

LEGISLATIVE REFERENCE LIBRARY
SD566.M6 M54
- Minnesota forests : Minnesota fore
3 0307 00061 8507

831088



Minnesota Forests

Minnesota Forest Resources Plan Assessment Summary

Funding Provided by the Legislative Commission on Minnesota Resources and the U.S. Forest Service

SD
566
.M6
M54



STATE OF
MINNESOTA
DEPARTMENT OF NATURAL RESOURCES

831088

BOX 9 , CENTENNIAL OFFICE BUILDING • ST. PAUL, MINNESOTA • 55155

DNR INFORMATION
(612) 296-6157

FILE NO. 9210

Dear Friend:

In 1982 the Minnesota Legislature passed the Forest Resources Management Act, the most comprehensive and significant forestry-related legislation in many years. A major purpose of this act was to establish a statewide forest planning effort. The Minnesota Forest Resources Plan (MFRP), when completed, will consist of seven volumes. This plan is to include an assessment of forest resources and conditions which will be updated at least once every ten years. It must also include a program describing specific actions to address the findings of the assessment and implement the forest resources management policy of the Act. The program portion of the plan will be updated every four years.

This Assessment Summary presents the highlights and major findings of the Assessment. It is intended for the reader who desires an overview of forestry and forest resources in Minnesota. Those who would like more detailed information should obtain a copy of the Assessment. The program elements of the MFRP are contained in Volume 6, Division of Forestry Program and Budget. Those who would like copies of these or related MFRP documents should contact the Forest Planning Section, Division of Forestry.

I hope this document will serve as a useful introduction to the forest resources of Minnesota and foster a better understanding of the multiple values of our forests. Understanding the present conditions and uses of our forests is the first step toward the wise use and protection of our valuable natural resources.

Sincerely,

A handwritten signature in dark ink, appearing to read "Raymond B. Hitchcock". The signature is fluid and cursive, with a long horizontal flourish extending to the right.

Raymond B. Hitchcock, Director
Division of Forestry

TABLE OF CONTENTS

Introduction

Section 1

Overview of Natural Resources	3
Mineral and Peat Resources	4
Soil and Water Resources	4
Forest Resources	4
Forest Land Use and Ownership	5
Changes in Forest Area: 1962-1977	5
Forest Land Ownership	6
Timber Resources	9
Timber Supply	9
Timber Demand	10
Wood for Energy	11
Economic Aspects of the Timber Industry in Minnesota	12
Forest Recreation Resources	13
Supply of Recreation Resources	13
Demand for Outdoor Recreation	14
Wildlife and Fish Resources	17
State Forest Roads	19

Section 2

Forest Resources Information, Education, and Research	22
Management Information Needs	22
Continuing Education and Extension Needs	22
Research Needs	23
Agencies, Organizations, and Programs	24
Federal Agencies	24
State Agencies	25
County Agencies	25
University of Minnesota	25
Private Organizations	25



INTRODUCTION

This document summarizes the *Assessment*, Volume 3 of the Minnesota Forest Resources Plan (MFRP). The *Assessment* describes and evaluates the past, present, and prospective forest resource conditions of Minnesota. The *Assessment Summary* analyzes the demands for Minnesota's forest resources and the capabilities of the resources to meet those demands. Information is provided which will be used in making major management decisions that will affect the economic, social, and environmental well-being of Minnesota. Significant economic and resource issues, such as alternative energy development, timber production, and tourism, are addressed.

The *Assessment Summary* is divided into two major sections. The first section, which summarizes chapters 1 through 6, focuses on the resource base in Minnesota. Chapter 1 provides a brief overview of the state's natural resources. This is followed by a more detailed look at Minnesota's forest resources in Chapter 2. Past, present, and projected use of forest lands and the forest land ownership pattern are discussed in this chapter. Timber resources are described in Chapter 3. Timber supply and demand, the use of wood for energy, and Minnesota's timber industry are among the topics in this chapter. Forest recreation resources are discussed in Chapter 4, and Chapter 5 describes the fish and wildlife resources associated with the state's forest areas. State forest roads are discussed in Chapter 6.

The second section includes chapters on management information and agencies and programs related to Minnesota's forest resources. Chapter 7 includes a brief discussion of forest resource management information systems. Chapter 8 describes the agencies, organizations, and programs that influence the use and management of Minnesota's forest resources.

Section 1



OVERVIEW OF NATURAL RESOURCES

Minnesota is blessed with a vast and varied natural resource base. This variation has affected economic development and settlement patterns throughout the course of Minnesota's history. Several natural resource zones, or regions, characterized by differences in climate, vegetation, soils, and bedrock geology, are evident (see land use zones, Figure 1). Approximately one-third of the state is forested, with the greatest concentration of forest land occurring in the northeastern, north central and southeastern parts of the state. This heavily forested zone also contains valuable minerals and peatlands. The agricultural zone in the southwestern, southern, and western parts of the state, is characterized by fertile, level plains and deep glacial soil deposits. The transition zone, stretching across the state from northwest to southeast, contains abundant water resources, a variety of soil types, and a wide variety of wildlife species.

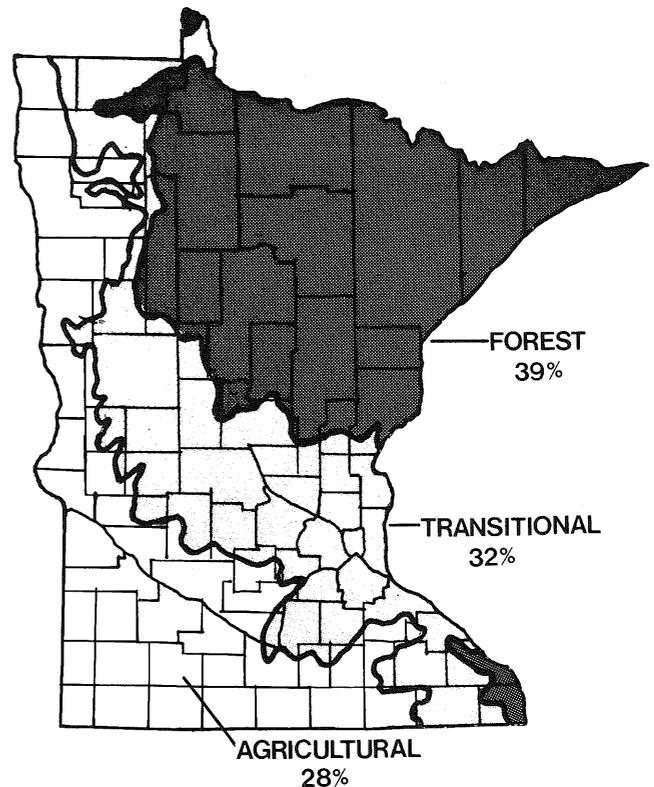


Figure 1. Major land use zones of Minnesota.

Mineral and Peat Resources

Minnesota has a vast and varied potential for the discovery of mineable metallic mineral resources. Copper-nickel deposits and manganese deposits in Minnesota have been calculated to be some of the largest in the nation. Most exploration today is occurring in the Greenstone formation of northern Minnesota, although southeastern Minnesota also has potential for deposits of lead and zinc.

Minnesota's more than six million acres of peatland contain approximately a quarter of the known peat deposits in the continental United States. Large deposits are found in the north central part of the state in Beltrami, Lake of the Woods, and Koochiching counties. Other substantial quantities are found in Aitkin and St. Louis counties. Of the three different types of peat, hemic peat is the most abundant type. This peat can be burned to produce electricity or gasified to produce synthetic natural gas. While there is interest in mining peat for energy production, it currently cannot compete economically with other fuel sources.

Besides the energy potential of peat itself, peatlands are also valuable as wildlife habitat and may be used for growing bioenergy crops. Sixty percent of Minnesota's peatlands are forested with black spruce, northern white cedar, and tamarack.

Soil and Water Resources

Water resources are of extreme importance to the state's economy. The abundance of lakes, rivers, and streams provide the state with a valuable recreation and tourism resource. There are approximately 3.3 million acres of lakes and 91,000 miles of rivers and streams in the state.

Soil is one of Minnesota's most important natural resources; the base upon which the state's agricultural economy is built. Soils vary widely in texture and chemical composition. The most fertile soils exist in the agricultural zone.

Forest Resources

Minnesota has 16.7 million acres of forest land. Forest land may be subdivided into three major land classes: commercial forest land (i.e., forest land capable of producing crops of industrial wood and not withdrawn from timber utilization by statute or administrative regulation), productive-reserved forest land (i.e., productive forest land that is withdrawn from timber utilization by statute or administrative regulation), and unproductive forest land. Commercial forest land is the largest class, accounting for 13.7 million acres or more than 80 percent of the forest land area in 1977. Productive-reserved forest land constitutes over a million acres of Minnesota's forest land and unproductive forest land comprises about two million acres of Minnesota's forest land. The following chart (Figure 2) illustrates the area of commercial forest land in Minnesota by forest type.

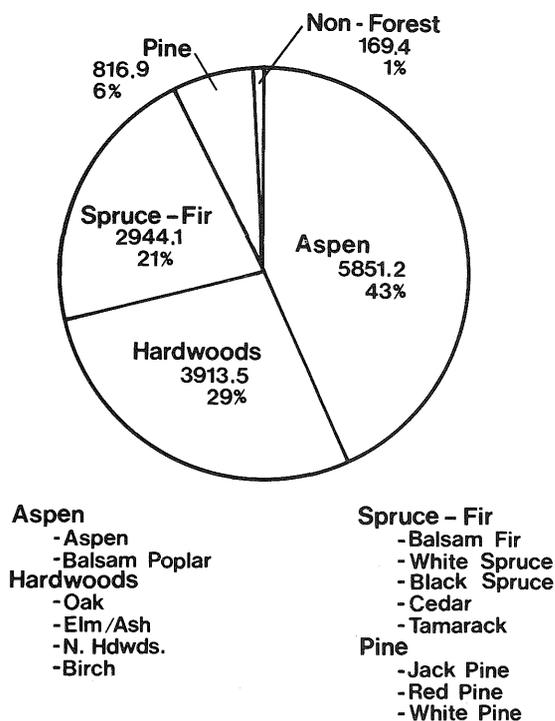


Figure 2. Commercial forest land in Minnesota by forest type in thousands of acres and percentage of total.

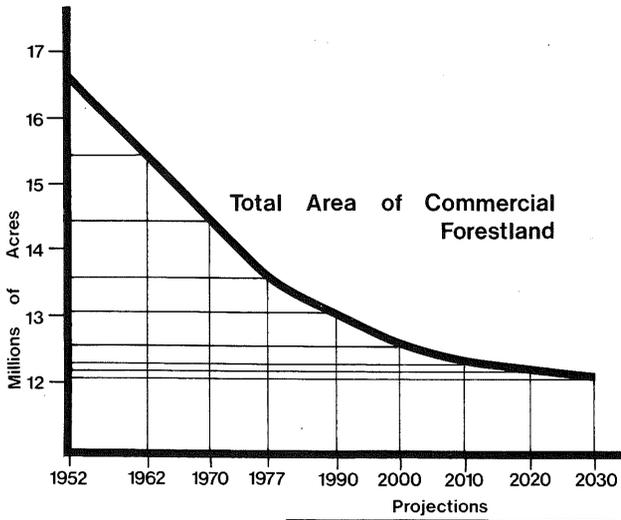


Figure 3. Total area of commercial forest land in Minnesota—1952, 1962, 1970, 1977, and projections to 2030.

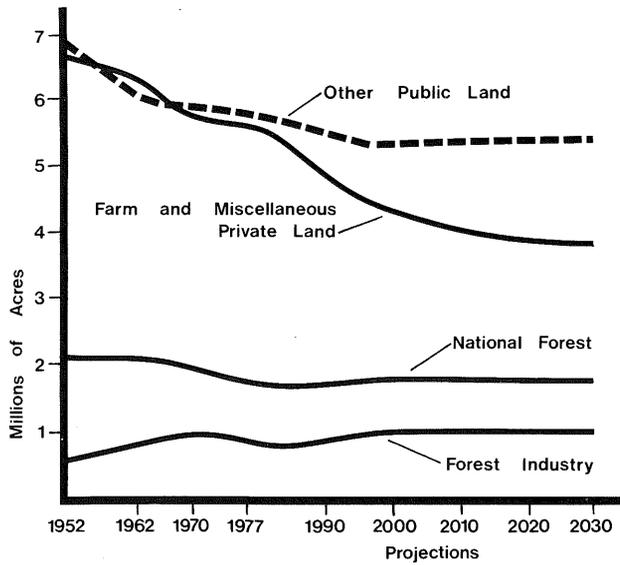


Figure 4. Area of commercial forest land by ownership category—1952, 1962, 1970, 1977, and projections to 2030.

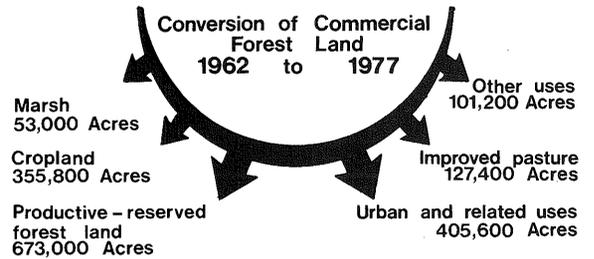


Figure 5. Conversion of commercial forest land, 1962 to 1977.

In 1978 the State Planning Agency projected withdrawals of forest lands for other uses of approximately 650,000 acres between 1975 and 1990. More recent projections by the U.S. Forest Service predict a loss of about 780,000 acres of commercial forest land between 1977 and 1990. The largest withdrawals of forest land to other competing uses will probably result from urban development and agricultural conversion. It appears that these withdrawals will be most significant in the cropland/forest transition zone, which extends from the northwest to the southeast part of the state, and will probably have the greatest impact on moderate to low productivity lands. This could cause adverse impacts on a local level in terms of forest industry needs, forest recreation opportunities, wildlife resources, and other forest uses.

Forest Land Ownership

While much of Minnesota's forest land is publicly owned, there are also large areas of forest land that are privately owned. Figure 6 illustrates the distribution of forest land ownership in Minnesota. Ownership of Minnesota's commercial forest land is nearly equally divided between the public (53%) and private sectors (47%).

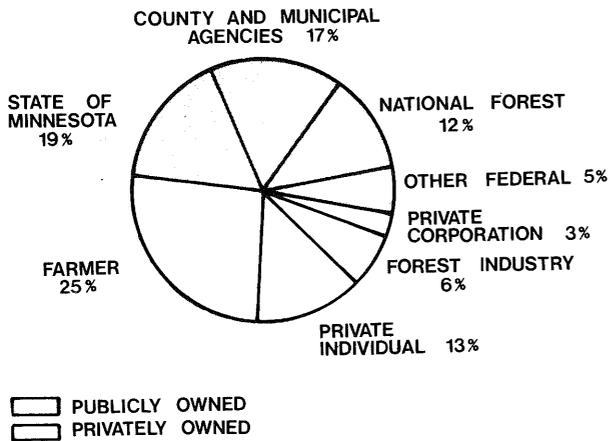


Figure 6. Distribution of commercial forest land by ownership class in Minnesota, 1977.

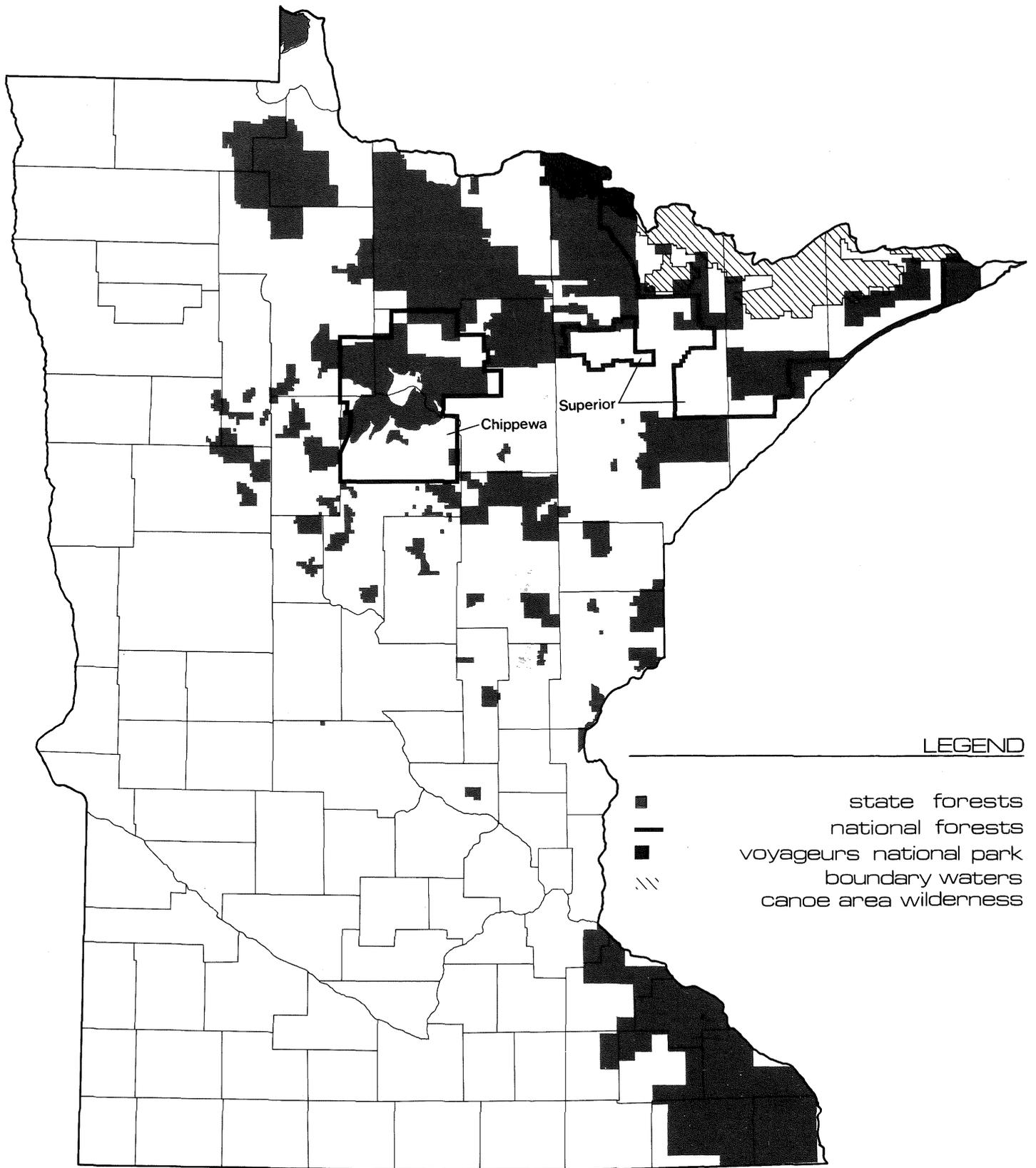
Farmers own 3.4 million acres or about one-quarter of the state's commercial forest land. Other private owners, including private non-forest-industry corporations, hold almost 2.2 million acres of commercial forest land. More than one-third of this land is owned by individuals or corporations having at least 100 acres of commercial forest land. This indicates a potential for significant forest management and production on these lands. Forest industry owns over 770,000 acres of commercial forest land.

The state of Minnesota administers 2.7 million acres of commercial forest land, and counties and municipal agencies administer an additional 2.3 million acres. Federal agencies also administer 2.3 million acres.

All groups of commercial forest landowners, except the forest industry, lost land between 1962 and 1977. The farmer and miscellaneous private landowner category lost the largest amount of commercial forest land, over 915,000 acres. Federal agencies lost 700,000 acres of commercial forest land. Counties experienced a loss of more than 340,000 acres of commercial forest land and the state lost almost 35,000 acres of commercial forest land. Only the forest industry showed an in-

crease in commercial forest land ownership during this period, acquiring an additional 56,000 acres.

Decreases in commercial forest land are expected to continue and a great majority of these losses will probably come from the farm and other private forest land class. This trend may have important implications for the timber supply situation within the state.



LEGEND

- state forests
- national forests
- voyageurs national park
- /// boundary waters
- /// canoe area wilderness

State and National Forest Lands



TIMBER RESOURCES

Timber Supply

In 1977 there were 163 million cords of timber on commercial forest land in Minnesota—145 million cords in growing stock trees (i.e., live trees of commercial value), 17 million cords in rough and rotten trees, and one million cords in salvable dead trees. Despite an 11 percent decline in the commercial forest land base since 1962, growing stock volume had increased by 21 percent and sawtimber volume had increased by 65 percent. This reflected the increasing maturity of Minnesota's forests.

The majority of the timber volume of growing stock trees on commercial forest land in Minnesota is in trees between 7 and 12 inches in diameter at breast height. This reveals that commercial forest land is dominated by trees approaching maturity roughly at the same time. In order to attain the goal of sustained-yield forestry, steps may be necessary to achieve a better distribution of age classes on commercial forest land.

In 1977 there were 44 million cords of softwood growing stock and 101 million cords of hardwood growing stock. The net annual growth of softwoods increased from 1.35 million cords in 1961 to 1.52 million cords in 1976, but the net annual growth of hardwoods decreased from 3.26 million cords to 2.90 million cords, resulting in an overall decrease in net annual growth during this period. This decrease was due primarily to the reduced commercial forest land base.

The net annual growth rate of the growing stock was about three percent of inventory in 1977. The net annual growth remained fairly constant between 1961 and 1976 at about 25 cubic feet per acre.

In 1976, hardwoods represented approximately 64 percent of annual timber harvest in Minnesota, while softwoods represented 36 percent. Fifty-seven percent of the annual growth of softwoods was harvested and 54 percent of the annual growth of hardwoods was harvested. Consumption of hardwoods, particularly aspen, is expected to more than double by the year 2000. Softwood consumption by Minnesota mills is also expected to rise by approximately 40 percent. In addition, the state of Wisconsin has proposed increasing consumption of Minnesota softwoods. To meet this expected demand, it will be necessary to intensify management of the state's timber resources.

The majority of the increase in timber consumption will be for pulp, paper and reconstituted board products. The U.S. Forest Service, North Central Forest Experiment Station is also projecting increased consumption of high quality hardwood timber and fuelwood. Increased consumption of fuelwood is expected to come from harvest and mill residues and will not reduce timber supplies available to forest products manufacturers.

Markets for Minnesota's high quality hardwoods such as select red oak, walnut and elm are growing rapidly, which will result in increased harvest. Additional timber management will be necessary to meet demand for these species.

Mortality of growing stock trees amounted to 1.8 million cords in 1976, 1.2 percent of inventory. Disease was the major factor in the mortality rate, causing 57 percent of all mortality in 1976. The mortality rate for softwoods was slightly lower than that for hardwoods, and publicly-owned forests generally had lower mortality rates than privately-owned forests.

Figure 7 shows the net annual growth and removals on the various ownerships. These figures reveal that non-industrial private forests (NIPF, i.e., forests owned by farmers, private individuals, and private corporations other than forest products firms) accounted for nearly 54 percent of Minnesota's timber removals in 1976 while comprising only 41 percent of the state's commercial forest land. In view of projections that future conversions of commercial forest land to other uses will affect primarily NIPF lands, it appears that public lands may have to assume a greater share of the state's production and the remaining private lands may have to produce timber more efficiently if future timber demands are to be met.

By applying more intensive forest management practices, it is estimated that the per acre production on commercial forest land could be increased by 25 percent between 1980 and 2020. The steadily diminishing commercial forest land base, however, may restrict the actual net volume increase to only slightly more than the current 4.4 million cords per year.

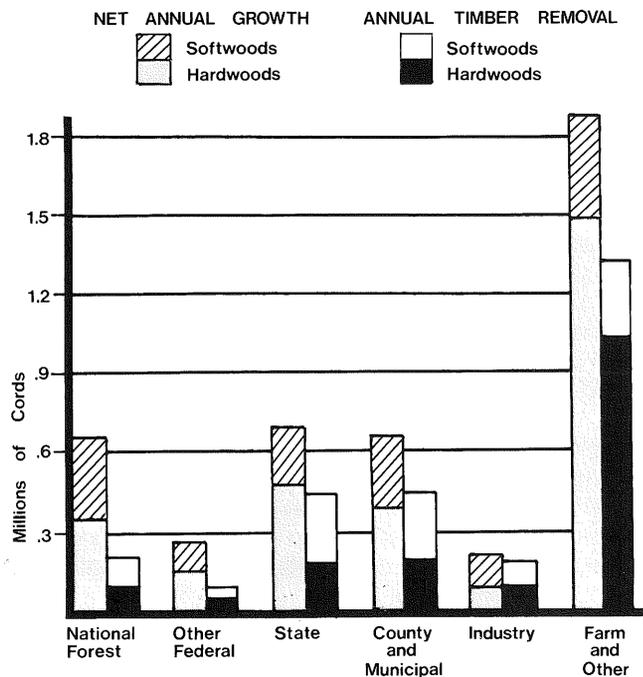


Figure 7. Net annual growth and removals* of growing stock on commercial forest land by ownership class and softwoods and hardwoods in Minnesota, 1976.

*Removals in 1976 are trend-level removals. "Other" removals from the transfer of commercial forest to productive-reserved are not included in 1976.

Timber Demand

The pulp and paper industry generates the greatest demand for forest products harvested in Minnesota. Projected demand for wood resources from commercial forest land in Minnesota is expected to increase steadily from the current 2.4 million cords to 3.8 million cords by 1990 and then more gradually to 4.2 million cords by the year 2000. The newly-established and expanding wafer-board industry and expansions in the paper-related industries are expected to account for this increase.

Based on current estimates, it is expected that pulp and paper production will increase 50-60 percent between 1983 and the year 2000. Although the electronics communications industry is rapidly developing, it is not expected to have any major impacts on Minnesota's paper industry. If anything, the demand for high quality copier paper and computer paper manufactured in Minnesota will probably increase. By the year 2000, the production of waferboard is expected to increase by an additional 20 percent over current levels of production, at which time it will probably level off.

The sudden growth of the waferboard industry (two new plants in 1981, one new plant in 1982, and the expansion of an existing plant in 1981-82) and announced expansions in the paper industry are expected to substantially increase the use of aspen.

In addition to proposed expansions of the existing paper mills, the only other industrial development foreseen is the possibility of one large reconstituted board plant being built. The plant would probably produce oriented strand board or medium density fiberboard.

International exports of timber products from the United States are expected to rise slightly until 1990, then level off. Because of Minnesota's location in relation to the coastal seaports and the high cost of transportation, no significant increases in overseas exports are expected. The only changes in exports expected are increased shipments to Thunder Bay. Exports to Canada are expected to go up from approximately 52 thousand cords in 1979 to over 100 thousand cords by the year 2000. Increases are expected to be primarily aspen.

Increases in projected national demands for all products combined are substantial. For example, the U.S.D.A. Forest Service publication, *An Analysis of the Timber Situation in the United States 1952-2030*, projects the consumption of roundwood timber to more than double by the year 2030 compared to the 1976 level of consumption. Most of that projected growth in demand will be for roundwood pulpwood. Even though national consumption is expected to double, most of the expansion is expected in the southeastern and pacific northwest with little impact on Minnesota.

Although Minnesota forest products will not have any significant impacts on international

and national markets, Minnesota can expect to see increased growth in its share of regional markets. Wisconsin is expected to become a major importer of roundwood timber, primarily softwood. Wisconsin is expected to increase consumption from 162 thousand cords in 1979 to 240 thousand cords by the year 2000. With the high cost of transportation, Minnesota manufactured products will become increasingly competitive. In particular, paper and reconstituted construction board will lead the way in increasing regional markets.

Wood for Energy

Domestic fuelwood is the most significant use of the non-aspen hardwood resource. During the 1979-80 heating season, 1.3 million cords of fuelwood were consumed for domestic use in Minnesota. Approximately 460,000 cords were removed from growing stock with the remaining 850,000 cords coming from other sources.

Demand for domestic fuelwood is expected to increase by about 50 percent by the year 2000. Ninety percent of this increase is expected within the next 10 years. Currently, however, there is no significant competition between domestic fuelwood consumers and the forest products industry for the timber resource.

Industrial use of wood energy in Minnesota is confined predominantly to the use of wood residues to produce heat and electricity within the forest products industry. Such use of wood residues is expected to increase substantially in the near future; however, demand for non-residue wood for industrial energy is not expected to rise significantly.

Over 80 Minnesota businesses and public and private institutions, including schools and office buildings, are now using wood energy for heat. The majority of these institutions have retrofitted existing heating systems to burn processed wood residue. The use of wood residues may become an attractive alternative for heating public buildings and small industries.

Economic Aspects of the Timber Industry in Minnesota

Minnesota's timber industry is the third largest manufacturing industry in the state. The value of forest products manufactured in Minnesota by the primary forest products industries was estimated to have been \$939,700,000 in 1980. Considering secondary manufacturing as well, the total sales value of forest products approached two billion dollars. The pulp and paper industry made the major wood products contribution to the state's economy.

While the direct role of Minnesota's timber industry in contributing to the state's economy is widely recognized, related impacts on the state's economy are often overlooked. The purchase of materials, equipment, and energy from other industries provides additional income and employment in Minnesota. Further impacts result from secondary manufacturing firms that locate in Minnesota because of the nearby source of forest products.

In 1980 more than 52,000 people were employed by the forest products industry in Minnesota. It is estimated that for each job created in the forest products industry in Minnesota, an additional 2.3 jobs are supported in related trades and service industries. This means that in 1980 over 119,600 people were dependent on Minnesota's forest products industry for employment.



FOREST RECREATION RESOURCES

Supply of Recreation Resources

The unique natural, cultural, and historical resources of Minnesota provide abundant opportunities for outdoor recreation. Outdoor recreation and tourism are closely linked to the state's lakes and forests. In recent years significant increases in demand for outdoor recreational opportunities have made it necessary to accelerate efforts to meet those demands. Forest lands in Minnesota have the potential to provide many additional recreational opportunities.

Estimates by the Minnesota Department of Economic Development show that tourist travel expenditures in the state exceeded \$2 billion for the first time in 1980. Although it is difficult to establish dollar values for the role forests play, their importance to recreational activities such as hunting, fishing, skiing, snowmobiling, camping, boating, canoeing, and tourist travel is substantial.

Minnesota's outdoor recreation resources consist mainly of lakes and forested lands north and west of the Twin Cities. Additional forested recreation lands are found in southeastern Minnesota. The largest amounts of public recreational lands, over 6 million acres, are managed by the United States Forest Service and the Minnesota Department of Natural Resources (DNR) as national and state forests. The state's public and private water access sites provide access to Minnesota's system of lakes and rivers, another vast recreational resource. County, municipal, and private lands provide additional areas and facilities for outdoor recreation opportunities.

The DNR, Division of Forestry administers 55 state forests totaling about 3 million acres and 1.5 million acres of state-owned lands outside state forests. Along with this, the Division of Forestry has responsibility for management of state land in the BWCAW totaling 106,360 acres. Recreational facilities administered by the Division of Forestry includes 64

primitive campgrounds, about 1,250 miles of trails, 172 public water access sites, and about 1,500 recreational homesite leases. State forest roads provide access to many of these lands and facilities.

The DNR, Division of Parks and Recreation administers 64 state parks and 11 state way-sides comprising about 183,000 acres. These parks provide a variety of recreation opportunities while preserving a diversity of natural and historic features. Approximately 920 miles of trails are available within state parks and fifty-seven parks provide camping facilities.

The DNR, Trails and Waterways Unit administers state trails and grant-in-aid trails. Together the state, grant-in-aid, and DNR unit trails total about 9,350 miles. There are 13 authorized state trails with 448 miles developed for use. Grant-in-aid trails make up the bulk of the trail system, accounting for 6,717 miles. Snowmobile trails comprise over 6,300 miles, while 417 miles are ski touring trails. The Trails and Waterways Unit also administers the water access and canoe and boating routes program.

The DNR is also responsible for the administration of several other recreational resources. These include: Scientific and Natural Areas, Wild and Scenic Rivers, Wildlife Management Areas, and State Trout Lakes and Streams.

Local units of government provide a major portion of Minnesota's recreational facilities. Counties manage a land base of over 2.8 million acres, most of which are forest lands and are open to public recreational use. Included on county or regional managed forest lands are over 700 recreation areas and 175 campgrounds. County and local governments also manage 25 parks over 500 acres in size.

The U.S. Forest Service manages 2,309,500 acres within the boundary of the Superior National Forest, including the 1,030,115 acre Boundary Waters Canoe Area Wilderness. The Forest Service also manages 658,285 acres within the boundary of the Chippewa National Forest. National forest lands are managed for multiple-use including timber production, recreation, and wildlife production.

The U.S. Fish and Wildlife Service administers the second largest federally-owned acreage in Minnesota. Its 500,000 plus acres include nine wildlife refuges and 530 waterfowl production areas. The National Park Service administers the 219,000 acre Voyageur's National Park. Other federal recreation lands include St. Croix National Scenic and Recreational River, two national monuments, and the Army Corps of Engineers lands and waters.

Private lands and facilities also play a very important role in serving Minnesota's recreation needs. About 770,000 acres of forest land are owned by forest products corporations. While most of these lands are managed for timber production, recreational use is generally permitted.

Compared to the public sector, the private sector provides more capital intensive, service-oriented facilities, ranging from overnight lodging in resorts to outfitting services for various outdoor experiences. Some private recreational businesses have onsite recreational facilities, while others rely on nearby public lands and facilities to attract users.

With many recreational activities and facilities provided by various agencies, it is helpful to classify these in order to determine the needs for additional opportunities and distribute responsibility for supplying those needs among the various providers. One method of accomplishing this is by use of the Recreation Opportunity Spectrum (ROS) system. The ROS is based on possible mixes of activities, sitings, and probable experience opportunities. Through use of the ROS system the proper role of forest lands in the outdoor recreation market may be determined.

Demand for Outdoor Recreation

Long-range planning for recreation resource development programs requires information concerning likely future levels of participation in various activities. Several methods for determining future recreational need have been developed. Although these methods have their limitations, they can provide baseline projections to assist the resource manager in planning for recreation. Major factors influencing participation in outdoor recreation include

population changes, available income, amount of leisure time, knowledge of recreational opportunities, and supply of recreational facilities.

According to data presented in the 1979 Minnesota State Comprehensive Outdoor Recreation Plan (SCORP), providers of winter recreational opportunities should seek to expand hunting, cross-country skiing, and snowmobiling opportunities. Providers of summer recreational opportunities should supply additional hiking, camping, and fishing opportunities. Other popular forest related recreational activities include boating, canoeing, picnicking, and ice fishing. Figure 8A shows occurrences of ten popular forest related recreational activities. Figure 8B lists the recreation activities with largest projected percent change in occurrences through 1995. Hunting is not shown because projections of occurrences were not available from SCORP data. However, hunting is considered to be one of the most popular forest recreation activities.

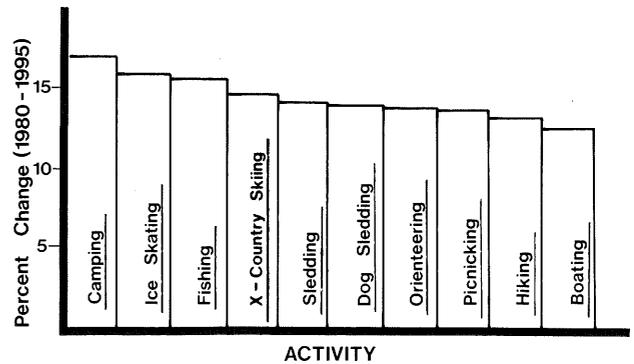


Figure 8B. Recreational activities with the largest projected percent change in occurrences through 1995.

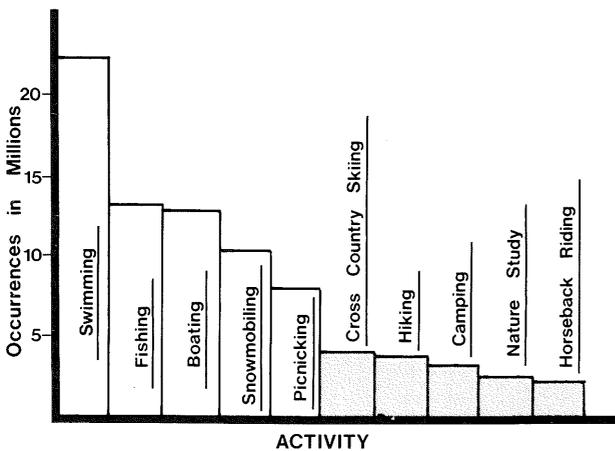
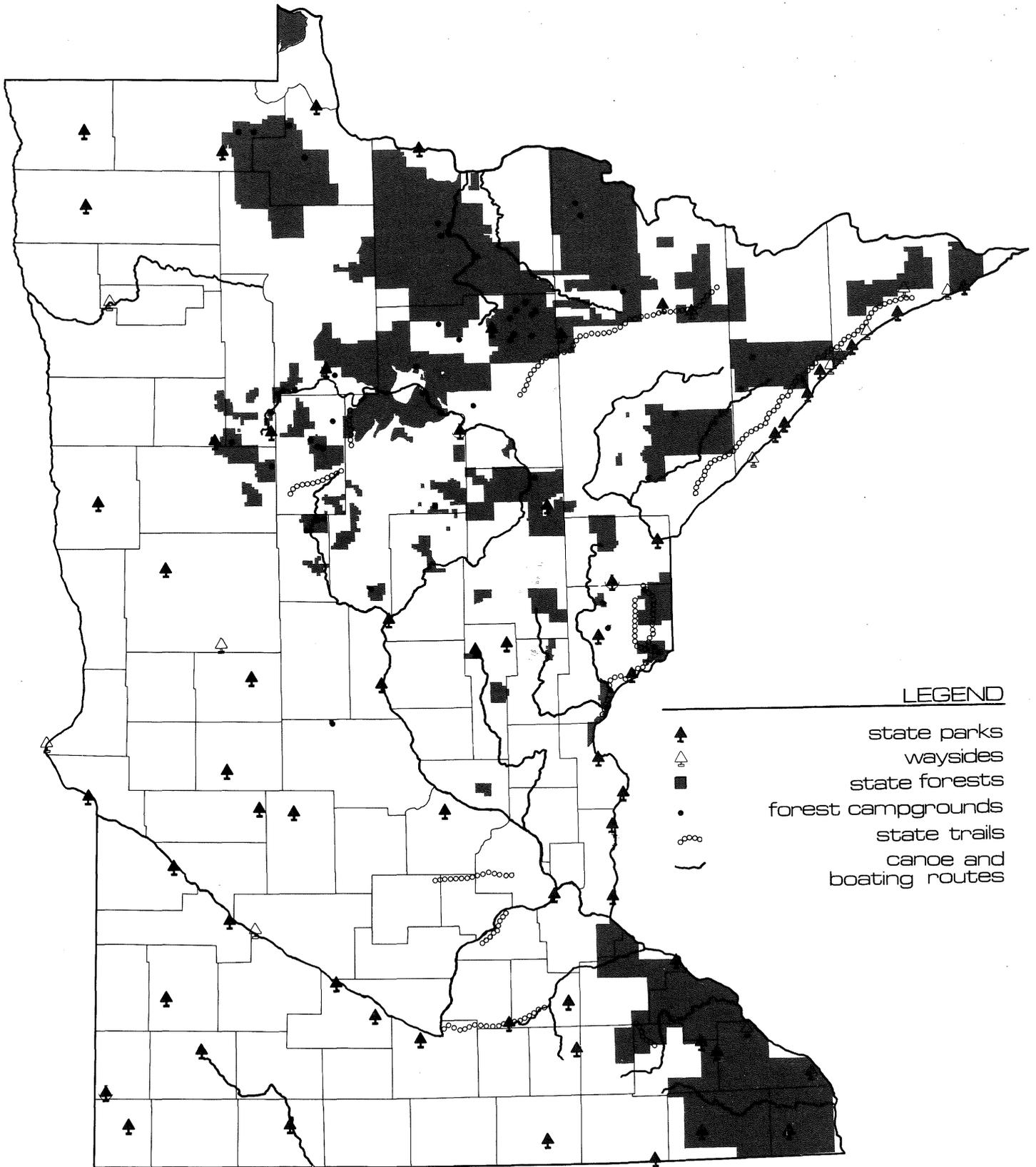


Figure 8A. Occasions occurring statewide of ten popular forest-related recreational activities in 1980.



LEGEND

- ▲ state parks
- △ waysides
- state forests
- forest campgrounds
- ⋯ state trails
- ~ canoe and boating routes

State Administered Outdoor Recreation Facilities



WILDLIFE AND FISH RESOURCES

The composition of Minnesota's forest wildlife and fish communities has changed considerably since presettlement times due to land clearing, timber harvesting, and wildfires. Many species of forest wildlife have been reduced both in number and geographic distribution over the past 150 years. Nevertheless, viable populations of all but a few forest wildlife species still exist in Minnesota, and some species that had been rare for many decades are increasing in abundance as forests mature and wildlife management efforts increase.

Forest wildlife habitat is likely to continue to decrease in extent throughout Minnesota during the rest of the century. Assuming past trends continue, the greatest number of acres lost will be located in the forest/agriculture transition zone stretching from northwestern to southeastern Minnesota. Continued losses of residual forest land in the agricultural zone are likely to have the most significant adverse impact on wildlife locally and regionally, since so little of the original forest land remains in this zone.

About 390 species of birds, 81 species of mammals, and 54 species of amphibians and reptiles have been recorded in Minnesota. Of these, approximately 233 kinds of birds and all of the mammals, amphibians, and reptiles breed, or formerly bred, in the state. About two-thirds of the breeding bird species nest in forests or along forest edges.

A list of endangered and threatened plants and animals in Minnesota is currently being prepared. Among vertebrate species that inhabit forest land, one is being considered for endangered status and five are being considered for threatened status. Several dozen forest plant species are being considered for either endangered or threatened status. In addition, a number of plant and animal species that occur in forest habitats are being considered for "special concern" status. These species may require special management to keep them from becoming threatened or endangered.

Minnesota's wildlife provides diverse opportunities for hunting, trapping, and wildlife observation. In 1980 approximately 772,000 hunting licenses, 33,000 trapping licenses, and 134,000 state waterfowl stamps were sold. Total license sales, including hunting, increased steadily from 1976 through 1980. Continued increases in future sales of all types of licenses appear likely.

In a recent survey conducted as part of the Minnesota State Comprehensive Outdoor Recreation Plan, 10.7 percent of the respondents expressed a need for more hunting opportunities. Hunting was one of the four activities with the highest expressed level of need for additional opportunities. Between 1980 and 1995, birdwatching occasions are projected to increase by 11.4 percent to almost 3.0 million, and trapping occasions are projected to increase by 2.7 percent to 621,000.

Wildlife resources play a significant role in helping maintain the tourism industry in Minnesota. Direct and indirect economic benefits derived from hunting, trapping, and wildlife observation are also substantial. In addition, wildlife is an important ingredient in the quality of nature walks, camping, snowmobiling, and other activities.

Because of Minnesota's abundant lakes, rivers, and streams, the state originally supported many rich fisheries. The quality and extent of Minnesota's water resources have been changing rapidly however, and the rate of change appears to have accelerated over the past three decades. Intensive agricultural practices, industrial development, and urbanization have resulted in siltation, pollution, destruction of spawning beds and food producing areas, drainage of wetlands, and the loss of surface and subsurface waters. These developments have significantly reduced the quality of Minnesota's fisheries. Despite these changes, Minnesota still supports one of the largest, highest-quality fisheries in the central United States. Minnesota's waters contain 151 species of fish, of which 31 species are designated game fish.

In 1980 there were about 2.6 million anglers in Minnesota. Between 1978 and 1995, ice fishing and fishing occasions are projected to rise by 14.1 percent to 21 million. Increases in fishing will make important contributions to the state's economy. Currently, anglers generate about \$520 million worth of business per year in Minnesota, or \$8.66 per fish caught.



STATE FOREST ROADS

The history of state forest roads goes back to the early 1900's when roads and railroads were developed by private logging companies throughout the forested regions of the state to access valuable timber stands. Later, during the Civilian Conservation Corps (CCC) era, a number of additional miles of road were developed for the purposes of timber management, fire protection, and access to recreational developments. By the mid-1950's the DNR had begun to reallocate limited funds from other programs to maintain and repair deteriorated sections of these early roads. The expenditure of state funds was necessary in view of the expansion and development of state forests for timber management and recreation purposes. Between 1963 and 1975 regular forest road appropriations were expended on routine maintenance and road repair.

Between 1975 and 1980 funds were not generally available for extensive state forest road maintenance and improvements. Consequently, road and bridge conditions have been rapidly deteriorating. In some cases, major repairs are needed in order to continue using certain roads and bridges and to ensure the safety of the people they serve.

The purpose of the state's forest road system is to provide transportation facilities that will permit the efficient protection and management of forest resources, transportation of forest products, and safe, reliable travel by resource users. In addition, state forest roads serve as designated recreational trails, school bus and delivery routes, and public transportation corridors.

The expansion of the timber industry has placed growing demands on state forest roads as larger and heavier log loads are harvested and transported from state lands. Along with this, there have been substantial increases in the demand for dispersed recreational activities. More and more, state forest lands, roads and trails will be called upon to facilitate additional recreational use. In many areas recreational road use may necessitate the upgrading of existing forest roads to accommodate increasing volumes of traffic.

In 1982 an extensive inventory was conducted to determine the extent, location, and condition of roads presently included within the state forest road system. The information obtained represents a complete inventory of the current condition of state forest roads. This inventory has resulted in the identification and ranking of forest road needs on a statewide basis. A comprehensive listing of road system needs will permit more efficient allocation of limited road improvement funding resources and assist in formulation of a long-term forest transportation strategy.

From the inventory, the Division of Forestry has been able to determine the present condition of the 1,800 mile forest road system. Six hundred and forty-two miles were identified as "deteriorated" and in need of major repair. Twenty-two bridges need major work or replacement. In addition, the need for 100 miles of new road development by 1989 was also identified.

Inadequate funding for road maintenance is a continuing problem. The Boundary Waters Canoe Area Wilderness Act (P.L. 95-495) has provided a temporary source of state forest road improvement and development funding for northeastern Minnesota, but lack of a permanent, reliable statewide source of road system funding continues to be a major concern.

The inventory also identified other problems, for example, the need to coordinate road planning and development with other agencies and landowners because of dispersed ownership patterns and the physical inter-connections of roads.

Section 2

FOREST RESOURCES INFORMATION, EDUCATION, AND RESEARCH

Management Information Needs

Forest management information systems provide the resource inventory data, demand projections, and other information that foresters need to make resource management decisions. Obviously there is no single data base or information system capable of providing the information needed for all forest resource management activities. Even within a single organization the range of information needed is quite broad. An effective management information system must provide support for all of an organization's functions, including strategic planning, management control, and operational control.

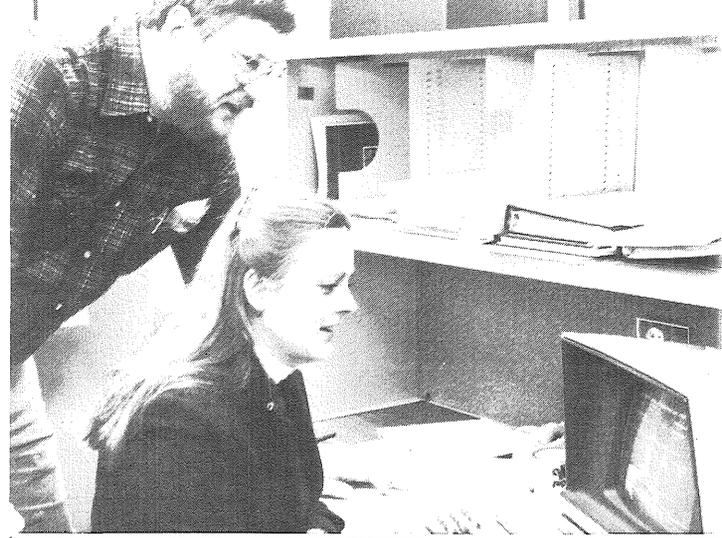
Recognizing the need for improvements in its information management capabilities, the Division of Forestry requested funds for the preparation of a long range plan for an integrated management information system. The Legislative Commission on Minnesota Resources (LCMR) funded the project for the 1982-83 biennium. A system development proposal was prepared following an initial assessment of the division's information needs. The proposal outlines the systems development approach to be used, estimates equipment needs and costs, and identifies the first applications to be developed.

While development of its forest resource management information system is important to the Division of Forestry, there are other information needs common to the broader forestry community. These needs include:

1. maintenance of forest resource inventory systems;
2. completion of the supply and demand analyses proposed by the Lake States Coordinating Committee; and
3. increased availability and use of econometric and simulation models to analyze the impacts of forest management decisions.

Continuing Education and Extension Needs

As professionals in a technical field, foresters need a continuing education program to avoid obsolescence. A continuing education task force with members from the Division of Forestry, College of Forestry, and State and Private Forestry has identified some continuing education needs of foresters in Minnesota



Forest Resources
Information, Education,
and Research

(MN/DNR Forestry and University of Minnesota College of Forestry, 1980). Task force recommendations included:

1. publication of a directory of Minnesota foresters to identify the audience for continuing education programs;
2. appointing a full time training officer for the division;
3. developing better procedures to identify training needs and to determine the effectiveness of training courses;
4. establishment of training requirements for specialist and managerial positions in the division;
5. coordination of training within multi-state regions; and
6. involvement of consulting and industrial foresters and foresters from other public agencies in continuing education programs sponsored by the Division of Forestry.

The Forest Resource Management Act of 1982 requires presentation of a report on the continuing education needs of public and private foresters to the legislature by March 1, 1983. The University of Minnesota is serving as the lead agency in developing the report which must include recommendations on course curricula and licensing of foresters.

There are 120,000 non-industrial private forest landowners in Minnesota. Most of these landowners have little technical knowledge about forest management and do not know where to seek advice (Banzhaf, 1980). Providing forest management information to these landowners is one method of improving the management of their forest resources. The forest management manual required by section 18 of the Forest Resource Management Act of 1982 is one vehicle for providing multiple use management information to landowners.

Research Needs

The University of Minnesota, College of Forestry, and the U.S. Forest Service's North Central Forest Experiment Station are the principal forestry research organizations in Minnesota. The Agricultural Experiment Station provides the majority of the funding for research at the college.

In recent years there have been several research planning efforts to identify research

needs. Between 1976 and 1978 the U.S. Department of Agriculture and the National Association of State Universities and Land Grant Colleges developed national and regional programs of research for forest and associated rangelands. Research initiatives identified for the North Central Region were:

1. utilization of low value hardwoods;
2. silviculture and management of high value and high utility hardwoods;
3. integrated pest management;
4. forest management and water quality;
5. renovation and establishment of shelterbelts;
6. resolution of land use conflicts;
7. forest biomass energy production;
8. communicating research results to users;
9. silvicultural management of softwoods;
10. forest management to enhance environmental amenity values in urban and rural areas.

Similar lists of research needs are contained in the report of the continuing education and research task force (MN/DNR Forestry and University of Minnesota College of Forestry, 1980) and the Minnesota Timber Resource Study (Banzhaf, 1980). These lists are only one factor in determining which research projects are actually conducted. Other factors include individual researcher's areas of specialization and the availability of funding.

Forest land managers often encounter problems that could be solved by additional research. However the procedures for bringing these problems to the attention of research organizations are not clearly defined. There is also a need to make research results available to forest managers in a timely manner.

AGENCIES, ORGANIZATIONS, AND PROGRAMS

Many agencies, organizations, and individuals have a role in determining how Minnesota's forest resources are used. No single agency or individual has overall responsibility for forest management. Some of the agencies and groups deal exclusively with forestry, while others have only secondary or peripheral involvement. Those agencies that have major involvement or impact are discussed in this section.

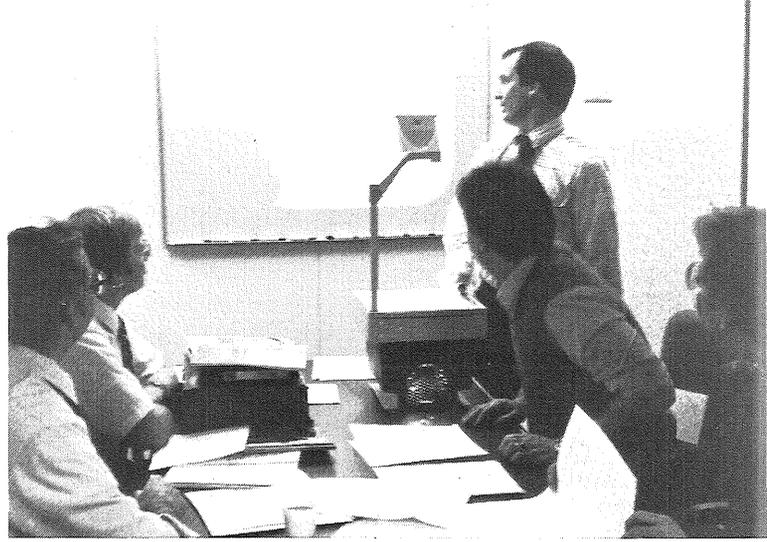
Federal Agencies

Several programs operated by units of the U.S. Department of Agriculture affect forest resources in Minnesota. The Forest Service has primary responsibility for national forestry programs, but the Soil Conservation Service, Agricultural Stabilization and Conservation Service, and the Science and Education Administration are also involved.

The Forest Service activities are divided into three major program areas: Forestry Research, State and Private Forestry, and National Forest Management. Research projects are carried out at eight regional experiment stations, including the North Central Forest Experiment Station headquartered in St. Paul. The State and Private Forestry section of the Forest Service administers programs to encourage and assist in the management of non-federal forest lands. The Forest Service cooperates with state forestry agencies to provide services to non-industrial private forest landowners, who control the majority of the nation's commercial forest land. The National Forest System section of the Forest Service manages the Chippewa and Superior national forests in Minnesota.

The Soil Conservation Service (SCS) provides leadership in the conservation, development, and productive use of soil, water, and related resources. The SCS functions primarily as a source of technical assistance for landowners, but SCS also cooperates with the Forest Service and the Division of Forestry in carrying out conservation programs.

The Agricultural Stabilization and Conservation Service (ASCS) administers a variety of financial assistance programs for farmers and other landowners, including two forestry cost-sharing programs—the Agricultural Conservation Program (ACP) and the Forestry Incentives Program (FIP).



Agencies, Organizations,
and Programs

State Agencies

The Department of Natural Resources (DNR) is the state agency responsible for management of public lands, timber, waters, minerals, fish and wildlife. This responsibility includes authority to control the use, sale, leasing or other disposition of various resources. The DNR has dual goals of protecting the environment and promoting resource use and development. The administrative organization of the DNR consists of the Commissioner of Natural Resources, a deputy commissioner, assistant commissioners, operating divisions headed by directors, service bureaus, and related boards and programs. Regional administrators coordinate the activities of operating division personnel in each of the DNR's geographic regions. The operating divisions within the DNR include Forestry, Enforcement, Fish and Wildlife, Minerals, Parks and Recreation, Waters, and the Trails and Waterways Unit.

The present Division of Forestry organizational structure consists of four functional staff groups in St. Paul and field personnel in each of the regions. The Forest Management Section consists of three major program areas: state land management, county and private forest management assistance, and insect and disease management. The Forest Resources and Products Section conducts the forest resources inventory, administers timber scaling and billing, and provides utilization and marketing services. The Operations and Planning Section is responsible for planning, environmental review, economic analysis, management information, and business management services. The Wildfire Protection Section provides wildfire protection for nearly 23 million acres within the state.

The Soil and Water Conservation Board (SWCB) provides administrative and financial assistance to local Soil and Water Conservation Districts in Minnesota. The SWCB and the Division of Forestry are jointly administering an LCMR funded cost-sharing program to encourage private forest landowners to adopt erosion and sediment control practices.

The Department of Energy, Planning and Development promotes the development and expansion of industry and business within the state. A recent economic development task force cited forestry as one area of the state's economy capable of supporting additional economic growth. Several units of the Department of Energy, Planning and Development, including the Environmental Planning Unit, the Tourism Division, and the Land Management Information Center, have an influence on the use of forest lands in Minnesota.

County Agencies

Minnesota counties are responsible for the management of about 2.3 million acres of commercial forest land. County forestry programs are financed by county appropriations, state payments in-lieu-of taxes, the federal BWCAW Forestry Intensification Program, and the state's County Assistance Program. Thirteen counties have County Land Commissioners. The County Land Departments have the responsibility to manage forestry programs as well as programs for parks, wildlife, soil and water, and surveying.

University of Minnesota

The College of Forestry is involved in forestry education, research, and extension activities. The college is the only accredited institution offering professional forestry education in the state. The college has cooperated with the Division of Forestry and the U.S. Forest Service in identifying the continuing education needs of professional foresters. Other University forestry-related agencies include the Agricultural Experiment Station and the Agricultural Extension Service. The Agricultural Experiment Station and the College of Forestry jointly sponsor many forestry research projects. The Agricultural Extension Service provides information on many forest management activities.

Private Organizations

Several private organizations affect the use of Minnesota's forest resources. Minnesota's forest industries own and manage about 770,000 acres of forest land, purchase and consume stumpage, support education and research efforts, and provide substantial employment. Other organizations include the Society of American Foresters, the Minnesota Forestry Association, the Minnesota Timber Producers Association, the Minnesota Forest Industries Committee, the Wood Fiber Council, the Izaak Walton League, the Sierra Club, the National Audubon Society, and a number of other environmental and conservation organizations.

