

DNR's Old-growth Forests Guideline *Implementation Results 2002*



DRAFT
Interim Summary Report

December 26, 2002

Prepared by
The DNR Old-growth Forest Committee



Old-growth white pine, photo by Steve Schneider / Photography

Cover photograph – Old-growth yellow birch and white cedar in Crosby Manitou State Park, photo by Steve Schneider / Photography

If you have questions or comments please contact report editors: Keith Wendt and Jim Manolis MN DNR Science Policy Unit at 651-297-7989.

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Old-growth and Subsection Committees

Old-growth Committee

Brad Moore, Co-chair (Commissioner's Office)

Keith Wendt, Co-chair (OMBS–Science Policy Unit)

Tom Baumann (Forestry)

Steve Merchant (Wildlife)

Dave Olfelt (Parks)

Kurt Rusterholz (Ecological Services)

Past Members (1992 to 2001): Bruce ZumBahlen, Chair (Forestry) and **Barry Morse** (Forestry)

Principal Staff : Jim Manolis, Daren Carlson, and Jon Rosales, (OMBS–Science Policy Unit)

Old-growth Subsection Chairs and Data Coordinators

Denny Allen (Regional Administration) – Chair of Blufflands Subsection

Ed Brekke-Kramer (Parks and Recreation) – Co-chair of Minnesota River Prairie and Prairie Coteau Subsections

Bill Barnacle (Forestry) – Chair of Anoka Sandplains Subsection

Katie Haws (Ecological Services) – Chair of Aspen Parklands and Red River Valley Subsections

Jeff Hines (Wildlife) – Data Coordination for Blufflands Subsection

Mike Lee (Ecological Services) – Data Coordinator for Blufflands Subsection

Mike Locke (Forestry) – Region 1 Data Coordinator

Becky Marty (Parks and Recreation) – Chair of Pine Moraines Subsection

Jack Olson (Regional Administration) – Chair of Mille Lacs Uplands and Glacial Lake Superior Plain Subsections

Tim Quincer (Wildlife) – Chair of Tamarack Lowlands Subsection

Dick Peterson (Forestry) – Chair of Big Woods and Oak Savanna Subsections

Doug Rau (Forestry) – Data Coordinator for Blufflands Subsection

John Schladweiler (Wildlife) – Co-chair of Minnesota River Prairie and Prairie Coteau Subsections

Thom Soule (Wildlife) – Chair of Chippewa Plains and Hardwood Hills Subsections

Dave Thomas (Forestry) – Chair of Agassiz Lowlands Subsection

Jim Weseloh (Regional Administration) – Chair of Border Lakes, North Shore Highlands, Little Fork Vermillion, St. Louis Moraines, and Nashwauk Uplands Subsections

Steve Wilson (Ecological Services) – Region 2 Data Coordinator

The 1994 Old-growth Stakeholder's Roundtable Participants

In 1994 a Stakeholder's Roundtable convened to assist DNR staff to establish targets critical to implementing DNR's Old-growth Guideline. Participants included:

Don Arnosti (Minnesota Audubon Society)

Wayne Brandt (Minnesota Forest Industries)

Steve Eubanks (U.S. Forest Service, Chippewa National Forest)

Lee Frelich (University of Minnesota)

Jan Green (Minnesota Audubon Council)

Howard Hedstrom (Hedstrom Lumber Company)

Ken Nickolai (Minnesota Center for Environmental Advocacy)

Garret Ous (Minnesota Association of County Land Commissioners)

Jack Rajala (Rajala Companies)

Jerry Rose (MNDNR Division of Forestry)

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Old-growth white cedar, photo by Steve Schneider / Photography

I. Background

A. Old-growth Forests in Minnesota – Definition and Current/Former Extent

Tree age, unique stand structure, and degree of disturbance define old-growth forests. Developing over long time periods without catastrophic disturbance, old-growth forests typically contain large trees older than 120 years, large snags, and large fallen trees. The death or windthrow of single trees produces a mix of tree ages, canopy gaps, and tip-up mounds and pits. These features together create the diverse and unique structure of old growth. Old-growth forests vary considerably by geographic location and by tree cover type; a few of Minnesota’s old-growth forest community types are shown below.



Figure 1. Old-growth northern hardwoods, Cass County, photo by George-Ann Maxson



Figure 2. Old-growth upland white cedar, Lake County, photo by Kurt Rusterholz



Figure 3. Old-growth lowland hardwoods, Minn. River Valley, photo by Daren Carlson

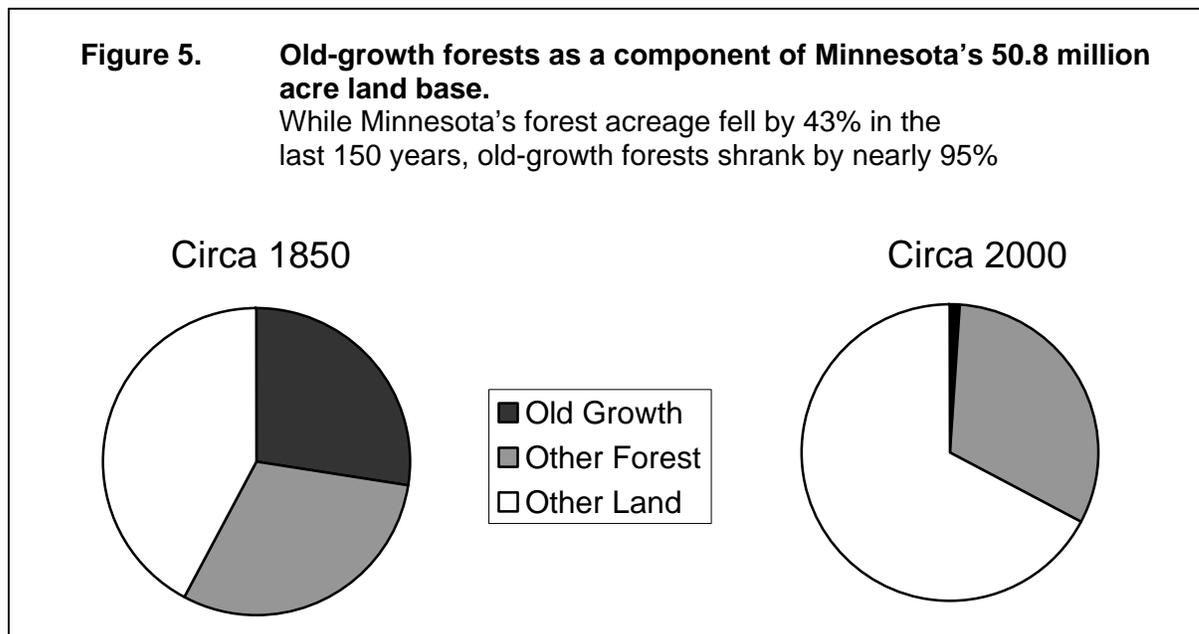


Figure 4. Old-growth red/white pine, the Lost Forty Scientific and Natural Area, DNR photo.

The best information on the historic and modern extent of Minnesota old-growth forests comes from *The Final Generic Environmental Impact Statement Study on Timber Harvesting and Forest Management in Minnesota* (1994 GEIS). On average, across all forest types, the 1994 GEIS estimated that approximately 51% of Minnesota’s forests were old growth prior to European settlement. The proportion of old-growth forest in individual cover types varied widely. For example, approximately 41% of lowland conifers; 55% of red pine and white pine; and 89% of northern hardwoods were old growth.¹

Old-growth forests are now rare in Minnesota. Based on an analysis of old-growth and old forest defined as stands older than 120 years (90 years for white spruce), the 1994 GEIS states that: “About four percent (610,800 acres) of current forests are old or old growth, compared with 51 percent in presettlement times.”² Even less of the forest meets the MNDNR definition of old growth, that is ‘old forest’ of natural origin with little evidence of logging.³ The Boundary Waters Canoe Area Wilderness contains most of the state’s old growth. However, the BWCAW’s geographic distribution (“Border Lakes”) and its cover types capable of attaining old-growth conditions (red-white pine, spruce fir, and white cedar) are not representative of all old-growth types in Minnesota. About one-third of the BWCAW has the potential to attain old-growth conditions.⁴

While Minnesota’s forest acreage fell by 43% in the last 150 years, old-growth forests shrank by nearly 95% (Figure 5).



¹ Biodiversity: A Technical Paper for a Generic Environmental Impact Statement on Timber Harvesting and Forest Management in Minnesota, December 1992, pp. 33-35.

² Biodiversity: A Technical Paper for a Generic Environmental Impact Statement on Timber Harvesting and Forest Management in Minnesota, December 1992, p. 35.

³ MDNR Old Growth Guidelines, January 1991.

⁴ Miron Heinselman, “The Boundary Waters Wilderness Ecosystem,” Table 4.1, p 18.

B. Old-growth Forest Values

Minnesota's forests serve a wide range of values: timber production; conservation of habitats, wildlife species, and overall biological diversity; outdoor recreation and hunting; watershed health; and fishing.⁵ Maintaining these values involves a range of forest management categories including: high production value forests managed primarily for wood fiber; mixed-use forests managed for multiple values, urban forest woodlots, and high conservation value forests managed primarily for their biodiversity and complexity.⁶ Sustainable forest management works to achieve the appropriate balance of these forest categories, each offering distinct ecological, economic, and social values. Minnesota's remaining old-growth forests represent important conservation areas that occupy unique historical, ecological niches across the landscape. Their protection is one element in the larger goal of long-term sustainability of all Minnesota forestlands.

Old-growth forests have many values:

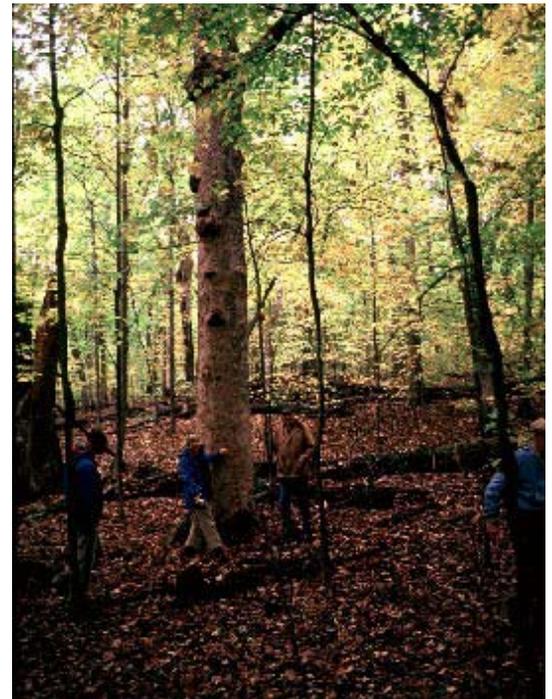
- Old-growth forests provide benchmarks of natural forest conditions; to which intensively managed forests can be compared.
- They provide special habitats for native wildlife and plants.
- They provide visitors with opportunities to enjoy a unique recreational and aesthetic experience.
- Old-growth forests are reservoirs of genetic material and ecological processes.

Managing a network of designated old-growth forest on state lands represent an investment in the future, one of the many foundation stones on which sustainable forest management is built.

“The provision for true old growth should be regarded as an essential activity of forestry, just as the provision for wood, wildlife, recreation, and water.”

Minnesota Society of American Foresters Old-growth Task Force, May 1992

Figure 6. Old-growth maple basswood in the Big Woods region, DNR photo



⁵ See Minnesota Sustainable Resources Act (Minnesota Statutes 2002 89A) and definition of forest resources (Minnesota Statutes 2002, Chapter 89)

⁶ See 2002 Report of the Annual Symposium for the National Commission on Science for Sustainable Forestry

C. Managing Old-growth Conditions as Part of a Dynamic Forest Landscape

All forests are dynamic; they cannot be preserved in a static condition. Management actions help sustain desired forest conditions and their associated values into the future. To function well as rare habitat for plant and animal species and to protect their structural complexity and unique natural characteristics, old-growth forests need to be managed within the context of the larger forest landscape. Management of old-growth forests and adjacent lands may involve: prescribed burning for certain forest types to maintain natural processes and tree regeneration; control and removal of exotic species; monitoring damage due to blowdowns; designing special harvest plans for lands around and between old-growth forests; conducting research in old-growth and old forests; and monitoring changes in old-growth forests compared with harvested forests. The distinctive features of old-growth forests allow comparison to more highly managed forests under various harvest regimes. Research and monitoring are needed to improve our understanding of the role structural diversity and complexity play in the functioning of forest ecosystems and in their long-term sustainability.

Many of the above management activities will be required in order to ensure that the often small and isolated patches of remaining old-growth forest continue to serve important roles in the larger forested landscape. Without this work, old-growth forest values may diminish over time or old-growth forests in Minnesota may simply be museums of what was, rather than integral parts of a healthy forest ecosystem in the future.

Figures 7 and 8. Using prescribed burning as a management tool to maintain and restore the integrity of old-growth pine communities at Itasca State Park.



Igniting a prescribed burn



Prescribed burn surface fire

D. Old-growth Forests and Sustainable Forest Management

Protecting old-growth forests is one element of DNR’s work to sustain a full range of values citizens expect from their forests. DNR’s approach to sustainable forest management is informed by a comprehensive examination of the range of forest economic, social, and environmental values provided in *The Final Generic Environmental Impact Statement Study on Timber Harvesting and Forest Management in Minnesota* (1994 Timber GEIS). The Timber GEIS modeled three harvest scenario levels and recommended mitigation strategies to offset potential significant impacts of baseline or increased harvest levels. As the GEIS states: “An analysis of long-term sustainability indicates that, with some modifications, the levels of demand specified under the base and medium scenarios are sustainable in the long-term. *However, harvest at these levels would need to implement the recommended mitigations relatively soon to avoid or mitigate the significant impact described under these scenarios*” (italics in original).⁷

Several GEIS mitigation strategies and recommendations address the issue of old growth and related old forest. The GEIS recommended that “an inventory of old growth forest [be conducted] across all ownerships.”⁸ Mitigation strategies included the “designation and reservation of old growth and old growth replacement acres.”⁹ Specifically, GEIS modeling assumed 57,500 acres of reserved old growth and a similar acreage of replacement old growth—younger forest maturing toward old growth.¹⁰ The GEIS model runs also employed mitigation strategies for “20% extended rotation forests (ERF) on state and federal lands.”¹¹ Extended rotation forests—any forest managed to lengthen the time of harvest—helps provide biodiversity features of older forests over large areas. “Increasing the proportion of ERF stands will also increase the volumes of sawtimber-sized logs produced, which is liked to benefit the sawmilling industry.”¹²

Corridors of extended rotation forests can link patches of old-growth reserves and create a *connected landscape* of mature forest habitat. A network of connected landscapes could “potentially reduce the effects of fragmentation without reserving large contiguous blocks of forest. They could be achieved by changing the spatial pattern of harvest, not the amount of harvest.”¹³ Such linkages facilitate the natural movement of many plant and animal species associated with large blocks of mature forest habitat. Creating corridors for species migration/dispersal “would be a way of allowing Minnesota’s forest to respond to future climate change.”¹⁴

⁷ Final GEIS - Executive Summary, p. xxviii.

⁸ Final GEIS - Executive Summary, p. xxvi; and GEIS Implications: Base Scenario, p. 5-108.

⁹ Final GEIS - Executive Summary, p. iv.

¹⁰ Maintaining Productivity and the Forest Resource Base (A Technical Paper for the GEIS), p. 125.

¹¹ Final GEIS - Executive Summary, p. iv and xxv; and GEIS Implications: Base Scenario, pp. 5-114 to 5-117.

¹² Final GEIS – Implications: Base Scenario, p. 5-115.

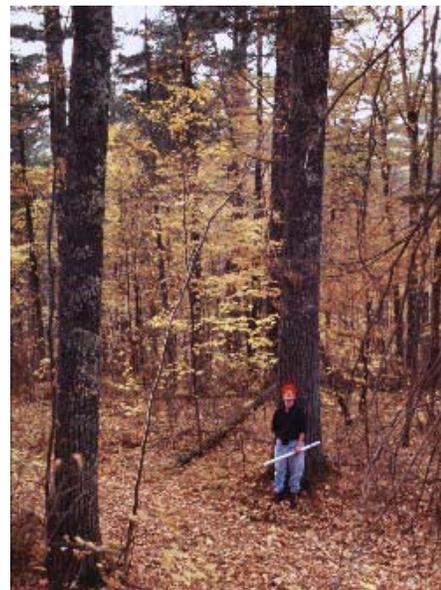
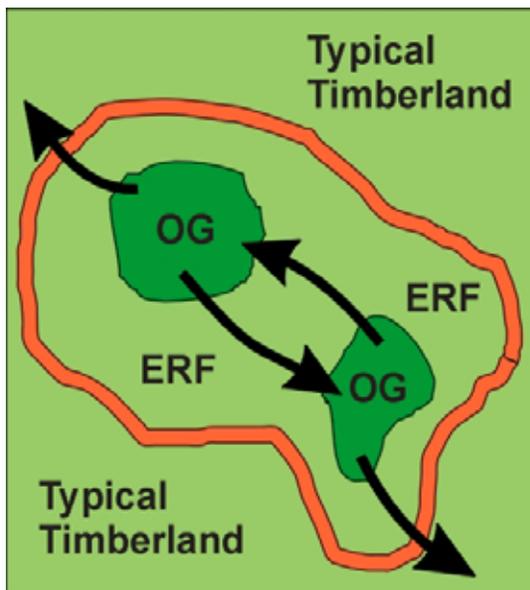
¹³ Final GEIS - Executive Summary, p. xxv; and GEIS Implications: Base Scenario, p. 5-115.

¹⁴ Final GEIS - Implications: Base Scenario, p. 5-116.

DNR envisions an old-growth forest network of designated sites on state lands surrounded and connected—where practical—with forests being harvested at longer time intervals using extended rotation forestry (ERF). DNR’s *Extended Rotation Forest Guideline* states the following objectives: Timber; Old-growth Buffers; Wildlife/Plant Communities; Recreation/Aesthetic values; and Soil and Water quality. ERF corridors accommodate regeneration harvests, thinnings, and periodic selective harvests and hence do not exclude road development.

Figure 9. Connected landscapes. By surrounding scattered old-growth forests (OG) with forests cut when trees are older (extended rotation forests, or ERF), old forest conditions are created on larger areas. Animals and plants that need older forests to survive can colonize and move through the forest landscape (arrows indicate their movement).

Figure 10. Extended Rotation Forests. White pine and sugar maple managed under extended rotation.



This report presents the results of implementing DNR’s *1994 Old-growth Forests Guideline*. While this Guideline affects only DNR-administered lands, it explicitly calls for coordinated management of old-growth forests across all ownerships. The Guideline states, “Identification and evaluation of old-growth forests on DNR-administered lands is part of a broader effort to manage old growth on forest lands in Minnesota.”¹⁵ The 1994 Guideline was to be considered “interim policy” while other planning, such as the Minnesota Forest Resources Council’s regional committees, worked to “integrate goals and coordinate management on all ownerships.”¹⁶ While this coordination is far from completed, DNR has made significant progress to protect old-growth forests as a first step toward a more comprehensive policy.

¹⁵ Old-growth Forests Guideline, May 1994, p. 1.

¹⁶ Old-growth Forests Guideline, May 1994, forward.

II. DNR’s Old-growth Forest Policy – History and Process

A. A Brief History

For over two decades DNR has been developing and implementing a policy to protect Minnesota’s remaining old-growth forests (Table 1). Beginning in the early 1980’s Minnesotans called for greater protection of remaining old-growth forests. DNR responded by appointing an interdisciplinary Old-growth Task Force to develop guidelines for identifying and managing old-growth forests on state-administered lands. In 1990 the DNR Commissioner approved a guideline for identifying old-growth forests produced by an interdisciplinary task force. This guideline, however, did not specify how much old-growth forest should be protected on state lands.

A series of stakeholder roundtable meetings followed and resulted in the *1994 Old-growth Forests Guideline*. This revision of the 1990 guideline set a preliminary goal of 27,000 acres to be protected on DNR-administered lands. The limited information then available about the extent and status of old-growth forests made this target an estimate. It would be adjusted as needed after a systematic inventory and evaluation were completed. An accelerated and systematic statewide inventory, initiated in 1999, has now been completed in 20 of the 21 landscapes regions identified for old-growth forest protection. As of October 2002, a network of 38,000 acres of old-growth forest have been designated on DNR administered lands.

Table 1. Timeline of DNR Old-growth Policy in Minnesota

1980	Old-growth forest issue emerges and DNR begins policy discussion through its Forestry/Wildlife coordination guideline process.
1990	DNR Commissioner approves <i>Old-growth Forests Guideline</i> developed by DNR task force following public review and in response to out-of-court settlement on a forest products plant siting. DNR identifies candidate old-growth sites.
1992	DNR Old-growth Committee formed to develop acreage targets for old-growth forests on state land and to design an operational inventory and evaluation process.
1994	Timber GEIS completed; mitigations and recommendations included old-growth inventory and protection, extended rotation forests, and related old forest conservation measures.
1994	DNR and Stakeholder Roundtable members agree to “identify and protect the highest quality remaining old growth forests” on state lands, estimated to be 27,000 acres. DNR Commissioner approves the <i>1994 Old-growth Forests Guideline</i> .
1995	DNR Commissioner approves addendum to the 1994 Guideline to clarify how the 1994 acreage targets are to guide selection of stands for designation.
1999	Old-growth guideline implemented with initiation of a systematic field inventory, creation of an old-growth database, regional team structure, and completion of old-growth designations in 3 pilot landscapes.
2002	Old-growth forest designation process completed in 20 of the 21 landscape regions; 38,000 acres designated as old growth on DNR-administered lands.

B. Policy Goal and Preliminary Targets

With the *1994 Old-growth Forests Guideline*, DNR clarified its overall goal by establishing measurable targets for protecting the highest quality old-growth forest on state-administered lands. In addition to identifying and designating existing old growth, DNR also identified younger, relatively undisturbed stands of red pine, white pine, and oak that would be allowed to become old growth in the future. These stands are called Potential Future Old Growth (PFOG).¹⁷ The pine and oak types can be difficult to regenerate without disturbance. In the absence of natural disturbance such as windthrow and fire, pine and oak types are often replaced by more shade tolerant species such as sugar maple and balsam fir. Prescribed burning can be used to perpetuate the pine and oak types; however prescribed burning is not always practical or possible. A pool of potential future old growth will allow replacement of old-growth pine and oak stands that succeed to other forest types, thus ensuring these types are maintained over the long term.

“The DNR’s old-growth management goal is to identify and protect the highest quality remaining natural old-growth forest communities.”

DNR Old-growth Forests Guidelines, May 1994, p. 2.

DNR’s *1994 Old-growth Forests Guideline* set acreage targets for each old-growth forest type in 21 of Minnesota’s Ecological Subsections (Figures 11).¹⁸ The targets totaled 27,000 acres (exclusive of Itasca State Park).¹⁹ These acreage targets were approximate as no accurate inventory of old-growth forests existed. This led to a thorough inventory and evaluation process to document the true extent and quality of DNR’s remaining old growth. This new information became the basis for designating the highest quality old-growth sites (Figure 12).

Figure 11. The 1994 old-growth acreage targets by ecological subsection

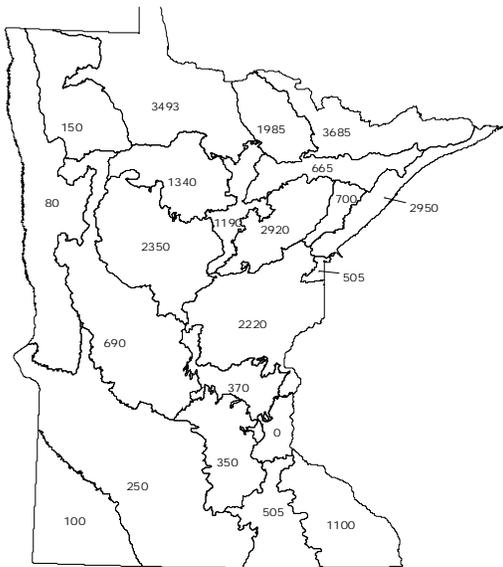
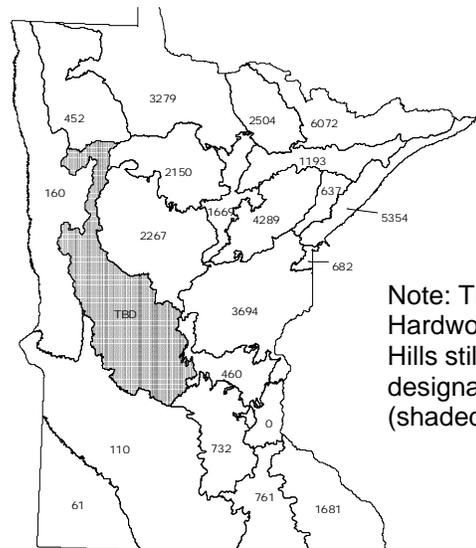


Figure 12. The actual 2002 designated old-growth acreage by ecological subsection



Note: The Hardwood Hills still to be designated (shaded).

¹⁷ DNR Old-growth Forests Guideline, 1994, p.6.

¹⁸ These are 1996 ECS subsection boundaries; upon completed old-growth designation, data will be displayed on the revised 1999 ECS subsection boundaries.

¹⁹ DNR Old-growth Forests Guideline, 1994, Table 1, p.3.

C. Inventory and Evaluation Process

DNR inventoried and evaluated old-growth forest distribution and quality in order to designate the highest quality stands for protection. This statewide process involved several steps: First, DNR staff searched the CSA (Cooperative Stand Assessment) forest inventory database and other databases for candidate old-growth stands. Criteria defined candidate stands as being:

- 1) natural in origin;
- 2) 120+ years old (or 90+ in regions with sparse old growth); and
- 3) 20+ acres in size (smaller in regions of sparse old growth or in a complex of old growth sites).

Cooperative Stand Assessment (CSA)

About 5 million acres of state and county-owned lands are classified and monitored using the CSA, a timber management tool that records cover type; average stand age and size; and other features. Any group of trees uniform enough in composition to be managed as a unit can be mapped in the CSA's Geographic Information System database. To be mapped, a stand must be at least 5 acres. The CSA is updated on a regular schedule with input from field staff involved in forest management.

For more information see:

http://www.ra.dnr.state.mn.us/tp/csa_doc.html.

Figure 13. Some measurable features of old-growth forests.



Snags



Multi-Aged with Large Old Trees and Fallen Logs

DNR personnel and contractors visited candidate stands, collected data on tree age, tree diameter, amount of human disturbance, size of the stand, and other ecological features (Figure 14). Using these data, DNR staff ranked the candidate stands according to a scoring system developed by the DNR’s Natural Heritage Program in consultation with Dr. Lee Frelich and Dr. Lucy Tyrrell. Since 1993 over 2,000 candidate stands totaling over 70,000 acres, have been field evaluated.

Figure 14. DNR staff in southeastern Minnesota evaluate a candidate old-growth oak forest using the Old Growth Evaluation Form.

Old-Growth Evaluation – NON-PINE (<i>Data page 8</i>)	
Evaluator(s): D. Johnson, S. Zager, B. Carlson	
Date: 1/26/00	
SCORING	
I. Size/Context Score (15 pts.) (From Size/Context Matrix)	14
II. Cut Stump Score (10 pts.)	8
III. Road and Trail Score (2 pts.)	2
IV. Age Score (10 pts.)	6
V. Subjective Score (3 pts.)	3
VI. Tree Size-Class Distribution Score (10 pts.) (Field evaluators leave blank)	7
TOTAL SCORE (50 PTS.)	40

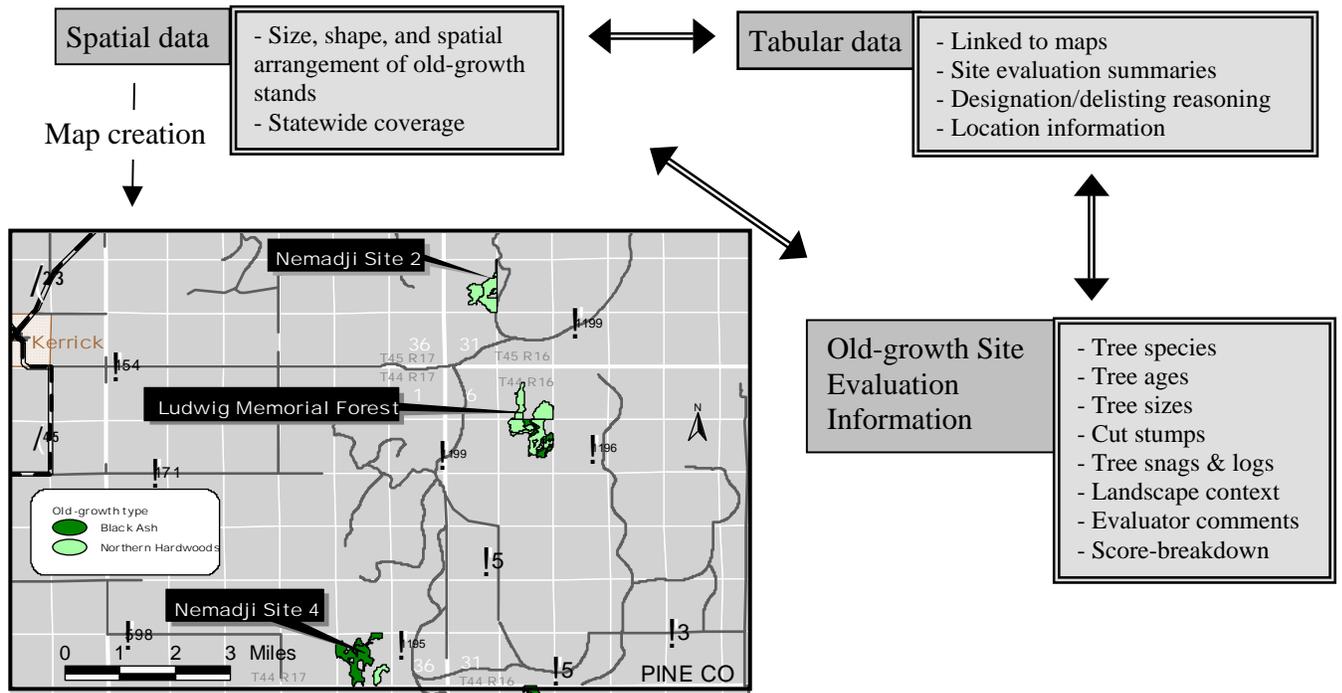


D. Old-Growth Data Standards and Database

In each subsection, DNR interdisciplinary landscape teams, using the old-growth database, reached agreement on the old-growth value of each stand. The highest quality candidates were designated for protection. These stands will be protected from future logging as long as they continue to meet old-growth criteria. Other stands of lower quality were dropped from further consideration and were removed (delisted) from candidate status. Such (delisted) stands will be managed for other uses as determined by broader DNR management unit and subsection forest resource management plans. Detailed rationale for designating or delisting candidate old-growth sites were documented in the old-growth GIS database (Figure 15). Not surprisingly, this thorough evaluation painted a more accurate and complete picture of old-growth distribution and quality than was possible in 1994 when the preliminary targets were set.

The old-growth database was essential to implement the *1994 Old-Growth Forests Guideline* because it provides complex information in a simple format to managers and decision-makers. As a result, the DNR can be confident within reasonable limits that it has identified and considered the potential old growth on its lands using quantitative data. It will be necessary to maintain the old-growth database so that accurate and reliable centralized data can be easily obtained. As old-growth stands are monitored, DNR staff will use the database to catalog the new data and provide insights into trends in old-growth forests on state lands.

Figure 15. The structure of the old-growth database.



E. Interdisciplinary Decision-making and Guideline Amendments

As data from the comprehensive old-growth inventory accumulated and was organized into a database, it became apparent that the 1994 targets underestimated the actual acreage of high-quality old growth for certain forest types while overestimating others. The 1994 Old-growth Forests Guideline itself anticipated this and built flexibility into the policy. The 1994 Guideline stated: “As new information becomes available (i.e., County Biological Survey), this guideline will be revised.”²⁰ The first Guideline adjustment came in 1995, when the DNR Commissioner approved an addendum clarifying the issue of potential future old growth and giving instruction on how the 1994 acreage targets are “to guide the selection of stands for designation.”²¹ Between 2000 and 2002, DNR’s Old-growth Committee, made up of representatives from the divisions of Forestry, Wildlife, Parks and Recreation, and Ecological Services along with representatives from the Commissioner’s Office and Office of Management and Budget Services, wrote six amendments:

1. Exceeding or Falling Short of the 1994 Acreage Targets;
2. Future Changes to the 2002 Old-growth Network;
3. DNR Roles and Responsibilities in Designating Old Growth;
4. Procedures for Establishing DNR Interdisciplinary Landscape Teams;
5. Old-growth Special Management Zones and Extended Rotation Forestry;
6. Old-growth Site-level Management.



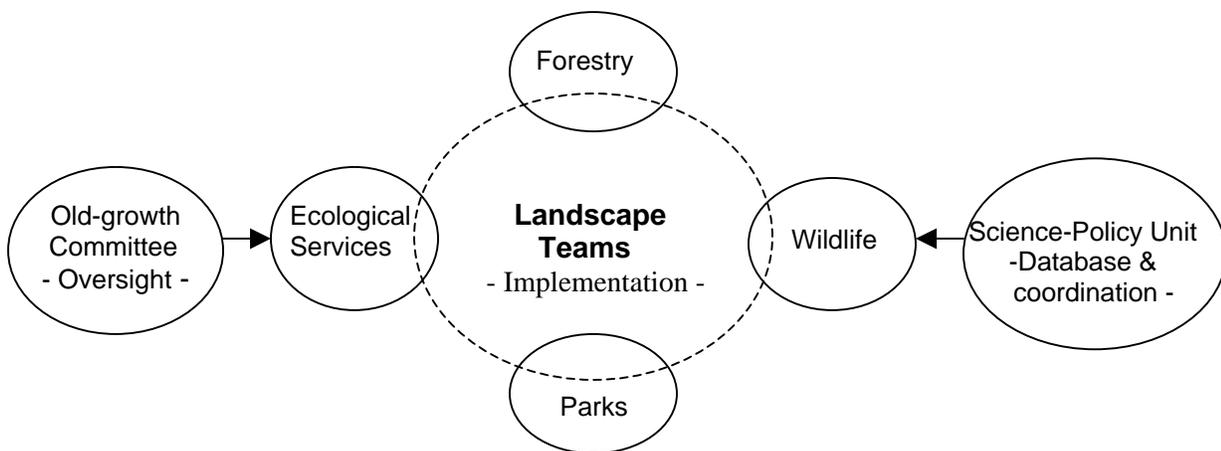
White cedar stand, photo by Steve Schneider / Photography

²⁰ Old-growth Forests Guideline, DNR, May 1994. p. 1.

²¹ Addendum to Old-growth Forests Guideline: Technical Procedures, Selection of Old Growth Forest Stands by Subsection, MDNR December 5, 1995.

Interdisciplinary landscape teams, with oversight from the DNR Old-growth Committee, were empowered to exceed or fall short of the 1994 cover-type acreage targets for a particular landscape by consensus and based on new old-growth inventory data. Interdisciplinary teams documented decisions to designate or delist candidate stands in the old-growth database. Following designation completion in 2002, a stakeholder roundtable will be convened if changes increase or decrease the total amount of designated old growth by 10%. Changes to the 2002 established old-growth could result from: 1) disturbances that destroy an old-growth forest stand, 2) agreement by adjacent landowners to cooperatively manage a complex of old-growth stands, and 3) new information from research findings, inventories, or changing public values.

Figure 16. DNR interdisciplinary structure to implement the Old-growth Forests Guideline.



III. DNR’s Old-growth Forest Policy – Implementation Results

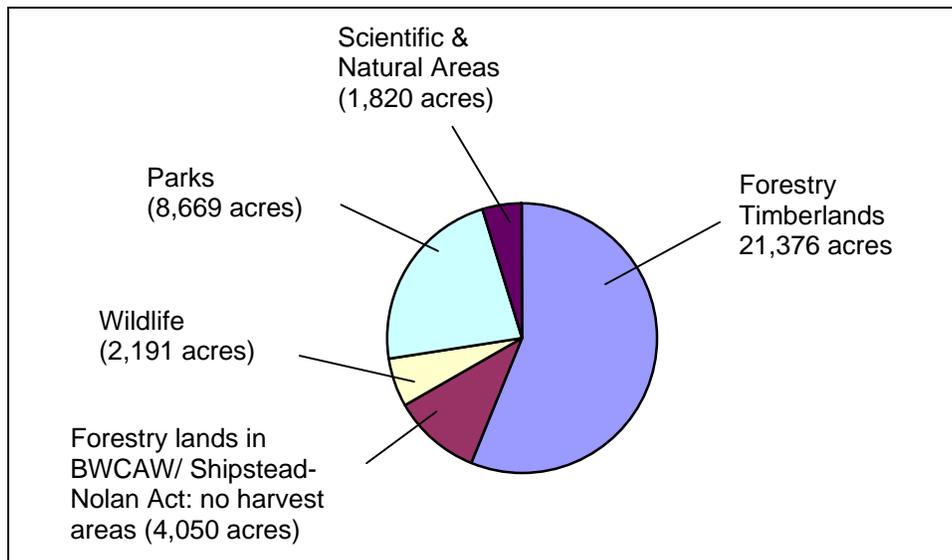
A. Evaluation and Designation Results

From 1998 to November 2002 DNR interdisciplinary landscape teams, using the old-growth database, completed designations in 20 of 21 ecological subsections throughout the state. From the 70,000 acres of potential old-growth forest (old-growth candidate stands), DNR designated 762 stands totaling about 38,000 acres as protected old growth. DNR also delisted 921 stands totaling approximately 32,000 acres that were of lower quality or did not qualify for other reasons (Table 2 and Appendix 1).

Table 2 Old Growth Evaluation and Designation Status (as of October 2002)	
About 70,000 old-growth candidate acres were evaluated, of these:	
•	32,000 acres de-listed for other uses
•	38,000 acres designated as old-growth.

The 38,000 acres of designated old-growth forest is found on four different types of DNR administered lands: Forestry-administered lands; State Parks; Wildlife Management Areas (WMA’s); and Scientific and Natural Areas (SNA’s) (Figure 17).

Figure 17. Designated old growth on DNR-administered lands.



DNR's designated old-growth forest acreage represents less than 1% of DNR-administered forestland and less than ¼ of 1% of Minnesota's total forestland base (Table 3).

Table 3. A comparison of DNR's designated old-growth acreage to 1) DNR's forestland acreage and 2) Minnesota's total forestland acreage (all ownerships).

The 2002 Designated DNR Old-Growth Acreage (38,000) Equals:

Less than 1% of DNR-administered forestland:

.74% of DNR Productive Timberland
(38,000 – 15,000 reserved land/3,100,000 acres)

.99% of DNR Total Forest Land
(38,000/3,840,000 acres)

Less than ¼ of 1% of Minnesota's forestland (all ownerships):

.16% of MN Productive Timberland
(38,000 – 15,000 reserved land/14,800,000 acres)

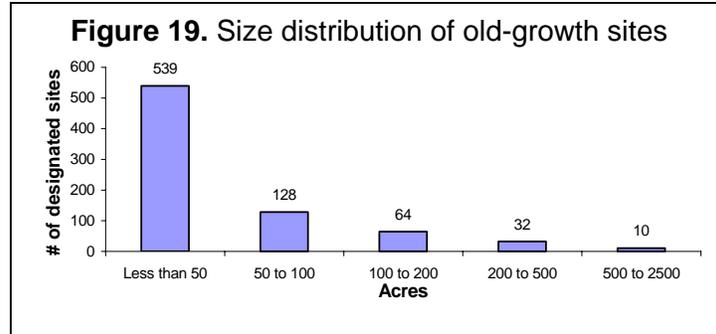
.23% of MN Total Forest
(38,000/16,700,000 acres)

Figure 18. Old-growth American basswood



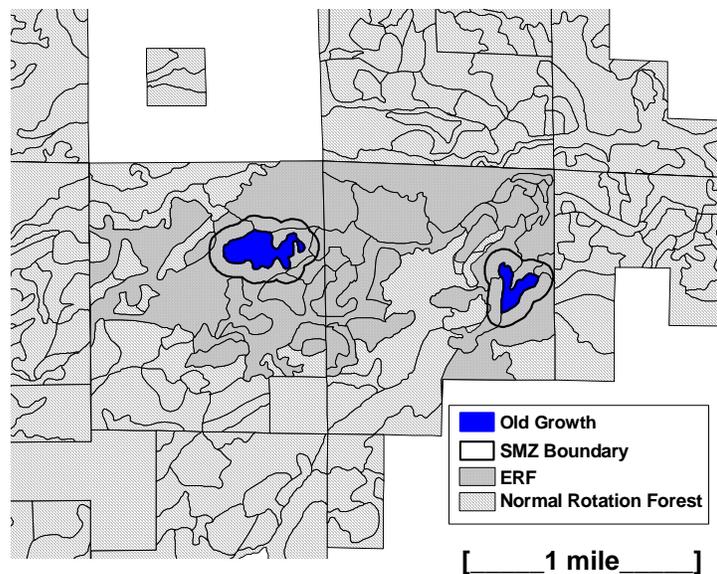
B. Old-growth Reserves and Associated Special Management Zones

The average size of DNR's designated old-growth forest sites is small. Approximately 70% of all designated old-growth sites are less than 50 acres in size (Figure 19).



To maintain viable old-growth sites, “Special Management Zones” are established for each designated old-growth site. The Special Management Zone (SMZ) is a buffer immediately surrounding designated old-growth forest stands (Figure 20). The SMZ is intended to minimize edge effects and windthrow damage to old-growth stands. Minimum width is 330 feet from the edge of the old-growth stand. The SMZ allows timber harvest; it is *not* a no-cut zone. The *1994 Old-growth Forests Guideline* specified that SMZ's be managed under DNR's *Extended Rotation Forest Guideline* and all-aged management prescriptions where conditions allow. Where even-aged management is desired, limited clear-cuts are allowed where, at any given time, no more than 25% of the SMZ has regeneration less than one-third potential height.

Figure 20. Designated old-growth forest sites and special management zones within a extended rotation forest (ERF) corridor area.



A total of 30,758 acres of DNR-administered forestland are included in SMZ's associated with the 38,000 acres of designated old-growth stands.

C. Comparing 2002 Designated Old-growth Acres and 1994 GEIS Mitigations

DNR's 38,000 acres of designated old growth forest (29,718 old growth acres and 8,282 potential future old growth acres) and its on-going work to establish extended rotation forest is consistent with the 1994 Forestry GEIS mitigation assumptions. GEIS model runs projected future forest conditions for three harvest scenarios. "Importantly, the model runs included ownership constraints and mitigations that reflect current and prospective management procedures and policies applied by the major forest land managers."²² Old forest mitigations built into the model included 57,500 acres of reserved old growth along with a similar acreage of replacement old growth and 20 percent extended rotation forests on state and federal lands (Table 4).²³

DNR's 2002 old-growth network differs from the GEIS model assumptions in one respect. DNR's "potential future old growth" (equivalent to the GEIS "replacement old growth") only applies to the pine and oak cover types. In addition, DNR did not protect potential future old growth in an acreage equal to that certified as old growth as assumed in the GEIS; DNR protected substantially less (Table 4).

The 1994 GEIS noted "if these ownership constraints and mitigations are not routinely applied to all timber harvesting and forest management activities during the next 50 years, the number and severity of significant impacts identified ... will increase for all three harvest levels."²⁴

Because "little is known about the types and extent of old growth on private lands," the GEIS model assumptions for old growth reserves were limited to state and federal lands and the GEIS recommended the following mitigation: "Conduct an inventory of old-growth forests across all ownerships."²⁵

The 1994 GEIS also recommended coordination between ownerships with targets for maintaining older age forests.²⁶ DNR has already worked with the two national forests and St. Louis County to adopt common old-growth evaluation procedures. DNR will need to work with other landowners and develop common definitions and common inventory and evaluation techniques in order to achieve a coordinated strategy for older forests across all ownerships.

²² Final GEIS - Executive Summary, p. iv.

²³ Final GEIS - Executive Summary, pp. xxxiii – xxxiv; Productivity: A GEIS Technical Paper, p. 125

²⁴ Final GEIS – Executive Summary, p. iv.

²⁵ Final GEIS – Implications: Base Scenario, pp. 5-108 and 5-133.

²⁶ Final GEIS - Executive Summary, p. xxv; and GEIS Implications: Base Scenario, p. 5-111.

Table 4. Actual designation of old growth and ERF compared to assumptions in the GEIS model runs (data on designation results only displayed for DNR lands).

Total Acres by Ownership and Treatment						
Ownership	Old-growth Forest		Replacement Old-growth Forest		Extended Rotation Forest (ERF)	
	GEIS Assumptions ²⁷	Actual Achieved	GEIS Assumptions	Actual Achieved	GEIS Assumptions ²⁸	Actual Achieved
State	30,100	29,718	30,100	8,282*	559,900	Status**
Chippewa NF	12,400		12,400		106,700	
Superior NF	15,000		15,000		232,800	
County	0		0		0	
Private/Other	0		0		0	
Total	57,500		57,500		899,400	

* The GEIS model assumed “57,500 acres of old growth and a similar acreage of replacement forest”²⁹ on state and federal lands. DNR uses the term potential future old growth (PFOG) to define replacement. Unlike the GEIS, DNR’s PFOG applies only to pine and oak cover types. DNR’s 38,000 designated acres contain 29,718 old growth acres and 8,282 PFOG acres.

** In Progress: DNR’s *Extended Rotation Forest Guideline*³⁰ requires a minimum of 10% of DNR timberlands be managed as extended rotation forest (ERF). Initial management plans prepared under the *Extended Rotation Forest Guideline* have consistently prescribed more than 20% of DNR timberlands for ERF.

²⁷ Maintaining Productivity and the Forest Resource Base (A Technical Paper for the GEIS, from Table 4.18).

²⁸ Maintaining Productivity and the Forest Resource Base (A Technical Paper for the GEIS, from Table 4.18).

²⁹ Maintaining Productivity and the Forest Resource Base (A Technical Paper for the GEIS, p. 125).

³⁰ Extended Rotation Forest Guideline, MNDNR, July 1994.

D. Comparing 2002 Designated Old-growth Acres and 1994 Target Acres

DNR's 2002 designated old-growth forest acres varied from the preliminary targets set in 1994. The *1994 Old-growth Forests Guideline* assumed changes to the preliminary targets following a systematic old-growth inventory. Starting in 1995, an Addendum and Amendments were written to clarify how changes would be made and to empower interdisciplinary landscape teams to exceed or fall short of the preliminary targets based on new inventory information.

Following systematic inventory, the landscape teams found that it was not possible to meet the 1994 subsection targets for all forest community types. For example, in the North Shore Highlands Subsection the 1994 target was 100 acres of old-growth red pine, but no old-growth red pine was found or designated. In other cases, the inventory found more high-quality old-growth forest than expected. For instance, in the Border Lakes subsection 2,170 acres of old-growth red pine were discovered and designated, exceeding the 1994 target by 605 acres.

In general, the 1994 preliminary targets substantially underestimated the amount of old-growth hardwoods, and slightly underestimated the amount of old-growth conifers (Figure 21). In particular, the inventory discovered much more old-growth black ash than was expected (Figure 22). The amount of old-growth forest designated in 2002 exceeded the 1994 Guideline target by roughly 11,000 acres.

Figure 21. 1994 preliminary targets and 2002 actual designations for hardwood and conifer old-growth forest types.

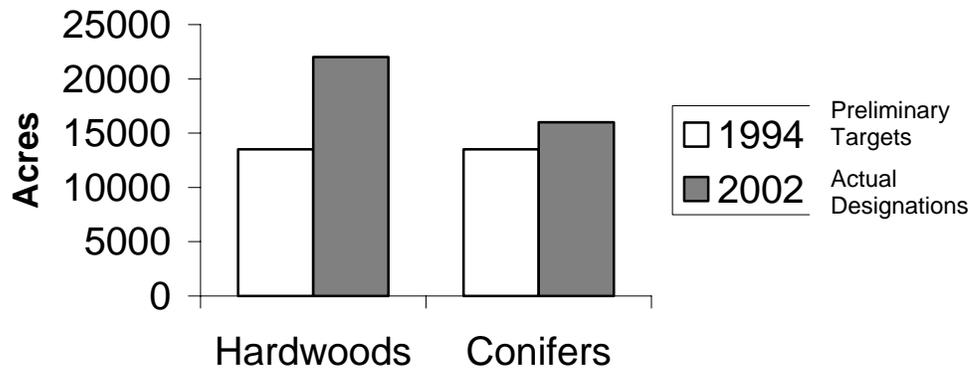
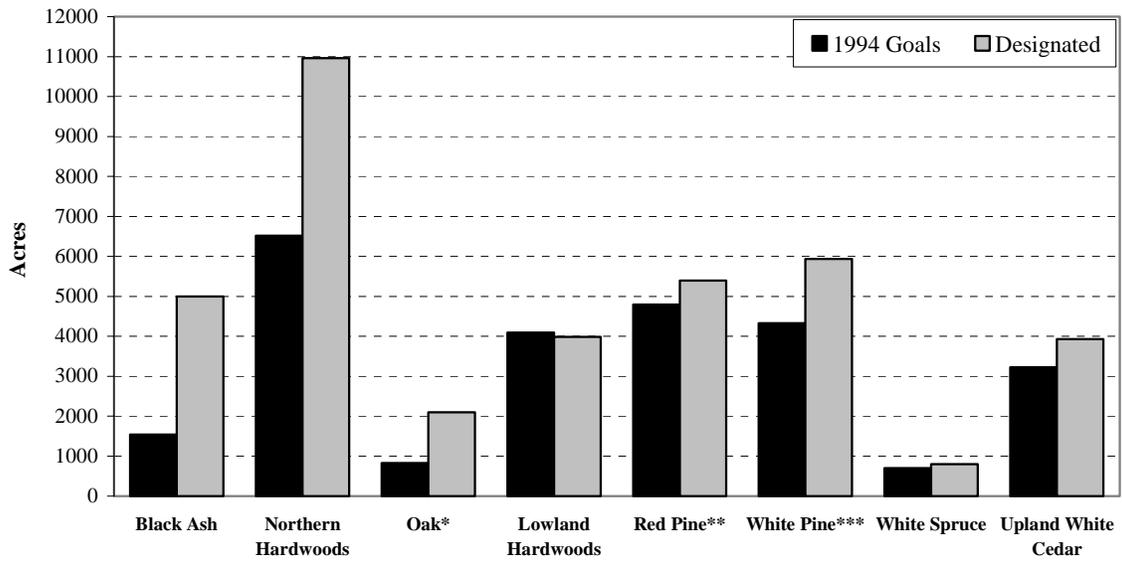


Figure 22. 1994 preliminary targets and 2002 designated old-growth acres by cover type.

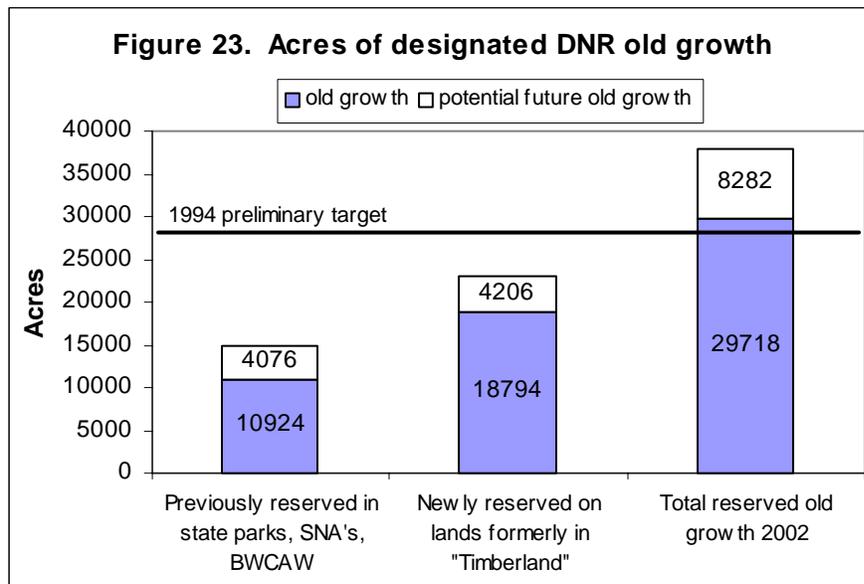


* The oak acres include 889 acres of potential future old growth.

** The red pine acres include 3,530 acres of potential future old growth.

*** The white pine acres include 3,863 acres of potential future old growth.

DNR designated old growth on lands that were previously managed as “reserves” (i.e., no harvest) and on lands classified as “timberlands” (i.e., previously available for harvest). The breakdown of old-growth designations by former harvest status is shown in Figure 23.



The 38,000-acre network of old-growth sites includes 8,282 acres of potential future old growth—younger (less than 100 years), relatively undisturbed stands of red pine, white pine, and oak that will be allowed to become old growth in the future (Table 5).

Table 5. Acres of designated PFOG previously reserved in State Parks, SNAs, and the BWCAW and newly reserved on Timberlands through the old-growth guideline designation process.

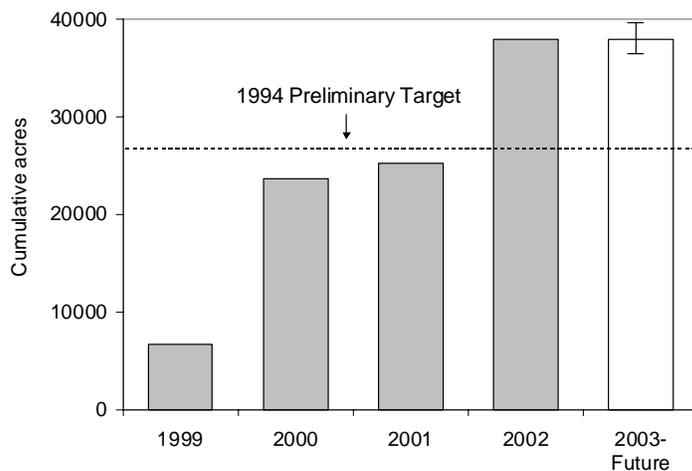
Potential Future Old-growth Forest	Oak	Red Pine	White Pine	Total
Acres previously reserved in parks, SNAs, BWCAW	220	1,385	2,471	4,076
Acres Newly reserved on Timberlands	669	2,145	1,392	4,206
Total PFOG	889	3,530	3,863	8,282

IV. Sustainable Forest Management Indicators

Measuring progress in sustainable forest management requires the use of many indicators that reflect a full range of forest values such as timber production; biodiversity and wildlife conservation; and scenic and recreational amenities. DNR uses indicators and associated targets to clearly define its program activities, their intended outcomes, and actual results. Indicators and targets bring clarity and accountability to balanced and sustainable forest management. The following examples of two forest indicators represent the broad social, economic, and environmental values of the state's forests and are among twelve DNR indicators found on the Governor's Office Results Website.³¹

By combining strategies to meet resource targets, DNR can achieve multiple objectives and resource protection goals. As the two indicators demonstrate below, DNR met or exceeded targets for timber output and old-growth protection during the same time period.

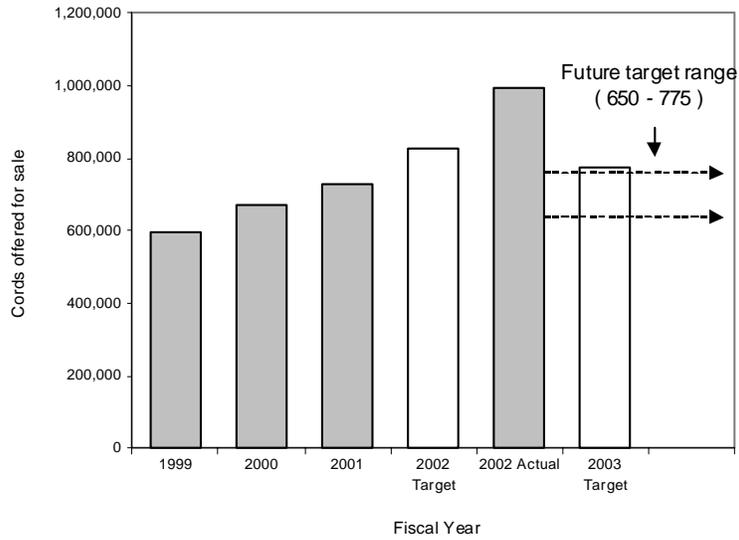
Figure 24. Indicator: Old-growth Forest Acres on DNR Lands



Working with forest industry and environmental interests, the DNR in 1994 agreed to "identify and protect the highest quality remaining natural old-growth forest communities." A preliminary target of 27,000 acres was established until a systematic old growth inventory and evaluation process could be conducted. With the inventory completed in 2002, DNR designated about 38,000 acres of the best old-growth forest for protection. If future changes increase or decrease the total amount of designated old growth by 10% or more, a stakeholder roundtable will be convened to discuss policy direction.

³¹ DNR indicators on the Governor's Office Results Website can be found at: <http://www.departmentresults.state.mn.us/dnr/>.

Figure 25. Indicator: Cords of Timber Offered for Sale on DNR Lands



Part of sustainable forest management is ensuring a constant, predictable supply of quality wood from state forest lands, a major wood source comprising 21% of the state's timberland. Cords of timber offered for sale are an indicator of DNR's support of the state's forest products industry.

Based on current plans and budget projection scenarios, DNR is likely to offer between 650,000 and 775,000 cords of wood for the next two fiscal years. FY01, FY02, and FY03 targets have been higher due to a legislative initiative offering a backlog of state timber that should have been sold in previous years.

V. Where Do We Go From Here?

Old-growth forest designations on DNR-administered lands represent over a decade of serious discussion and study. Hundreds of individuals have contributed their time and intelligence, for example citizens provided input at public hearings, biologists collected field data, and DNR staff and stakeholder roundtable members developed guidelines.

DNR's goal of sustaining state forests requires the protection of unique forests and providing for increased use, enjoyment, and consumption of natural resources on forest lands. This goal requires reconciling the interests of diverse constituencies while practicing responsible stewardship of public resources. Old-growth forest designation is one component of many on which sustainable forest management is built.

DNR also must clearly define its essential program activities while it strives for sustainability in forest management. Indicators of sustainable forest management enable the DNR to monitor whether targets for key indicators of sustainability are being met through DNR's programs.

Finally, DNR will continue to make progress in implementing other strategies to ensure sustainability, as called for in the 1994 GEIS. A challenge to sustaining older forests will be to link old-growth stands using extended rotation forestry (ERF) practices. The 1994 Forestry GEIS urged that linkages be considered "between remnant areas of older forest or natural areas" and envisioned that these areas would be managed under ERF. This approach is critical to "overcome some of the current problem of old-growth patches that are probably too isolated to allow exchange of genetic material among old-growth species."³² Recognizing the small size and isolation of some old-growth stands, the Old-growth Committee wrote Guideline Amendments to identify and design management units focused on the development of larger patches of old forest. This old forest would be managed under ERF in areas around old-growth patches.

Given the rarity of old-growth forests and the increasing awareness of their ecological and aesthetic values, DNR will need to monitor old-growth stands and incorporate old-growth protection results into its broader Subsection Forest Resource Management Planning Process (SMRFP).³³ Outside researchers will be encouraged to do research in and around the old-growth forest stands. Since old-growth forest conditions are different from conditions in the surrounding landscapes, old-growth stands can serve as control stands for monitoring the effects of forest management elsewhere.

DNR will need to work cooperatively with other landowners to assist in conducting old-growth forest and old forest inventories. As part of this collaboration, DNR will seek opportunities for cooperative management with adjacent landowners. Finally, DNR will provide information about its old-growth forest network and its management to the public via a website.

³² Final GEIS - Executive Summary, p. xxv; and GEIS Implications: Base Scenario, p. 5-115.

³³ Information on DNR's Subsection Forest Resource Management Planning Process can be found at: <http://www.dnr.state.mn.us/forestry/subsection/index.html>

Appendix I. Old-growth Forest Designation and De-listing by Ecological Subsection

The following tables list the original 1994 *Old-growth Forests Guideline* acre goals, actual acres designated in 2002, and candidate acres delisted (removed from candidate status). Delisted stands are now available for other uses consistent with area plans. Adjustments may be made to acre totals as old-growth stands are more accurately mapped.

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Table A-1. Designated and delisted acres in the **Blufflands and Rochester Plateau** subsections. From the pool of 2,763 candidate acres, 1,681 acres were designated as protected old-growth forest and 1,082 acres were delisted (removed) from old-growth candidacy.

Forest type	1994 Old-growth Goal Acres	Old-growth acres designated	Old-growth acres delisted
Black Ash	0	0	0
Lowland Hardwoods	155	198	389
Northern Hardwoods	450	485	180
Oak	270	762	503
Red Pine	0	0	0
White Pine	185	231	10
White Spruce	0	0	0
Upland White Cedar	40	5	0
Total	1100	1681	1082

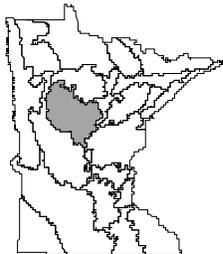


Table A-2. Designated and delisted acres in the **Pine Moraines and Outwash Plains** subsection. From the pool of 4,585 candidate acres, 2,267 acres were designated as protected old-growth and 2,318 acres were delisted from old-growth candidacy.

Forest type	1994 Old-growth Goal Acres	Old-growth acres designated	Old-growth acres delisted
Black Ash	65	127	140
White Cedar	85	6	0
Lowland Hardwoods	385	145	298
Northern Hardwoods	710	878	586
Oak	125	95	220
Red Pine	615	653	802
White Pine	320	363	263
White Spruce	45	0	9
Total	2350	2267	2318



Table A-3. Designated and delisted acres in the **Little Fork – Vermillion Uplands** subsection. From the pool of 4,331 candidate acres, 2,504 acres were designated as protected old-growth and 1,827 acres were delisted from old-growth candidacy.

Forest type	1994 Old-growth Goal Acres	Old-growth acres designated	Old-growth acres delisted
Black Ash	125	254	634
White Cedar	375	543	475
Lowland Hardwoods	425	488	202
Northern Hardwoods	0	0	0
Oak	0	0	0
Red Pine	615	746	249
White Pine	375	385	153
White Spruce	70	88	114
Total	1985	2504	1827



Table A-4. Designated and delisted acres in the **Nashwauk Uplands** subsection. From the pool of 1,575 candidate acres, 1,193 acres were designated as protected old-growth and 382 acres were delisted from old-growth candidacy.

Forest type	1994 Old-growth Goal Acres	Old-growth acres designated	Old-growth acres delisted
Black Ash	65	63	0
White Cedar	85	219	59
Lowland Hardwoods	80	83	0
Northern Hardwoods	115	211	141
Oak	0	0	0
Red Pine	205	254	116
White Pine	90	206	17
White Spruce	25	172	49
Total	665	1193	382



Table A-5. Designated and delisted acres in the **Border Lakes** subsection. From the pool of 6,932 candidate acres, 6,072 acres were designated as protected old-growth and 860 acres were delisted from old-growth candidacy.

Forest type	1994 Old-growth Goal Acres	Old-growth acres designated	Old-growth acres delisted
Black Ash	65	110	21
White Cedar	140	170	162
Lowland Hardwoods	80	4	0
Northern Hardwoods	115	223	0
Oak	0	0	0
Red Pine	1565	2170	377
White Pine	1585	3272	265
White Spruce	85	123	35
Total	3635	6072	860



Table A-6. Designated and delisted acres in the **Laurentian Highlands** subsection. From the pool of 848 candidate acres, 637 acres were designated as protected old-growth and 211 acres were delisted from old-growth candidacy.

Forest type	1994 Old-growth Goal Acres	Old-growth acres designated	Old-growth acres delisted
Black Ash	40	0	64
White Cedar	85	9	0
Lowland Hardwoods	40	56	37
Northern Hardwoods	115	222	20
Oak	0	0	0
Red Pine	205	174	90
White Pine	185	176	0
White Spruce	30	0	0
Total	700	637	211

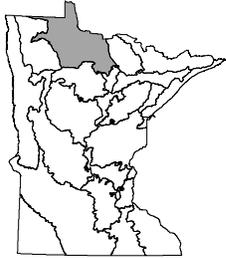


Table A-7. Designated and delisted acres in the **Agassiz Lowlands** subsection. From the pool of 10,161 candidate acres, 3,493 acres were designated as protected old-growth and 6,668 acres were delisted from old-growth candidacy.

Forest type	1994 Old-growth Goal Acres	Old-growth acres designated	Old-growth acres delisted
Black Ash	425	938	1699
White Cedar	335	399	1442
Lowland Hardwoods	1230	1093	2387
Northern Hardwoods	55	0	123
Oak	40	55	127
Red Pine	360	539	382
White Pine	230	316	101
White Spruce	130	153	407
Total	2805	3493	6668



Table A-8. Designated and delisted acres in the **North Shore Highlands** subsection. From the pool of 7,266 candidate acres, 5,354 acres were designated as protected old-growth and 1,912 acres were delisted from old-growth candidacy.

Forest type	1994 Old-growth Goal Acres	Old-growth acres designated	Old-growth acres delisted
Black Ash	65	98	78
White Cedar	1400	1850	1096
Lowland Hardwoods	80	5	58
Northern Hardwoods	960	3019	455
Oak	20	94	0
Red Pine	100	0	0
White Pine	135	45	123
White Spruce	190	242	102
Total	2950	5354	1912



Table A-9. Designated and delisted acres in the **St. Louis Moraines** subsection. From the pool of 2,523 candidate acres, 1,669 acres were designated as protected old-growth and 854 acres were delisted from old-growth candidacy.

Forest type	1994 Old-growth Goal Acres	Old-growth acres designated	Old-growth acres delisted
Black Ash	85	167	72
White Cedar	170	185	60
Lowland Hardwoods	115	153	35
Northern Hardwoods	340	605	303
Oak	20	47	0
Red Pine	205	272	188
White Pine	230	236	154
White Spruce	25	4	42
Total	1190	1669	854



Table A-10. Designated and delisted acres in the **Anoka Sand Plain** subsection. From the pool of 1,596 candidate acres, 460 acres were designated as protected old-growth and 1,136 acres were delisted from old-growth candidacy.

Forest type	1994 Old-growth Goal Acres	Old-growth acres designated	Old-growth acres delisted
Black Ash	0	0	12
White Cedar	0	0	0
Lowland Hardwoods	80	112	462
Northern Hardwoods	115	151	159
Oak	40	103	328
Red Pine	0	0	0
White Pine	135	94	175
White Spruce	0	0	0
Total	370	460	1136

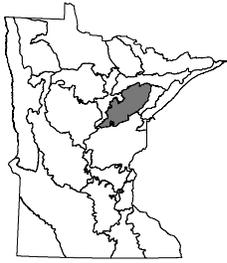


Table A-11. Designated and delisted acres in the **Tamarack Lowlands** subsection. From the pool of 5,480 candidate acres, 4,289 acres were designated as protected old-growth and 1,191 acres were delisted from old-growth candidacy.

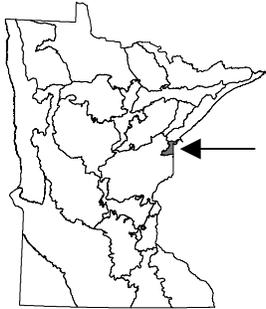
Forest type	1994 Old-growth Goal Acres	Old-growth acres designated	Old-growth acres delisted
Black Ash	150	1216	242
White Cedar	210	145	178
Lowland Hardwoods	390	601	66
Northern Hardwoods	1615	1973	330
Oak	40	130	0
Red Pine	305	133	57
White Pine	185	91	18
White Spruce	25	0	0
Total	2920	4289	1191



Table A-12. Designated and delisted acres in the **Mille Lacs Uplands** subsection. From the pool of 7,274 candidate acres, 3,694 acres were designated as protected old-growth and 3,580 acres were delisted from old-growth candidacy.

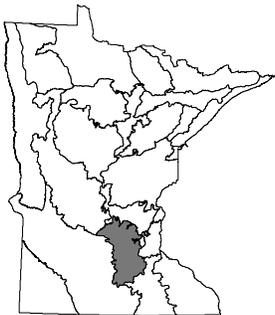
Forest type	1994 Old-growth Goal Acres	Old-growth acres designated	Old-growth acres delisted
Black Ash	285	1727	1611
White Cedar	85	76	40
Lowland Hardwoods	415	519	465
Northern Hardwoods	930	1042	1302
Oak	95	238	14
Red Pine	155	78	99
White Pine	230	14	49
White Spruce	25	0	0
Total	2220	3694	3580

Table A-13. Designated and delisted acres in the **Glacial Lake Superior Plain** subsection. From the pool of 789 candidate acres, 682 acres were designated as protected old-growth and 107 acres were delisted from old-growth candidacy.



Forest type	1994 Old-growth Goal Acres	Old-growth acres designated	Old-growth acres delisted
Black Ash	20	87	63
White Cedar	40	0	0
Lowland Hardwoods	0	0	0
Northern Hardwoods	115	135	0
Oak	0	0	0
Red Pine	0	0	0
White Pine	305	425	26
White Spruce	25	35	18
Total	505	682	107

Table A-14. Designated and delisted acres in the **Big Woods** subsection. From the pool of 789 candidate acres, 682 acres were designated as protected old-growth and 107 acres were delisted from old-growth candidacy.



Forest type	1994 Old-growth Goal Acres	Old-growth acres designated	Old-growth acres delisted
Black Ash	0	0	0
White Cedar	0	0	0
Lowland Hardwoods	115	17	341
Northern Hardwoods	225	476	92
Oak	40	239	3
Red Pine	0	0	0
White Pine	0	0	0
White Spruce	0	0	0
Total	380	732	436

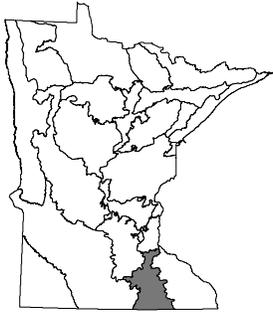


Table A-15. Designated and delisted acres in the **Oak Savanna** subsection. From the pool of 789 candidate acres, 682 acres were designated as protected old-growth and 107 acres were delisted from old-growth candidacy.

Forest type	1994 Old-growth Goal Acres	Old-growth acres designated	Old-growth acres delisted
Black Ash	0	0	0
White Cedar	40	0	0
Lowland Hardwoods	115	60	66
Northern Hardwoods	280	583	14
Oak	65	118	77
Red Pine	0	0	0
White Pine	45	0	0
White Spruce	0	0	0
Total	505	761	157

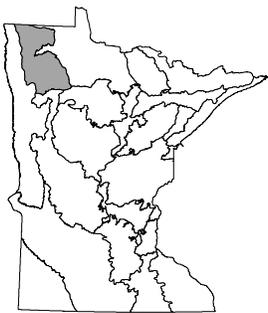


Table A-16. Designated and delisted acres in the **Aspen Parklands** subsection. From the pool of 670 candidate acres, 452 acres were designated as protected old-growth and 218 acres were delisted from old-growth candidacy.

Forest type	1994 Old-growth Goal Acres	Old-growth acres designated	Old-growth acres delisted
Black Ash	40	73	41
White Cedar	0	0	0
Lowland Hardwoods	80	204	50
Northern Hardwoods	0	0	18
Oak	30	175	109
Red Pine	0	0	0
White Pine	0	0	0
White Spruce	0	0	0
Total	150	452	218

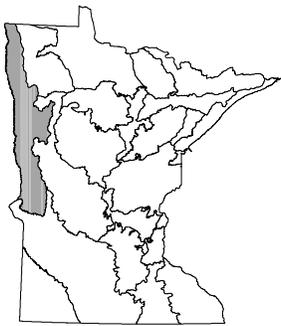


Table A-17. Designated and delisted acres in the **Red River Prairie** subsection. From the pool of 211 candidate acres, 160 acres were designated as protected old-growth and 51 acres were delisted from old-growth candidacy.

Forest type	1994 Old-growth Goal Acres	Old-growth acres designated	Old-growth acres delisted
Black Ash	0	0	51
White Cedar	0	0	0
Lowland Hardwoods	80	160	0
Northern Hardwoods	0	0	0
Oak	0	0	0
Red Pine	0	0	0
White Pine	0	0	0
White Spruce	0	0	0
Total	80	160	51

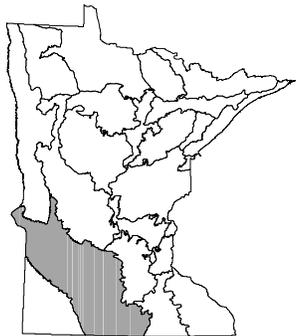


Table A-18. Designated and delisted acres in the **Minnesota River Prairie** subsection. From the pool of X candidate acres, 110 acres were designated as protected old-growth and X acres were delisted from old-growth candidacy.

Forest type	1994 Old-growth Goal Acres	Old-growth acres designated	Old-growth acres delisted
Lowland Hardwoods	115	37	242
Northern Hardwoods	115	42	205
Oak	20	31	210
Total	250	110	657

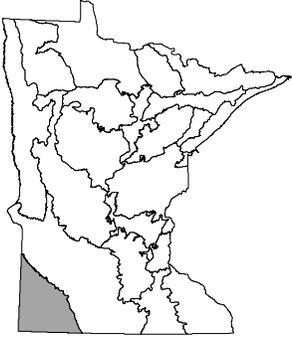


Table A-19. Designated and delisted acres in the **Prairie Coteau** subsection. From the pool of X candidate acres, 61 acres were designated as protected old-growth and X acres were delisted from old-growth candidacy.

Forest type	1994 Old-growth Goal Acres	Old-growth acres designated	Old-growth acres delisted
Lowland Hardwoods	80	51	0
Northern Hardwoods	0	0	180
Oak	20	10	314
Total	100	61	494



Table A-20. Designated and delisted acres in the **Chippewa Plains** subsection. From the pool of 670 candidate acres, 452 acres were designated as protected old-growth and 218 acres were delisted from old-growth candidacy.

Forest type	1994 Old-growth Goal Acres	Old-growth acres designated	Old-growth acres delisted
Black Ash	110	210	240
White Cedar	170	329	58
Lowland Hardwoods	225	156	104
Northern Hardwoods	375	1019	889
Oak	40	31	0
Red Pine	305	356	243
White Pine	90	77	206
White Spruce	25	0	26
Total	1340	2160	1784

Table A-21. Designated and delisted old-growth forest candidate acres in the **Hardwood Hills** subsection. **Evaluation and designation is in progress.**

Forest type	1994 Old-growth Goal Acres	Old-growth acres designated	Old-growth acres delisted
Black Ash	20		
Lowland Hardwoods	115		
Northern Hardwoods	395		
Oak	160		
Total	690		