Point presentations)
- Native Plant Community Mapping: Northern Superior Uplands. Mark A. White and George E. Host. Work Plan – November 30, 1999
- Mapping Range of Natural Variation Ecosystem Classes for the Northern Superior Uplands: Draft Map and Analytical Methods. Mark A. White and George E. Host. August 9, 2000.
- Map based on Physiographic Clusters, Land Type Associations and GLO bearing tree distributions – Northern Superior Uplands. Mark A. White
- Northeast Landscape - Range of Natural Variation Analysis: methods, data and analysis. Mark A. White, George E. Host, Terry N. Brown. Jan. 25, 2001.
- Growth Stage Summaries for Mesic White pine-red pine and Mesic Aspen-birch-spruce-fir. Mark A. White. May 7, 2001
- Growth Stage Summaries for Dry-mesic White pine-red pine and Dry-mesic Jack pine-black spruce. Mark A White. May 7, 2001
- Northern Superior Uplands: A Comparison of Range of Natural Variation and Current Conditions. Terry Brown and Mark White. February 26, 2002
- Average Species Volume Estimates for Northern Superior Uplands Ecosystem Types Based on 1990 FIA Plot Data. Terry Brown and Mark A. White. June 4, 2002.

- Final Ecological and Fire Conditions – Bwoundary Waters Canoe Area Wilderness. April 2002. Prepared by Dr. Lee Frelich and Don Carlton, and submitted to the USFS Superior National Forest.
- Imput data for IMPLAN Model being developed in the MFRC Northeast and North Central Landscape Regions. Chad Skally. June 12, 2002; Revised July 9, 2002.
- Average Tree Species Volume Estimates for Northern Superior Uplands Ecosystem Types Based on 1990 FIA plot data. Prepared by Mark A. White, Natural Resources Research Institute, University of Minnesota, Duluth, for the Minnesota Forest Resources Council Landscape Program. May 9, 2002.

ECONOMIC ANALYSIS

- Northern Minnesota Forestry Analysis. Richard Lichty et al.. July 2001. UMD Bureau of Business and Economic Research
- Forestry Bottleneck Analysis. September 2002. UMD Bureau of Business and Economic Research
- Modeling of Northeast Landscape Scenarios. December 20, 2002. Chad Skally, Dave Miller, MFRC and Mark White, Terry Brown, UMD - NRRI