ITASCA WILDERNESS SANCTUARY SCIENTIFIC AND NATURAL AREA

MANAGEMENT PLAN AND RESOURCE INVENTORY

The Scientific and Natural Areas Program...
Protecting and Managing
the Best of Minnesota's
Natural World

ITASCA WILDERNESS SANCTUARY SCIENTIFIC AND NATURAL AREA

MANAGEMENT PLAN AND RESOURCE INVENTORY

A Public Use Unit

Permitted Uses Include:

- Research - Programs conducted by qualified scientists and college graduate and post-graduate students (permit required)
- Education - Primary, secondary and college programs
- Public Use - Interpretive programs and nature observation

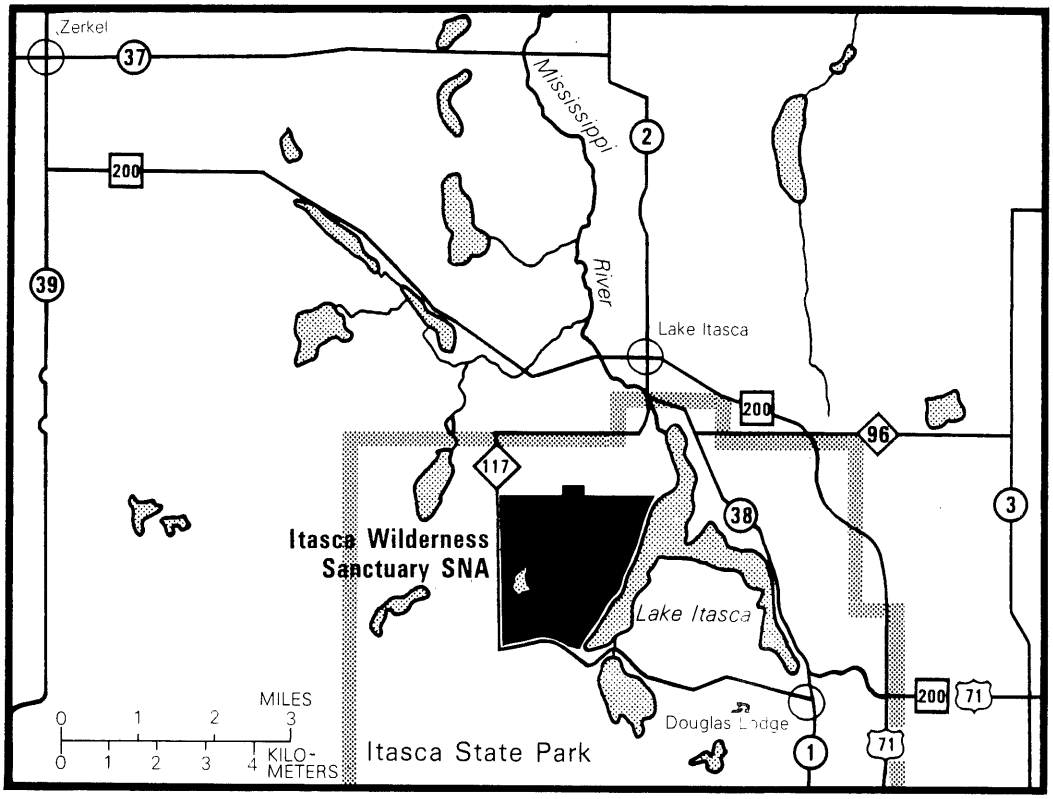
Division of Fish and Wildlife
Minnesota Department of Natural Resources

A MANAGEMENT PLAN
FOR
ITASCA WILDERNESS SANCTUARY
SCIENTIFIC AND NATURAL AREA

A Subunit of Itasca State Park

Portions of
Sections 3, 4, 8, 9, 10, 11, 15, 16, 17
Township 143 North, Range 36 West
Lake Itasca Quadrangle - J9B
Clearwater County
Minnesota

Prepared by
The Scientific and Natural Areas Program
Section of Fish and Wildlife
Minnesota Department of Natural Resources
March 1986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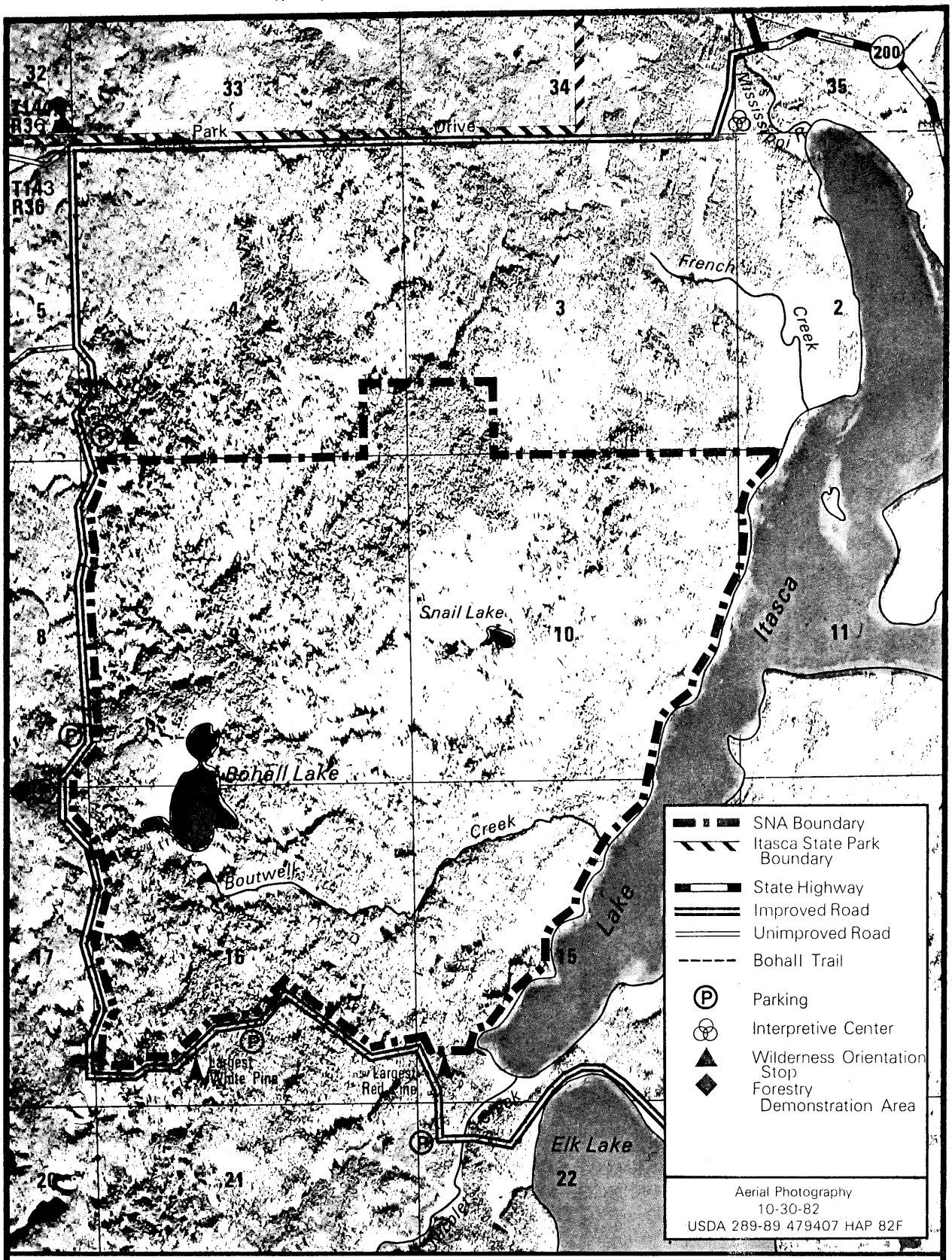
Itasca State Park



ITASCA WILDERNESS SANCTUARY SNA

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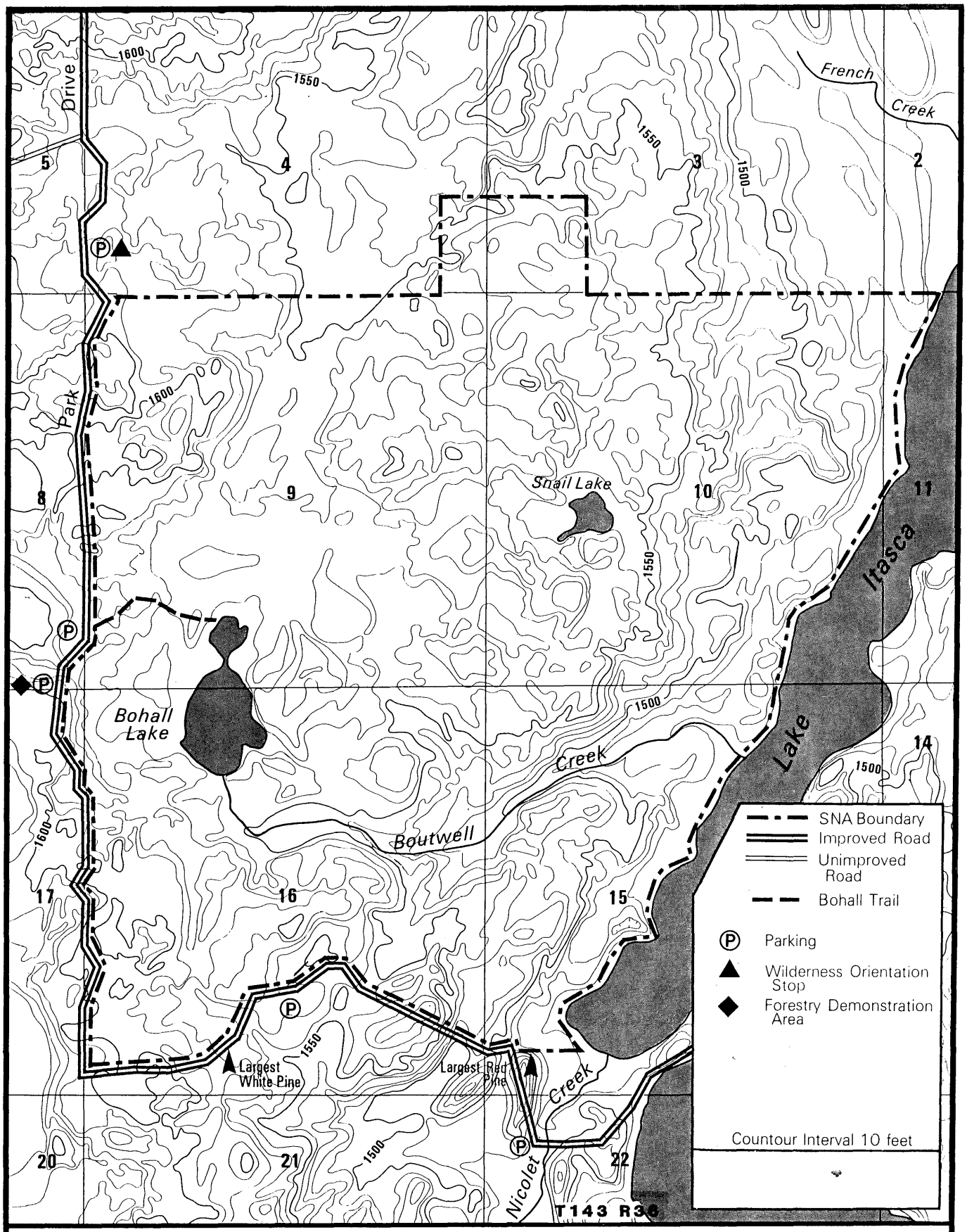

ITASCA WILDERNESS SANCTUARY SNA

0 ¼ ½ 1 MILES

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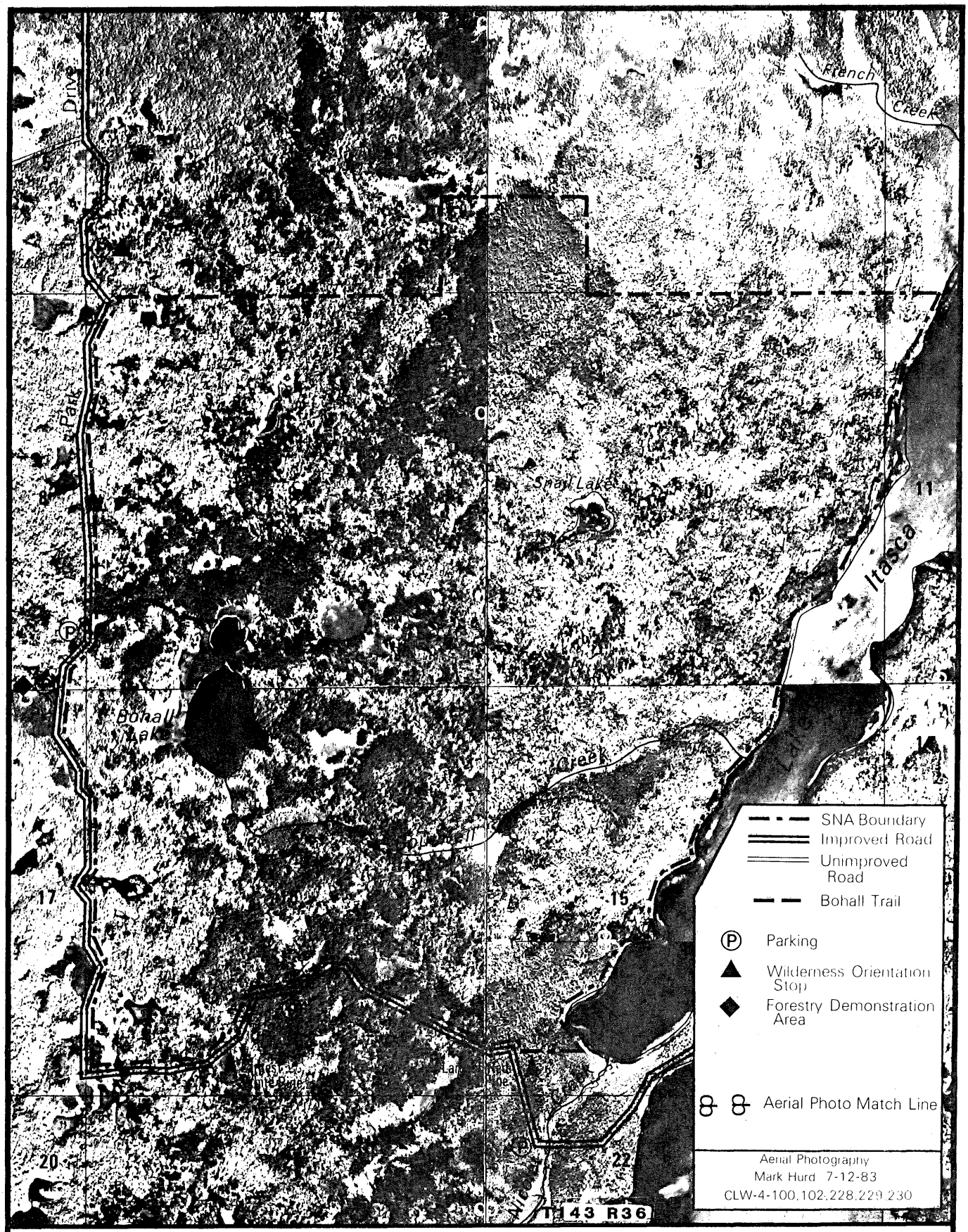
SITE



ITASCA WILDERNESS SANCTUARY SNA

SITE

This SCIENTIFIC and NATURAL AREA was established to protect and perpetuate Minnesota's rare and unique natural resources for nature observation, education, and research.

Principal activities which are UNLAWFUL in the use of this area are listed below. Further information is available at Department of Natural Resources Offices.

. Collecting plants, animals, rocks, or fossils.

. Camping, picnicking, and swimming.

. Horses, dogs, and other pets.

. Snowmobiles and other motorized vehicles.

. Trapping, fishing, and boating.

. Entry into restricted areas.

WALK GENTLY

MINNESOTA DEPARTMENT OF NATURAL RESOURCES

PREFACE

Scientific and Natural Areas are established to protect and perpetuate natural features which possess exceptional scientific or educational value. Nominated areas must substantially satisfy a set of rigorously drawn criteria to quality for designation. Scientific and Natural Areas serve many purposes. They are places for the quiet appreciation and study of nature, and serve as outdoor classrooms for teachers. They provide areas against which the effectiveness of resources management techniques employed elsewhere can be evaluated. Scientific and Natural Areas often protect some of the best remaining occurrences of a rare species, plant community, or ecosystem. They also serve as control areas for scientists engaged in furthering our knowledge of natural processes.

However, land control alone does not assure long term preservation of natural areas and their endangered species. Natural areas will decline in quality if they are not properly managed. Management of vegetation, control of foreign species, and management of visitors are important concerns.

Comprehensive planning is the key to effective and successful management. In 1975, the Minnesota legislature passed the Outdoor Recreation Act (86A), establishing the Outdoor Recreation System. This act directed managing agencies to prepare master plans for units of the system. This document is part of a planning effort to satisfy the mandates of that act. The goal of this plan is to coordinate a strategy for stewardship that addresses biological management, obligations of ownership, and visitor management.

This plan was prepared by the Department of Natural Resources, Scientific and Natural Areas Program with the assistance of the Commissioner's Advisory Committee on Scientific and Natural Areas. It was based on a resource inventory prepared by the Scientific and Natural Areas Program and the Natural Heritage Program. Funding was provided by the Legislative Commission on Minnesota Resources.

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OVERVIEW

A. Description

The Itasca Wilderness Sanctuary Scientific and Natural Area (SNA) encompasses approximately 2,000 acres immediately west of Lake Itasca, in Itasca State Park. This area represents about six percent of the park and was acquired by the state prior to logging. It was set aside in 1939, at the suggestion of the Minnesota Academy of Science, to preserve a part of the wilderness character of Minnesota that existed prior to logging and settlement. In 1965 the Sanctuary was designated as the first National Natural Landmark in Minnesota by the U.S. Department of the Interior. The Itasca Wilderness Sanctuary was designated a state Scientific and Natural Area in 1982, recognizing the area as the finest example of Great Lake Pine Forest in north central Minnesota. The Sanctuary encompasses large virgin stands of 100-300 year old red and white pines, and contains habitat for several rare plant species.

B. Preservation Value

The Itasca Wilderness Sanctuary SNA lies within the Pine Moraine Landscape Region. Several highly significant natural features have been identified on the SNA by the DNR's Natural Heritage Program. The Natural Heritage Program maintains the most comprehensive data base available on Minnesota's rare plant and animal species, and natural communities. These biological entities (species and communities) are known as "elements" and are ranked according to their endangerment in the state. Itasca Wilderness Sanctuary contains at least 3 rare plant species, and one rare natural community.

Plants

1. Bog adders-mouth (*Malaxis paludosa*) - endangered

M. paludosa is often considered one of the rarest orchids in North America. Fewer than 30 collection sites have been recorded. Of the six populations reported from Minnesota, three are known to still exist. It has been collected twice from the Wilderness Sanctuary near Garrison Point; once in 1915, and again in 1949. The conifer swamp believed to be the most likely source of these specimens was searched intensively in 1984, but no plants were found.

2. White adder's-mouth (*Malaxis brachypoda*) - DNR watch list

This orchid has a broad transcontinental range but local and sporadic distribution. There are eight records from Minnesota. Only three are recent ones. This species was discovered in a spruce-tamarak swamp in the SNA in 1984. Only one individual was found. There is currently too little information to determine if this species is declining or stable in Minnesota.

3. Matricary grape-fern (Botrychium matricariaefolium) - DNR watch list

There are only two recent records for this species in Minnesota. It was collected from the area now within the Wilderness Sanctuary by John Moyle in 1934. The same area was searched in 1984 but no plants were found.

Natural Communities

1. Great Lakes Pine Forest (Red Pine Forest, White Pine Forest) - threatened

Lumbering, land clearing and suppression of fires has virtually eliminated the original Red Pine Forest and White Pine Forest from the landscape. The SNA contains the finest example of Red and White Pine Forests in north central Minnesota. Most of the stands are 100-300 years old. The most significant man-induced alterations within the SNA have been the protection of the forest from fire since 1918 and the build-up of an excessive deer population. Other than some salvage cutting which ended in 1953, no logging has occurred in the Wilderness Sanctuary.

C. ORA Classification

The Itasca Wilderness Sanctuary SNA fully meets the designation criteria for a scientific and natural area as outlined in the Outdoor Recreation Act (M.S. 86A.05, Subd. 5). The preserve includes (1) an undisturbed plant community maintaining itself under prevailing natural conditions typical of Minnesota, (2) habitat supporting the following vanishing, rare, endangered species: Bog adder's-mouth (Malaxis paludosa), White adder's-mouth (Malaxis brachypoda), Matricary grape fern (Botrychium matricariaefolium), and Bald Eagle (Haliaeetus leucocephalus), and (3) embraces an area large enough to permit effective research or educational functions and to preserve the inherent natural values of the area.

D. Management Philosophy

The original 1891 enabling legislation setting aside Itasca State Park said, in part, "The State Forestry Board shall preserve intact the primeval pine forest now growing in Itasca State Park." The Wilderness Sanctuary was first established in 1939" ... to remain unaltered by man ... the only portion of the park whose fate is determined by natural forces alone and where, through the study of its many plants, animals, soils, and waters, man may yet understand and appreciate the life of this region in its primeval condition." These two statements were originally conceived as being entirely compatible. However, research has shown that human-induced changes such as high deer populations and fire exclusion have had major impacts on the composition of the natural vegetation. The historical impact of European immigrants on the vegetation of the region (detailed in the Appendix to this report) has created changes necessitating that we actively manage this area by reintroducing natural forces that acted in the past.

In order to replicate natural processes as closely as possible, fire must be reintroduced to the site. The impact of fire on the vegetation in its present condition is largely unpredictable, and the many other natural processes affecting post-fire regrowth (e.g. herbivore populations, seed availability, weather conditions, etc.) further complicate the matter. A site-specific, technical management plan will be developed for the SNA with the help of specialists in prescribed-burn natural vegetation management.

The primary management objectives will be to maintain the undeveloped nature of the Sanctuary and to return the natural process of fire to the site. A secondary objective is the maintenance of mature Red Pine and White Pine Forest natural communities through burning, and the enhancement of any naturally-occurring regeneration of red pine trees through management.

The complex and controversial nature of this site make it essential that management proceed within a carefully-planned research framework. New and ongoing ecological studies will be coordinated with experimental management techniques using natural processes to the greatest extent possible.

Section I. GENERAL MANAGEMENT CONSIDERATIONS

A. Itasca State Park

Itasca Wilderness Sanctuary SNA is a secondary unit within Itasca State Park as authorized by the Outdoor Recreation Act (M.S. 86A.08). This plan will serve as a coordination document to guide SNA and Park management of the site. It is consistent with goals and objectives identified in the Itasca State Park Management Plan, approved December 1979.

The Commissioner's Order designating the Itasca Wilderness Sanctuary SNA made an exception to SNA rules and regulations (NR 300-303) to allow deer hunting in the SNA when the rest of the park is open for that activity.

There are several scientific research projects currently in progress in the park, including some in the Wilderness Sanctuary. A permit from the SNA Program is required for any collecting or research projects conducted in the Wilderness Sanctuary. (See considerations under Action 1.3 for exceptions). Park staff patrol and enforce the permit requirement.

Action 1.1 Provide park staff with copies of all collection or research permits

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Considerations:

Purpose - To provide for effective enforcement and compliance by keeping park staff informed of all approved research or collection projects.

B. Lake Itasca Forestry and Biological Station

The station is in Itasca State Park and has been operated by the University of Minnesota since 1909. It offers field courses in biology and forestry and has an active research program.

The Itasca Wilderness Sanctuary has long been used by the station for research and classroom activities. Data collected in these studies is reported in student papers, graduate theses, research reports, and published journal articles. There has not been a systematic indexing of these data or studies by the SNA unit. As a result, the data are difficult to retrieve. The station and the SNA program have a shared benefit in maintaining a well documented, edited data bank on Itasca Wilderness Sanctuary. This maximizes research effort, facilitates classroom use, and provides the basis for sound resource management decisions.

Research projects in Wilderness Sanctuary SNA require SNA approval and must meet program guidelines. Collecting is generally prohibited, however, certain field courses offered at the station specialize in studying taxa which have not been adequately surveyed in the SNA. Collecting of these taxa may be allowed by special permit. Use of the SNA for "non-consumptive" classroom exercises is encouraged.

Action 1.2 Improve the filing and accessibility of data collected from the SNA

Considerations:

Data bank - Designate a central data bank where all investigators will store information collected on the SNA. To improve accessibility, the SNA program will cooperate with the station library to collect existing data and reports and establish procedures for filing results of future studies.

Action 1.3 Allow research and classroom collecting by special use permit

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Considerations:

Objective - to acquire data on components not adequately surveyed in the SNA.

Permit - All long-term research projects, studies which may impact any part of the environment, and collecting will require a special permit obtained from the SNA program. Short-term, nondestructive student projects may be conducted under the guidance of Biological Station instructors. Collections shall be deposited as permanent specimens in a public institution.

Action 1.4 Supply the station with SNA informational materials

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Considerations:

Purpose - to increase awareness and appropriate use of the SNA by station staff, researchers and students.

Materials - to include program brochures, site maps, rules and regulations, research and collecting guidelines, and other relevant materials. Following the development of an archive of data (Action 1.2), the SNA program will provide the station with a list of suggested research topics for the Wilderness Sanctuary.

C. Division of Forestry

1. School Fund Land-Section 16.

The Division of Forestry currently administers Section 16 for the school trust. This section is included in both the original dedication of the Wilderness Sanctuary, and the National Natural Landmark. It includes significant virgin stands of Red Pine and White Pine Forest. Section 16 is not presently included in the SNA because SNA designation would preclude income from being generated from the tract for the trust.

Recent legislation (1985; Sections 92.121 and 120.85) states that the DNR shall inventory all trust fund lands within state parks by January 15, 1986, and should conduct land exchanges to place trust fund lands under the control of Parks.

The Division of Forestry will be preparing a unit forest resource plan for the Bemidji administrative area in the next 2-5 years. A major objective of that plan will be to coordinate the Division of Forestry's activities with those of other DNR administrative units, other agencies, local governments and private sector. This plan should consider the state and national significance of Section 16 and evaluate alternatives to protect it.

Action 1.5 Include Section 16 in SNA project boundary

Considerations:

Bemidji Unit Plan - recommend Forestry to consider transferring administrative control of Section 16 to Parks. Either directly compensate the trust or transfer the trust dedication to other lands.

SNA designation - designate Section 16 as part of the Itasca Wilderness Sanctuary SNA following transfer from Forestry to Parks.

2. Wildfire Management

The policy regarding wildfire management is outlined in Section 3A. Briefly, until a comprehensive vegetation management plan has been developed with the input of individuals with expertise in the field, wildfires should be suppressed by Division of Forestry personnel.

Wildfire suppression has been relatively effective in the Itasca Area since the late 1920's. The Itasca Forstry District has a very low incidence of wildfire relative to other districts in the Bemidji Area. Most wildfires are the result of human-related ignitions. The likehihood of wildfire in the Wilderness Sanctuary is low because of the buffering effect of surrounding parkland, and low visitor use during the prime fire seasons (late spring and fall).

Forestry should take immediate action on all wildfires easily accessible from Wilderness Drive. Low impact supression techniques (i.e. water, hand crews, backfiring, allowing fire to spread to secure bundaries) are typically sufficient control measures. Heavy equipment should only be employed as a last resort.

Wildfires occurring in the interior of the Wilderness Sanctuary will be controlled when necessary using aerial support and hand crews. Under low to moderate fire hazard conditions the Regional Forestry and Parks Supervisors should decide whether the fire can be allowed to burn itself out prior to initiating suppression efforts. Under high hazard conditions, indirect suppression or other techniques should be used to avoid the need to construct buildozed fire lines or access trails into the sanctuary.

D. National Natural Landmark Program

The Wilderness Sanctuary was designated a National Natural Landmark in 1965 because of its fine stands of virgin red and white pines and associated plant and animal species. This program is administered by the National Park Service, which is within the U.S. Department of the Interior. Under this program the National Park Service cooperates with others to protect and perpetuate natural and cultural resources outside the National Park System that are of state, regional, national and international importance. When such areas are identified, they are designated as National Natural Landmarks and are listed on the National Registry of Natural Landmarks.

E. Management Resources

The type of management that takes place in an SNA depends both on need and availability of management resources. The SNA Program is responsible for developing a management plan, securing development funds, and overseeing implementation. Based on this plan the SNA Program will prepare work plans to schedule and coordinate management actions. SNA relies heavily on the cooperation of, and coordination with other DNR programs, divisions, and other agencies and organizations. Some of these resources are described below.

1. DNR Offices and Facilities

Itasca Wilderness Sanctuary SNA is entirely within Itasca State Park. Park staff and the District Forestry Office are located in the park. The Region 1 Nongame Specialist, Area Wildlife Manager, and Wetland Wildlife Research Group, together with all other regional DNR personnel, are stationed in Bemidji, approximately 30 miles from the park. The SNA is about 220 miles from St. Paul based SNA staff.

2. Proximity to University and College Campuses

The University of Minnesota Itasca Forestry and Biological Station is located in Itasca State Park. This facility uses the SNA extensively for classroom exercises and research projects. Bemidji State University has also done work in the SNA. The SNA should continue to receive research attention from these and other educational and research institutions.

F. Surveillance and Enforcement

Inappropriate uses or overuse can damage natural conditions and preservation efforts in natural areas. Because of the fragility of nature preserves, continued protection and maintenance requires systematic surveillance and enforcement.

Enforcement will continue to be the responsibility of DNR Park staff and the area conservation officer. Visitors to the park and SNA are encouraged to report any signs of problems or violations. No specific enforcement problems relating to the SNA have been reported. SNA rules and regulations will be posted at Bohall Trail and at the Wilderness Sanctuary parking lot (see Action 2.1).

SECTION 2. STRUCTURES AND FACILITIES

A. Wilderness Drive

The Wilderness Drive borders the SNA on the west and south. The actual SNA boundary parallels the road 50 feet from the centerline of the road. The boundary is set back from the road in order to avoid any conflicts between road development, maintenance or other road related activities, and SNA rules and regulations.

B. Trails

The Bohall Wilderness Trail is the only trail in the Wilderness Sanctuary SNA. It is a narrow, primitive trail, approximately 1/3 mile long, with only limited development (a bench 1/2 way along the trail and an interpretive sign and bench at the end overlooking Bohall Lake). The low degree of development on Bohall Wilderness Trail is consistent with SNA policy on human use management and trails. No further extension or development of this trail is recommended. No future trail development in the SNA is planned or desired. A primary purpose for setting the area aside in 1939 was for it "to remain unaltered by man".

The Landmark Interpretive Trail and the Trail to the Largest Red Pine are adjacent to the NW and SE corners, respectively, of the Wilderness Sanctuary. They provide important orientation and interpretive information about the Sanctuary but are not part of the SNA.

C. Signing and Interpretation

The purposes of signing and interpretation are to identify and describe the SNA unit, and to provide basic visitor information. An interpretive program for Wilderness Drive was recently completed by Parks; it includes an auto tour guide, self guided trail brochures, Discover Itasca leaflets, and signing. Large numbers of people will use these materials and facilities, providing a unique opportunity to expose the public to the SNA Program. Information about the Wilderness Sanctuary and SNA's is presented at the Landmark Interpretive Trail, in the Wilderness Drive Auto Tour Guide, and in the Discover Itasca Series number 9 - Itasca Wilderness Sanctuary.

Parks has the primary responsibility for providing signing and interpretive materials about the Wilderness Sanctuary to the general public. The only existing SNA needs are rules and regulations signs, and a sign marking the end of the SNA (from Wilderness Drive).

Action 2.1 Post rules and regulations signs

Considerations:

Locations - at Bohall Wilderness Trail and the Wilderness Sanctuary parking lot.

Coordination - all SNA signing and interpretive materials will be coordinated between the SNA program, park manager, park naturalist, and regional park naturalist.

Action 2.2 Sign the 'end' of the Wilderness Sanctuary SNA

Considerations:

Purpose - to inform visitors on Wilderness Drive that they are leaving the Wilderness Sanctuary SNA (the entrance is presently signed).

Design - to be determined by Parks

SECTION 3 - RESOURCE MANAGEMENT

A. Natural Community Management

The 1980 Management Plan for Itasca State Park classified the park as a Natural State Park, and recommended that the Wilderness Sanctuary be designated an SNA. Resource Management objectives in a Natural State Park are to: perpetuate or reestablish plant and animal life which represent pre-European settlement biotic communities, and to use resource management techniques that will harmonize with the park's natural systems. The SNA was designated to protect and perpetuate in a natural state those natural features which possess exceptional scientific or educational value. The plan specifically called for burning the Sanctuary with early spring fires in order to "reduce the tinder" load to the point where wildfires could eventually be allowed to burn unchecked.

The complexity of the many factors affecting post-fire regrowth and the unpredictability of the effects of burning on the site's present vegetation necessitate that a carefully-researched prescribed burn plan for the SNA be developed prior to the reintroduction of fire. The plan will address the following management objectives:

1. No persistent development features such as roads or trails should be constructed.

2. Vegetation management should simulate natural processes whenever possible.

3. Prescribed burning will be confined to mature pine stands to provide for the removal of hardwood species, balsam firs, and young spruces, and promote an open understory. Fire should be excluded from portions of the site supporting communities which were not historically fire-maintained and which harbor rare species (e.g. conifer swamps). It may be necessary to burn areas surrounded by or contiguous to pine stands, such as aspen-birch forests and isolated shrub swamps.

4. An objective of burning will be to remove as much forest floor litter as possible, in order to create favorable conditions for red pine seedling regeneration.

5. Active regeneration of pines (by planting) will not be pursued; however, any natural regeneration will be encouraged through available management techniques, including protection from herbivores where necessary.

The development and implementation of the plan will require a long-term commitment by the DNR of organizational and financial resources. The plan should be developed with the cooperation of experts in the field of prescribed burn natural vegetation management, all affected DNR Divisions, and the University of Minnesota.

Until the plan is completed, fire suppression should continue to be practiced in the SNA.

Action 3.1 Recommend the development of a strategic plan to preserve the pine forests in Itasca State Park

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Considerations:

Parks - this action is in support of the "blue-ribbon committee" which has been appointed by Parks to address vegetation management in Itasca State Park.

Purpose - to identify the technical alternatives for management of pine forests in the Park and to recommend optimal management strategies.

- to identify the organizational resources necessary to achieve the management objectives.

- to secure stable, long-term legislative and department fiscal commitment to the program.

Relationship to Former Projects - The committee should incorporate into their recommendations the extensive research and pilot projects that have been conducted to date in the park.

Action 3.2 Develop a prescribed burn plan for the SNA

Considerations:

Agencies involved - this action will be tied to the recommendations of the blue-ribbon committee, and will entail the input and cooperation of all involved DNR Divisions and University of Minnesota research personnel.

Implementation - Development of the plan will entail several stages. SNA staff will prepare a land use and vegetation history report for the site. Preburn field data, including but not limited to fuel load, accurate mapped community boundary lines, and vegetation structure, will be collected by students or researchers in conjunction with goals developed by SNA staff. The final process is the development of a technical fire management plan. This will be prepared by SNA staff with the advice and input of fire management specialists in the DNR and in other agencies.

Cost - this action will entail a large financial expenditure to produce a plan and to implement it.

B. Surveying and Monitoring

Several long-term ecological monitoring stations are being maintained in the SNA. These should continue to be studied, and more plots added to increase representation of areas to be burned. Some research questions which should guide ecological monitoring in the SNA follow. (The list is not exhaustive, but should serve as a starting point).

1. What long-term succession patterns are occurring in red pine and white pine stands?

2. How do herbivory levels affect seedling regeneration and survival of white pine and red pine?

3. What factors affect seed productivity and viability of red pine? Do seed diseases or insect predation limit viable seed production?

4. What is the impact of white pine blister rust on white pine regeneration?

5. How do early spring burns (while some snow remains and before the first general rain) affect structure and regeneration of pine forests?

6. What is the ideal burn regime to maintain mature red pine forests and promote red pine regeneration?

Action 3.3 Establish and maintain a set of permanent reference plots, including photo stations.

Considerations:

Coordination - Coordinate with existing permanent plots (maintained by U of M Forestry) and expand to include more areas, especially red and white pine forests. Monitoring should address the above research questions whenever possible.

Action 3.4 Establish and maintain one or more deer exclosures

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Considerations:

Materials - should be constructed of fireproof materials such as heavy galvanized pipes.

Location - should be included in newly burned areas where pine regeneration is a likelihood.

A primary management objective for SNA's is the conservation of endangered, threatened and special concern species. At a minimum, censusing of those species is necessary. The objective is to document numbers and distribution of these species over time. These data will provide the basis for assessing their status and management needs.

Action 3.5 Survey SNA for additional listed plant species populations

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Action 3.6 Monitor Malaxis brachypoda and Botrychium matricariaefolium

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Considerations:

Scope - Establish a replicable censusing procedure to permit systematic reverification of the species' status in the SNA. Extend monitoring to additional listed species when located.

SECTION 4. MANAGEMENT COSTS AND IMPLEMENTATION

Actions recommended in this plan have been separated into two categories: (1) administrative and (2) operational. The costs of administration actions are difficult to itemize because they are included in an SNA staff member's salary.

Operational actions are on-site activities. These often have both capital and labor costs. Capital costs have been listed. Estimates of labor needs are provided where possible.

Administrative and operational actions are often funded out of different budget sources. This makes it difficult to present an implementation schedule that equates both types of actions. To accommodate budget planning, separate implementation schedules are outlined for each category.

It is important, however, to have a mechanism that does allow comparison between all actions in this plan and between actions from different plans. The system outlined below distinguishes between (1) actions needed to improve or maintain the integrity of a site's most important features called elements, (2) legal or moral obligations of ownership or land management by the Department, and (3) all other actions important for reasons other than above.

Group I Actions: Actions that prevent or reduce the vulnerability of the element to destruction or serious degradation. That is, in the absence of these actions the preservation of the element is threatened on this site. Research, ecological survey and monitoring may be included here if, without such information, it is not known what actions are necessary to maintain the element.

Group II Actions: Actions necessary because they constitute an obligation of land management/ownership by the Department. These may be legal obligations, departmental,or SNA program standard requirements.

Group III Actions: Actions taken for all other reasons. For example, actions taken to provide for public use, acquire supplementary resource information, administrative coordination, etc.

The following chart illustrates the scheduling of actions described in the text, and the immediate on-going capital costs of implementation. The scope of this plan covers a ten year period. The plan should be reviewed every five years to evaluate progress, reassess priorities, and refine management techniques. Actions listed under the category "Begin Immediately" need immediate attention or are a continuation of an existing program. "Phase I" is the first five year period. "Phase II" is the second five year period. Implementation of many actions depend on availability of materials, equipment and labor. An action may be initiated

sooner than scheduled if circumstances so dictate and earlier schedule actions will not suffer as a result. Under the "comments" column, the DNR unit with the primary responsibility for carrying out the action is noted. The SNA program will secure development funds and prepare annual work plans to schedule and coordinate management activities described in this plan.

ADMINISTRATIVE ACTIONS		Group	Begin Immediately	Phase I	Phase II	*Comments
Action 1.5	Include Section 16 in SNA Project boundary	I		X		FOR/P
Action 3.1	Recommend developing a strategic plan to preserve the pine forests in Itasca State Park	I		X		SNA/P/FOR/UM
Action 3.2	Develop a prescribed burn plan for the SNA	I		X		SNA
Action 1.1	Provide Park staff with copies of SNA research permits	II	X			
Action 1.2	Improve data filing and accessibility	III		X		SNA/UM
Action 1.3	Allow collecting in SNA by special use permit	III		X		SNA
Action 1.4	Supply Itasca Biology Station with SNA materials	III		X		SNA
OPERATIONAL ACTIONS						
Action 3.3	Establish and monitor permanent plots	I		X		SNA
Action 3.4	Establish and maintain deer exclosures	I		X		SNA
Action 3.5	Survey SNA for additional listed plant species populations	I		X		SNA/NHP
Action 3.6	Monitor M. brachypoda and B. Matricariaefolium	I		X		SNA
Action 2.1	Post rules and regulations signs	II		X		P
Action 2.2	Sign the end of the SNA	II		X		P

*SNA = Scientific and Natural Areas
FOR = Forestry
P = Parks and Recreation
UM = University of Minnesota
NHP = Natural Heritage Program

ADMINISTRATIVE ACTIONS		Group	Beg Immed
Action 1.5	Include Section 16 in SNA Project boundary	I	
Action 3.1	Recommend developing a strategic plan to preserve the pine forests in Itasca State Park	I	
Action 3.2	Develop a prescribed burn plan for the SNA	I	
Action 1.1	Provide Park staff with copies of SNA research permits	II	
Action 1.2	Improve data filing and accessibility	III	
Action 1.3	Allow collecting in SNA by special use permit	III	
Action 1.4	Supply Itasca Biology Station with SNA materials	III	
OPERATIONAL ACTIONS			
Action 3.3	Establish and monitor permanent plots	I	
Action 3.4	Establish and maintain deer exclosures	I	
Action 3.5	Survey SNA for additional listed plant species populations	I	
Action 3.6	Monitor M. brachypoda and B. Matricariaefolium	I	
Action 2.1	Post rules and regulations signs	II	
Action 2.2	Sign the end of the SNA	II	

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NHP = Natural Heritage Program

APPENDIX

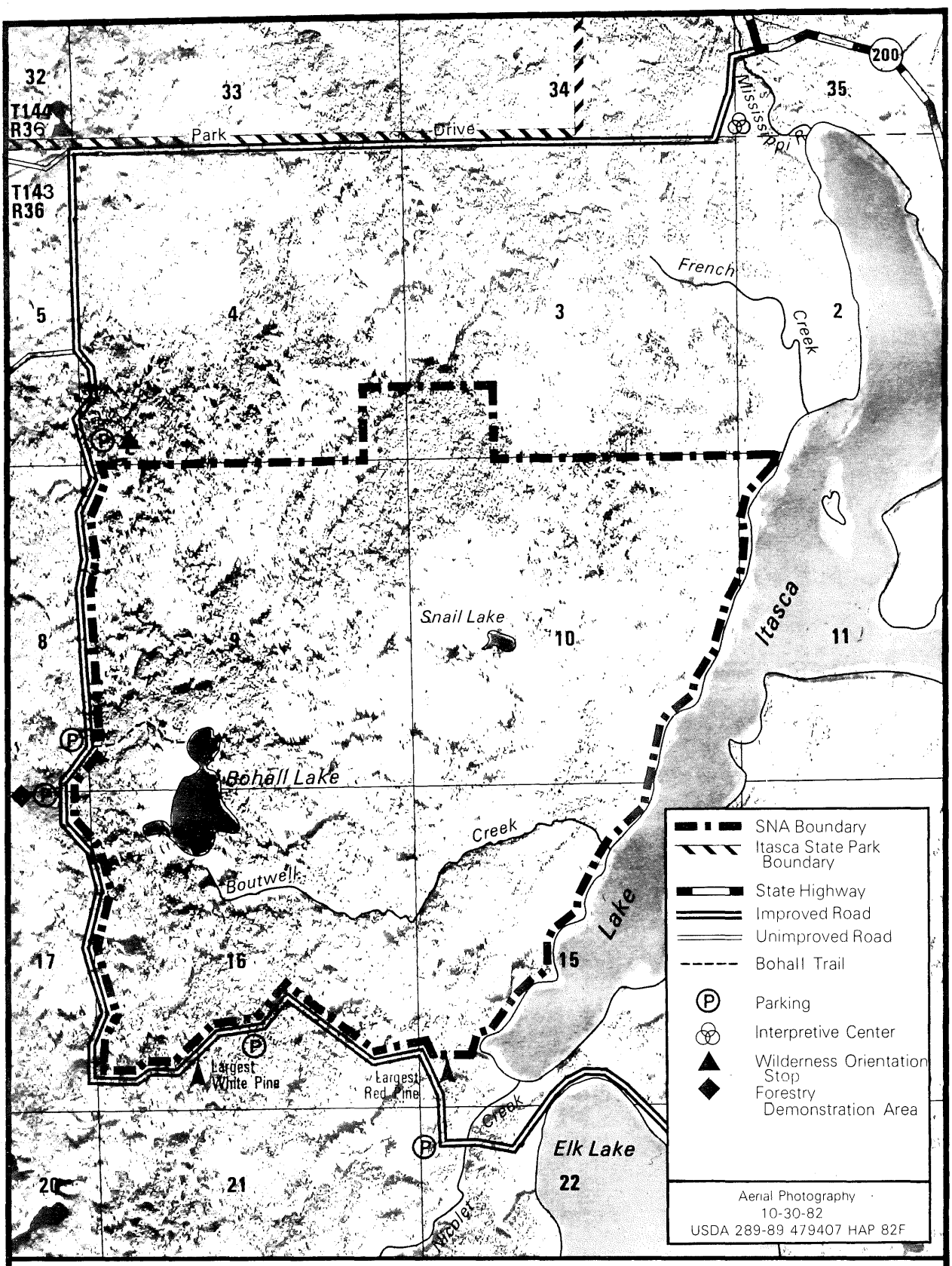
ITASCA WILDERNESS SANCTUARY

SCIENTIFIC AND NATURAL AREA

RESOURCE INVENTORY

Revised April 1986

Land Use and Vegetation History
Present Vegetation
Great Lakes Pine Forest - Element Abstract
Flora
Element Status Sheets



ITASCA WILDERNESS SANCTUARY SNA

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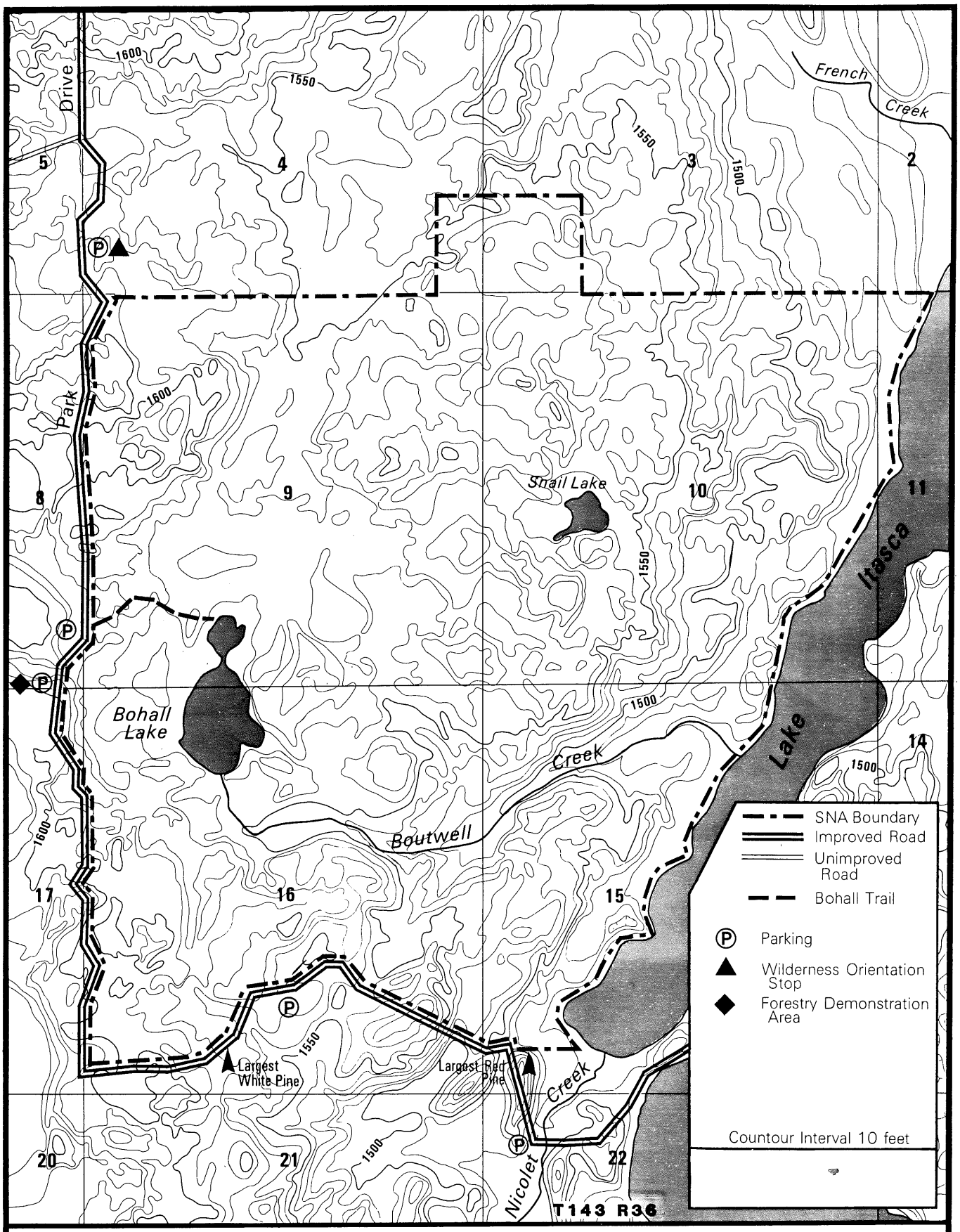
VICINITY



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Itasca Wilderness Sanctuary SNA Land Use and Vegetation History

Introduction

The reconstruction of the Itasca Wilderness Sanctuary Scientific and Natural Area land use and vegetation history was accomplished utilizing numerous sources. The earliest accounts of the area history were derived from several historical texts, state park files and the field notes of the first surveyors of Clearwater County in 1875.

Recent history was obtained through park files, SNA files and conversations with Itasca State Park personnel.

General Area History

The Lake Itasca area was occupied by humans as early as 7,000 to 8,000 years ago. Evidence of a group described as migrant hunters following the bison, has been discovered through excavation of a site near the southern boundary of the SNA (Shay, 1971) (Fig. 1).

Several other prehistoric site excavations indicate the next known residents to be members of the Blackduck phase of the Woodland culture. This culture subsisted in the area as long as 900 years ago.

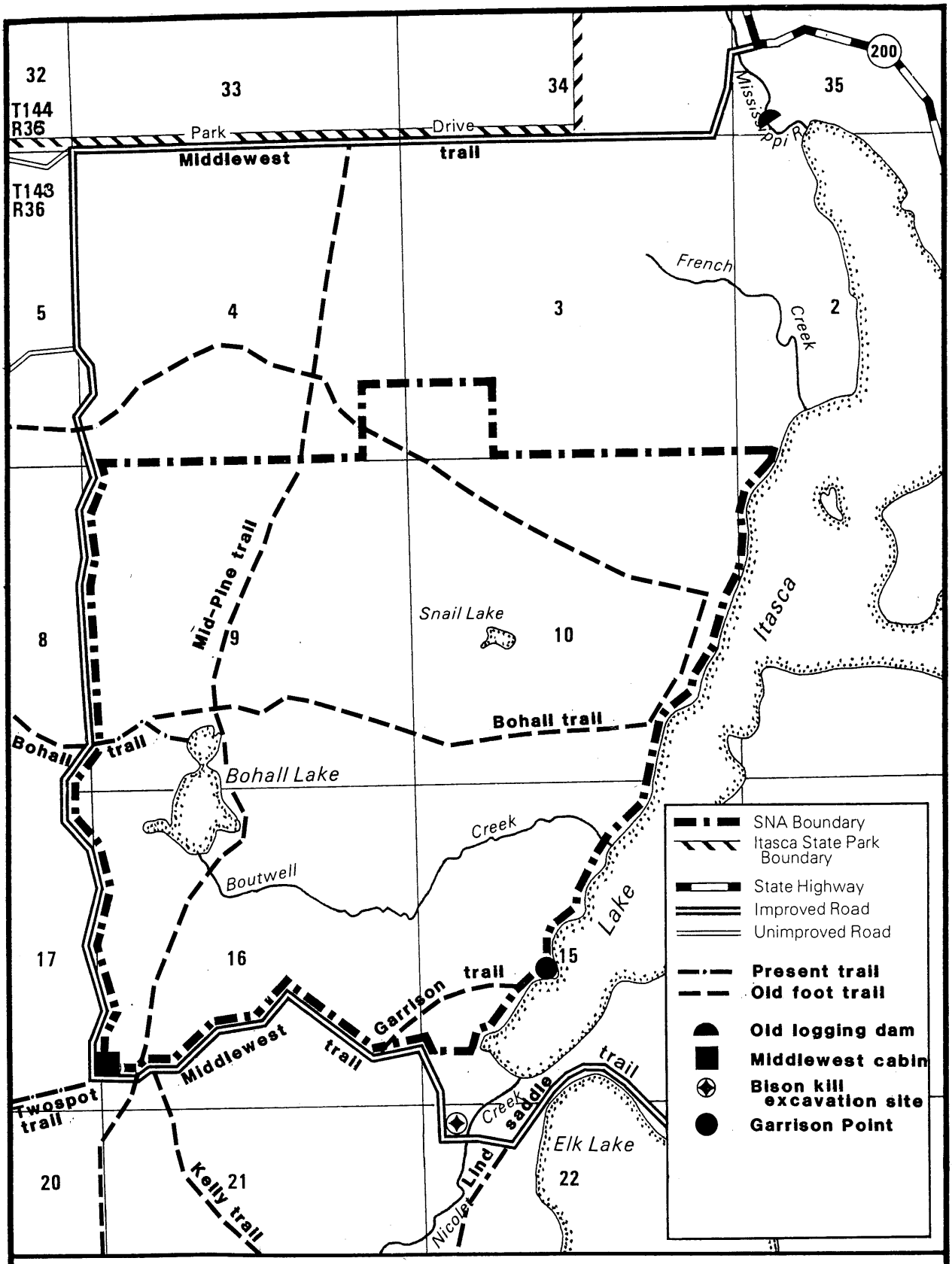
The first historical, and perhaps Blackduck-related, native American Indian tribe is thought to have been the Dakota. The Dakota were hunters and gatherers and therefore their occupation of several hundred years ago had little permanent impact on the area.

In the mid-18th century the Dakota nation was displaced from the woodlands to the plains by the Ojibwa. In 1855 the Ojibwa ceded the lands to the U.S. in a treaty. Convincing evidence indicates that native Indian tribes utilized fire to manipulate forest and prairie vegetation (see Hansen et al., 1974 for a discussion). This may account for some of the area's fire history.

Numerous historical texts have been written about the earliest explorers of this area most of whom came seeking the true source of the Mississippi River. It is likely that the first Europeans to visit the area were fur traders, but they left no record of their travels. The first name to appear in the history is that of William Morrison who spent the winter of 1803-04 and 1811-12 in the area buying furs.

After many years of other expeditions and false definition of the Mississippi's true source, the explorer Henry R. Schoolcraft is given the credit for naming Lake Itasca as the source in 1832 (Minnesota Historical Society, 1979).

Following the 1855 treaty, settlement of the area began. Very few homesteads were ever established within the park and of those all but one had been abandoned before the park was established in 1891. Much of the land in what is now the park was privately owned, but not by homesteaders. The major



ITASCA WILDERNESS SANCTUARY SNA

0 ¼ ½ 1 MILES

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FIGURE 1 LAND USE HISTORY

private ownership was in the hands of the absentee land speculators and lumber companies. It is primarily these lands that were eventually logged before title passed to the state. Slash fires following logging and land clearing in surrounding areas may have increased fire frequency in the area (Hansen et. al., 1974). In August 1892 all undisposed-of U.S. lands within park boundaries were granted to the State for park purposes. State acquisition of the park occurred slowly. Most of the land within the original boundary outline as well as 3 later boundary additions had been acquired by the State by the 1920's. Two later boundary additions were acquired by 1936. Some areas are still state school trust fund lands, including Section 16 within the SNA.

Prior to 1907 the park was controlled by a number of state auditors, some with loyalties to lumber interests and some just not really interested in maintaining a wilderness area. In February, 1907, a bill was passed which established Itasca State Park as a State forest and placed its supervision in the hands of the Forestry Board. The Park was operated like any other forest reserve except that no "primeval" timber could be cut except dead, downed and diseased lumber.

The Itasca Wilderness Sactuary SNA encompasses approximately 2,000 acres west of Lake Itasca. It was set aside in 1939, at the suggestion of the Minnesota Academy of Science. In 1965 the Sanctuary was designated a National Natural Landmark by the U.S. Department of the Interior. The Itasca Wilderness Sanctuary was designated a State Scientific and Natural Area in 1982.

Land Use History

Logging Operations

Lumbering has had an appreciable impact on Itasca State Park. Approximately the western one third of the park was heavily logged between 1903 and 1919. Scattered private lands were also logged in eastern portions of the park. Although very little to no cutting actually occurred within the SNA boundaries, the activities associated with logging did affect the site. One impact has been the permanent rise in the level of Lake Itasca, which borders the site. To facilitate moving ("booming") of the lumber a dam (Fig. 1) was constructed at the outlet of the lake in 1900 by Brainerd Lumber Company. This dam was enlarged and made more permanent in 1904. The result of this damming was an approximately 3 ft. rise in the levels of Itasca and Elk lakes.

Eight to nine log drives were made from Lake Itasca between 1902 and 1921, the years of major lumbering activity. To transport the lumber down the Mississippi to the mills, it first had to be gotten to the lake from a wide variety of cutting locations. Most of the time this necessitated dragging the logs along hastily cut roads and trails through the park (Brower 1904, Aaseng 1976). These roads generally followed lowlands and drainage ways. Since a major portion of the lumbering occurred on the west side of the park, this places the SNA between the lumbering and the lake needed for transportation. It is probable that a great deal of lumber cut from the western portion of the park was transported across the SNA to Lake Itasca.

In 1901 the legislature voted to allow salvage logging of dead and down timber in the park. During the following years, numerous contracts were made with lumber companies for the removal and purchase of dead and downed timber on the state owned lands. This period is riddled with accusations of corruption involving pirating of live timber and timber from areas not specified in contracts. Although only one flagrant case was ever brought to court (Dobie, 1959), some of this type of activity could have occurred in the area which is now the SNA. Salvage logging is still contracted for in portions of the park, however the control and monitoring of these activities is more stringent than in earlier years.

In July of 1951 a storm created a great deal of blowdown timber within the park, including the SNA. Letters appear in various files expressing concern about proposed logging of this timber disturbing the Natural Area. It appears that enough concern was generated prior to any logging occurring to force a decision on Oct. 2, 1953 by the division of Forestry to prohibit salvage logging on the SNA.

Roads and Trails

The SNA is bordered on the west and south sides by a paved road called Wilderness Drive. This drive is a combination of two trails named (on a 1940's map) Middlewest Trail and Lind Saddle Trail (Fig. 1). Paving of the road took place in the summer of 1984.

In the 1940's there were also two foot trails which passed through the site (Fig. 1). Of the original several miles of trails, there remains only a half-mile trail extending from Wilderness Drive to the north edge of Bohall Lake in Section 9. This was part of a trail which once ran to the shores of Lake Itasca and turned and proceeded back west through the northern edge of the site. Presently, the east end of the Anchor Hill hiking trail (once called the Two Spot Trail) is at the southwest corner of the SNA (Fig. 1).

Park Management Practices

The original 1891 enabling legislation setting aside Itasca State Park said, in part, "The State Forestry Board shall preserve intact the primeval pine forest now growing in Itasca State Park." In 1939, the Minnesota Academy of Science formulated the wording of a sign erected in the SNA which said, in part, "This area ... was set aside ... to remain unaltered by man. Here ... is the only portion of the park whose fate is determined by natural forces alone..." It was thought that fire suppression would contribute to meeting both of these stated goals. Since the park was established, fires have been controlled and have burned very minimal areas. The only recorded fire in the SNA since the park was established occurred in 1911. This fire apparently didn't create any major pine regeneration in the area.

Another impact on the area has been whitetail deer management. As the Itasca area became increasingly settled, predation by wolves began to lessen. In the late 1920's a program of wolf trapping was instituted to remove the wolves from the park because they were killing deer, bothering park neighbors and being a nuisance around the elk pasture. By 1935 the deer population reached abnormally high levels, drastically exceeding the estimated carrying capacity of 16 animals per section. Since hunting was prohibited, programs

of deer feeding and livetrapping and removal were instituted to attempt to control the problem. These attempts mainly failed. Over the next 10 years thousands of deer starved to death in the park and experimental study plots showed this overpopulation of deer was largely responsible for destroying any pine regeneration (Ross, Bray and Mitchel, 1970). In 1945 hunting was authorized in the park and the first season was opened. Since then, the season has continued, and has only occasionally been closed.

Beaver have affected vegetation in the SNA and other park lands through their selective feeding. For many years before 1901 beaver were believed to be extirpated from the park. In that year 3 beaver were imported from Canada and the population flourished. By 1918 populations were high enough that the Forest Service decided to trap the excess to raise funds for the park. With the lack of natural predators this trapping was the major limiting factor on beaver populations. Local opposition to the trapping was so intense, however, that it was halted in 1921. By 1934 beaver populations were so high that most of the aspen and other prime food sources within easy reach of the lodges were exhausted. The beaver were having to resort to less desirable foods and travel further distances from their lodges. During the severe winter of 1935 most starved, and the population continued to decline in subsequent years. Within a few years they were so scarce that finding an active colony was difficult. Currently beaver populations are maintaining themselves at relatively low levels with food availability being the main limiting factor (Hansen et al., 1974).

Porcupine populations have also caused considerable concern. Concentrated porcupine activity in and near the Wilderness Sanctuary in 1965 and 1966 may have caused damage to red and white pine stands. The damage has not been conclusively assessed. Studies have shown, however, that porcupines do feed on pine, and this sometimes results in the girdling of trees (Hansen et al., 1974). Control was attempted in 1986 by introducing the porcupine's most efficient natural predator, the fisher. The effectiveness of the control effort was not documented.

Another management practice that may have impacted the Natural Area is white pine blister rust control. The control program revolved around eradicating Ribes spp., the alternate host of the rust organism, through hand pulling and later, chemical application. The initial control work in 1920 was not in the SNA, nor was the control work done between 1951 and 1959. The Natural Area was intentionally excluded from the work done in the 1950's. Some control may have been conducted on or near the site by CCC crews between 1933 and 1936. Since 1960, little more than pruning cankered branches of roadside trees with high asthetic value has been accomplished (Hansen et al., 1974). Questions have been raised about the effectiveness of Ribes spp. eradication in blister rust control.

Several tree plantings of white and red pine seedlings have been undertaken in the park. For the most part location and survival data were not recorded. It is unlikely that any planting was done in the SNA, as plantings were generally in areas from which all or most pines had been removed and along roads.

Historical sites

There is at least one site of historical significance within the SNA boundaries. The site is Garrison Point on the western shore of Lake Itasca in Section 15 (Fig. 1). This site was last excavated in 1959. It is a village and mound site associated with the Blackduck phase of woodland culture which occupied the area between 500 and 900 years ago.

Just outside the southwestern corner of the SNA boundaries remains the foundation of Middlewest cabin (Fig. 1). Middlewest cabin was one of several park ranger "overnight" cabins built around 1924 and scattered throughout the park. These cabins were apparently necessary to house fire fighting crews when the roads were too muddy for rapid transportation (Dobie 1959).

Research and education

The SNA has been used extensively by the Forestry and Biological Station since the station began formal operations in 1909. The two are situated directly across Lake Itasca from one another, providing ample opportunity to utilize the Natural Area as an outdoor laboratory and classroom.

Vegetation History

Much of the history of the Itasca State Park region's vegetation has been recorded by means of literature reviews, General Land Office survey notes, palynological work, and reconstructions of the history of present stands by dendrochronological and fire scar analyses. The large body of recent ecological research in the park also provides information useful in inferring historical and past successional changes in the vegetation.

Two major factors influenced the natural community types occurring in the Itasca area previous to recent human impacts: climate and fire. Climatic changes have produced a number of successive vegetation associations, many of which have been traced through fossil evidence. The current mosaic of pine-dominated and associated communities has been present for about 1000 years. Pollen and plant macrofossil evidence indicates that the area was occupied by boreal spruce-dominated forest 12,000 years ago, and there followed at least 4 other major associations before the present regime established itself (see Hansen et al., 1974 for discussion).

Before settlement, the recent upland forests of the Itasca area were composed primarily of a mixture of aspen and white birch with interspersed red, white, and jack pine stands (Frissell, 1971). The pine species occurring in each stand were determined primarily by soil texture and depth to water table. All of these species germinate most successfully on mineral soil and are relatively intolerant of shade. In the absence of disturbance, shade and organic mulch increase in these communities, leading eventually to replacement by more shade-tolerant species such as hardwoods or white spruce/balsam fir mixes. In presettlement time, periodic natural disturbance created the conditions necessary for successful regeneration of aspen, birch, and pine species. One possible insect-caused disturbance was the defoliation of aspen by forest tent caterpillars; this may have reduced some of the area occupied by aspens and stimulated growth of the pines (Hodson, 1941). Since no other recorded major insect or disease epidemics occurred prior to settlement, fire

clearly provided the natural periodic disturbance required by these species. Wind storms are known to occur in the area, but blowdowns do not create the extensive areas of mineral soil necessary for regeneration of the extensive even-aged pine stands that occur in the area.

Reconstructions of fire history by Spurr (1924) and Frissell (1973), together with ecological research in extant pine communities demonstrate the importance of fire in the Itasca area. Data from Frissell (1973) indicate that major fires occurred in Itasca State Park an average of every 10.3 years in the interval between 1650 and 1922. The average frequency with which fires apparently affected any specific park location was about every 22 years. An examination of maps of major fires occurring between 1712 and 1913 (Frissell, 1973) indicates that 11 of the 20 fires recorded in that interval included parts of the SNA, with 5 of the 11 resulting in the regeneration of pine stands (in 1712, 1727, 1803, 1811, and 1820). It is clear that fire was an integral part of the presettlement ecosystem in the Itasca Wilderness Sanctuary.

Soon after the middle of the 19th century, European settlement had begun to greatly impact Itasca area ecosystems. As settlement progressed westward, harvest of fur-bearing carnivores was greatly accelerated, so that populations of wolf, cougar, fisher, marten, weasel, and wolverine, together with beaver and others, were virtually decimated. Populations of herbivores, especially deer, hare, and rodents, exploded as a consequence. Logging of pines and very frequent slash fires reduced sources of pine seedlings and greatly increased the availability of less palatable broadleaf forage: hazel, birch, and aspen. By the 1940's, young pines and high-quality shrubs had been trimmed off as high as deer could reach, and deer starved in quantity every winter (Lawrence and Swanson, pers. comm.).

Deer hunting within the Wilderness Sanctuary and the rest of the park has been authorized by the DNR since 1945, so that activity replaces to some degree the former toll of predators. Deer populations are still high in the park, however, and continue to limit pine regeneration.

With the suppression of fires in the park beginning in the 1920's, organic mulch began to accumulate on the forest floor, denying pine seedlings a suitable mineral substrate for root penetration, adequate water and minerals, and stability. Fire control was so successful that not a single new pine stand has originated in the park since 1912 (Frissell, 1973). Instead, succession is occurring and is gradually leading on mesic sites to sugar maple/basswood forest, and on nutrient-poor sites to spruce/fir forest or transitional northern hardwoods (see discussion in Great Lakes Pine Forest Element Abstract in this report).

Another recent impact on pine regeneration is the exotic disease, white pine blister rust. Studies have shown that white pine regeneration in some areas of the park is severely affected by this disease (H. Hansen, pers. comm.).

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PRESENT VEGETATION

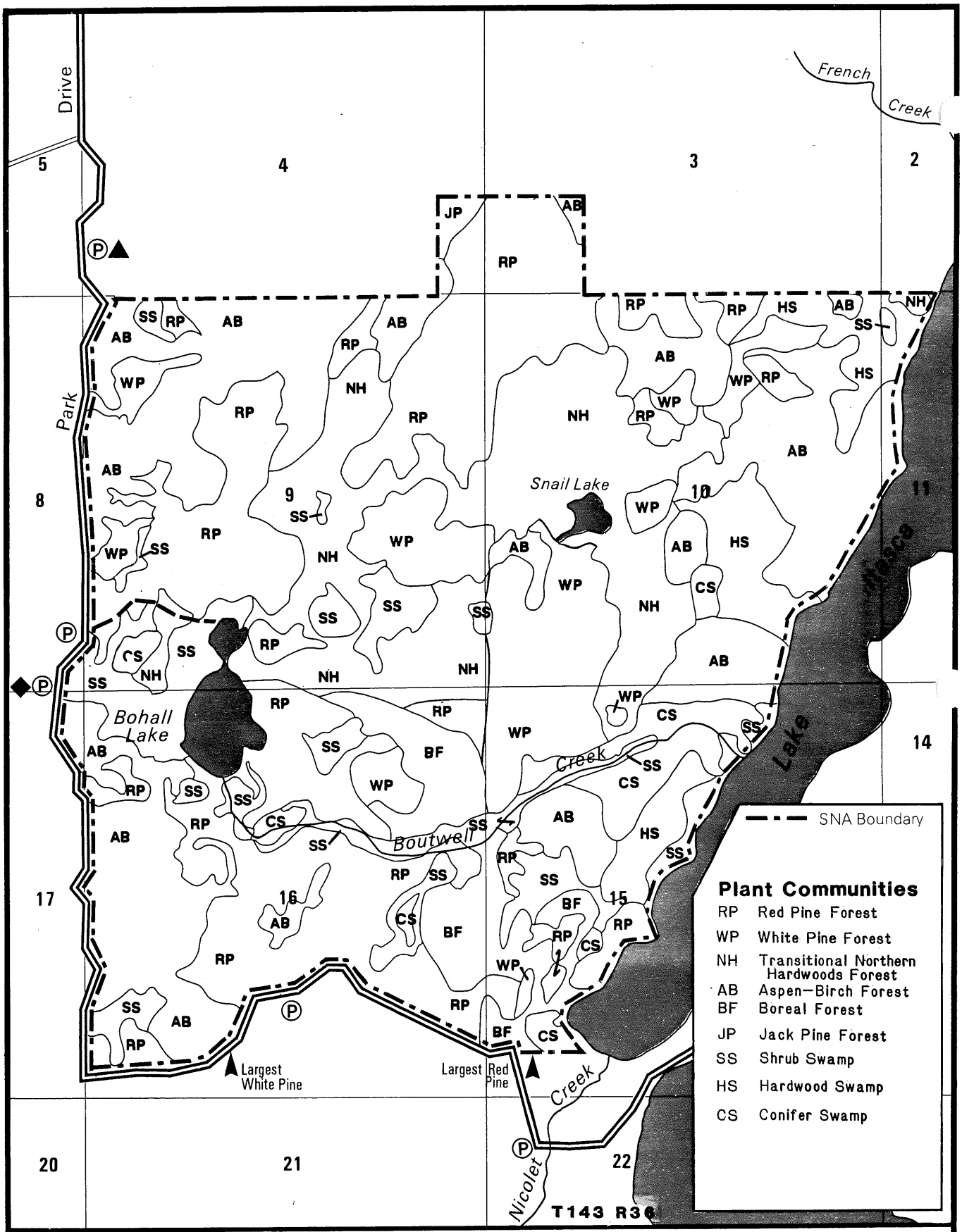
Introduction

The 32,000 acre Itasca State Park, in which the Itasca SNA is located, was established in 1891 to save a remnant of the "primeval pine forest" associated with the Mississippi headwaters. The park lies within the area of the Itasca Moraine - a prominent land form consisting of rolling to steeply irregular land, characterized by numerous depressions filled with lakes and small peat bogs. Sand outwash deposits are common throughout the moraine. This varied physiography combined with a long history of frequent fires has allowed the development of a heterogeneous mosaic of vegetation types. The upland forests within the park are dominated by aspen-birch forest and stands of red pine forest and white pine forest. Less common are boreal forest and transitional northern hardwood forests. Lowland sites are occupied by conifer and hardwood swamp, sedge meadow, and alder swamp.

The 2,000 acre Scientific and Natural Area within the park was established to recognize the significance of the virgin stands of red pine and white pine forest along with associated vegetation types representative of the Itasca Moraine in north central Minnesota. The SNA contains the finest example of Great Lakes pine forest (see detailed description) within north central Minnesota. As is the case with virtually all forests in the Great Lakes states, the Itasca SNA has been influenced by human activities. The most significant man-induced alteration within the SNA has been the artificial protection of the forest from natural fires. Frequent fires prior to 1918 maintained much of the entire park area in successional forest with pine largely dominating the uplands. Fire created conditions favorable for establishment and maintenance of these seral communities. Under a fire protection policy, uninterrupted succession is favoring an increase in more shade tolerant trees (red maple, sugar maple, red oak, balsam fir, etc.) at the expense of the pines. The most striking feature of the contemporary pine forests as noted by numerous researchers is the vigorous development of understory shrubs and hardwoods and the almost complete absence of successful pine reproduction.

In addition to altering or eliminating natural fire cycles, man has artificially increased deer populations which can have a major impact on natural vegetation development. The influence of excessive deer populations on the prevailing vegetation within the SNA has not been studied specifically. However, exclosure studies suggest deer overutilization at various times has directly or indirectly caused the suppression or elimination of pine seedlings within Itasca Park. High populations of other herbivores, including porcupine, beaver, hares, and rodents have undoubtedly also had an impact on vegetation in the area. Another factor limiting pine regeneration is white pine blister rust (H. Hanson, pers. comm.).

The vegetation communities within the Itasca SNA are mapped and described in the following section. The vegetation for this site is grouped into 9 types -- red pine forest, white pine forest, transitional northern hardwood forest, aspen-birch forest, boreal forest, jack pine forest, shrub swamp, hardwood swamp and conifer swamp. This classification is based on dominance of canopy layer species and overall floristic composition, and to some extent reproductive development. The boundaries of the vegetation types on the cover type map were identified with the use of aerial photographs, DNR



ITASCA WILDERNESS SANCTUARY SNA

VEGETATION

forest inventory data, and on-site field evaluations. Boundaries of vegetation types are always more definitive when mapped than they appear in the field. Discrete changes between vegetation types are rare; instead they grade on a continuum from one type to another. In the SNA, this continuum is especially significant in the upland vegetation types that are closely related through successional trends. Overlap of vegetation characteristics from one type to another is common. In the following descriptions, red pine forest and white pine forest are described in greater detail than other communities because of the ecological significance of these pine communities.

Community Descriptions

Red Pine Forest (RP)

Red pine forests are a distinctive feature of the wilderness area. Most examples of this community are typically found on coarse-textured mineral soils. Stands are composed primarily of even-aged mature red pine (Pinus resinosa), or of red pine in combination with lesser amounts of white pine (P. strobus). The age of red pine stands is highly correlated to fires in the 1700's and 1800's.

The present understory vegetation reflects the supression of natural fires over the past 40 years. The absence of periodic surface fires has allowed the vigorous development of understory shrubs and hardwoods. Competition from shade tolerant species and lack of mineral seed beds are critical factors inhibiting successful pine reproduction. Regeneration under mature pine canopies is predominately species of the northern hardwoods, boreal forest, and/or aspen-birch communities. Highly developed understories of red maple (Acer rubrum), paper birch (Betula papyrifera), trembling aspen (Populus tremuloides) and red oak (Quercus rubra) are prevalent throughout the red pine stands. In some areas, balsam fir (Abies balsamifera) and lesser amounts of white spruce (Picea glauca) dominate the subcanopy, most typically on low-nutrient sites.

Hazelnut (Corylus cornuta) is the most dominate shrub, occurring in moderate to high densities depending on the amount of competition from regenerating hardwood species. Other shrubs, more frequently growing in small groups, include Acer spicatum, Cornus rugosa, Viburnum rafinesquianum, Dirca palustris and Vaccinium angustifolium.

Groundlayer species which are restricted to red pine forest and can be used to differentiate this community from other types have not been identified. The prevalent herbaceous species are also encountered in other vegetation types. These are Aster macrophyllus, Pteridium aquilinum, Maianthemum canadense, Dryopteris spinulosa, Steptopus roseus, Thalictrum dioicum, Aralia nudicaulis, and Lathyrus ochroleucus.

Seedlings of red maple, sugar maple (Acer saccharum), red oak and hackberry (Celtis occidentalis) are locally abundant depending on shrub competition and to some extent on animal browsing. Pine reproduction is unsuccessful in this community type. Researchers at Itasca State Park have identified a combination of reasons for this including intense competition from hardwood tree and shrub species, deer browse, white pine blister rust, variable seed production, and the lack of appropriate seedbeds.

White Pine Forest (WP)

This community is dominated by mature to old growth white pine, with specimens over 200 years old common in the central portion of the SNA. White pine forests characteristically occur on more mesic sites having finer textured soils than sites occupied by red pine forests. In addition, the understory of white pine forests usually includes more mesophytic species.

Closed canopy forests of pure white pine are rare in the SNA. Instead, white pine usually forms a more or less open overstory with different stages of northern hardwood development in the subcanopy. Where white pine is also found in admixture with red pine, it exceeds red pine in coverage and volume.

The understory typically has an abundance of shade tolerant mesophytic hardwood species, notably sugar maple, basswood (Tilia americana) and ironwood (Ostrya virginiana). Researchers attribute this highly developed hardwood understory to fire suppression since the early 1920's. Within the present white pine forest communities, white pine saplings and other intermediate size-age classes are almost absent. Studies in Itasca State Park have shown that white pine reproduction is most successful in jack pine forests where understory competition is minimal.

With the eventual loss of the old growth white pines to windthrow and other factors, the mesic hardwood species are likely to survive the loss of the pines and assume dominance in the upper canopy. In advanced stages of succession the white pine community resembles that of the transitional northern hardwoods community. Boundaries between these two types are somewhat artificial because of this overlap in vegetation characteristics.

Transitional Northern Hardwoods Forest (NH)

The transitional northern hardwood forests are found on the more mesic and finer-textured soil sites in the SNA. This community is represented by stands which are transitional in development, and contain a mix of seral and climax tree species.

In most cases the upper canopy is open and contains seral tree species - bur oak (Quercus macrocarpa), big-tooth aspen (Populus grandidentata), trembling aspen, red pine and/or white pine. These tree species occur singly or in combination. They are typically represented only by old growth trees. Seedlings and saplings of seral trees are uncommon in the understory.

In contrast, the northern hardwood species - sugar maple, red oak, basswood, ironwood, red maple and black ash, are represented in all age classes except the old growth class. They heavily dominate the mid canopy with few trees exceeding 100 years in age. Sugar maple and red maple are the most abundantly reproducing species. The shrub layer is typically sparse. Corylus cornuta and Acer spicatum are common components. The most common groundlayer herbs are Clintonia borealis, Aralia nudicaulis, Dryopteris spinulosa, Streptopus roseus, and Osmorhiza longifolia.

Before fire suppression, this community was probably restricted to mesic, fire-protected sites where fire frequency and intensity were low. Based on numerous studies within Itasca State Park, the transitional northern hardwood forests, under continued undisturbed succession, are expected to expand throughout the park at the expense of the seral oak and pine communities.

Aspen-birch Forest (AB)

This short-lived pioneer community is common on well-drained to moderately drained sites that have been subjected to fire or other catastrophic disturbances. Trembling aspen dominates most stands; paper birch is locally more abundant in some areas. The aspen-birch forest is typically 60-80 years in age with many stands becoming decadent with age or disease (especially hypoxylon canker and white trunk rot). Stands of aspen-birch forest with highly developed northern hardwood and/or conifer understories are found throughout the SNA. Red maple, balsam fir, red oak and white spruce are the prevalent species regenerating under aspen-birch forest. Other areas have limited understory tree development and are characterized by dense, near-continuous thickets of hazelnut, and lesser amounts of Viburnum rafinesquianum, Cornus spp., and Diervilla lonicera. Seedling or sucker regeneration of aspen and birch is common only in exposed areas. The prevalent herbaceous species in aspen-birch forests are Aster macrophyllus, Pteridium aquilinum, and Streptopus roseus. Aspen and birch are common components in other forest types throughout the SNA. Along with more tolerant hardwoods and conifers they often invade old growth pine forests following mortality of the canopy trees.

Boreal Forest (BF)

In the SNA, boreal forests are most often located on mesic to dry mesic areas near the Lake Itasca shoreline or on sites drained by Boutwell or Nicolet Creek. The most common species, balsam fir, occurs singly or in complex mixes with white spruce, birch and trembling aspen. Stands of boreal forest are predominately all-aged with balsam fir the most abundant reproducing species. Stand development appears to be young in most cases with the dominant trees less than 100 years. Occasionally scattered old growth red and/or white pine may be found in the overstory.

Jack Pine Forest (JP)

Mature jack pine stands are most prevalent on xeric sites of low fertility found near the north-central border of the SNA. Lesser amounts of balsam fir, aspen, birch and red pine are mixed in the canopy. Understory is composed of hazelnut and other shrubs in medium densities. Jack pine, red pine, and most often, white pine, are the most abundant reproducing trees typically found in openings in the forest. Balsam fir, shrub, and hardwood regeneration may limit success of pine regeneration in some areas.

Shrub Swamp (SS)

Shrub swamps, marshes and sedge meadows occur most frequently in poorly drained organic soils adjacent to streams or lakes. The largest areas are along or adjacent to Boutwell Creek, Nicolet Creek, the low shoreline of Lake Itasca, and west of Bohall Lake. Other areas include pitted outwash

depressions. Alder (Alnus rugosa) is common in thickets of moderate to dense cover. Other areas contain a significant willow (Salix bebbiana, S. gracilis) component. Open areas are typically dominated by cattails (Typha latifolia) or sedges (Carex spp.). These areas are often encircled by willows, alders, or hardwoods. Additional herbaceous species include Scirpus cyperinus and Phragmites australis.

Hardwood Swamp (HS)

Hardwood swamps occur in poorly drained lowlands near the outlets of French Creek and Boutwell Creek into Lake Itasca, and in other low areas near the Lake Itasca Shoreline. Dominant hardwood species include black ash, paper birch, balsam poplar (Populus balsamifera) and basswood. Associated tree species include yellow birch (Betula lutea), american elm, trembling aspen, balsam fir, and white spruce. Hazelnut and alder are common in the understory.

Conifer Swamp (CS)

Conifer swamps are most common on moderately wet sites along Boutwell Creek, Nicolet Creek and adjacent low areas. The largest conifer swamps are dominated either by black spruce (Picea mariana) or white cedar (Thuja occidentalis) and have tamarack (Larix laricina), balsam fir, and black ash associates. Smaller conifer swamps typically have nearly pure stands of tamarack or black spruce. Labrador tea (Ledum groenlandicum) and hazelnut (Corylus spp.) dominate the shrublayer.

GREAT LAKES PINE FOREST
(White Pine Forest, Red Pine Forest)
ELEMENT ABSTRACT

NATURAL COMMUNITY
ELEMENT NAME: Red Pine Forest, White Pine Forest

ELEMENT RANK: *Special Concern/Threatened in Minnesota

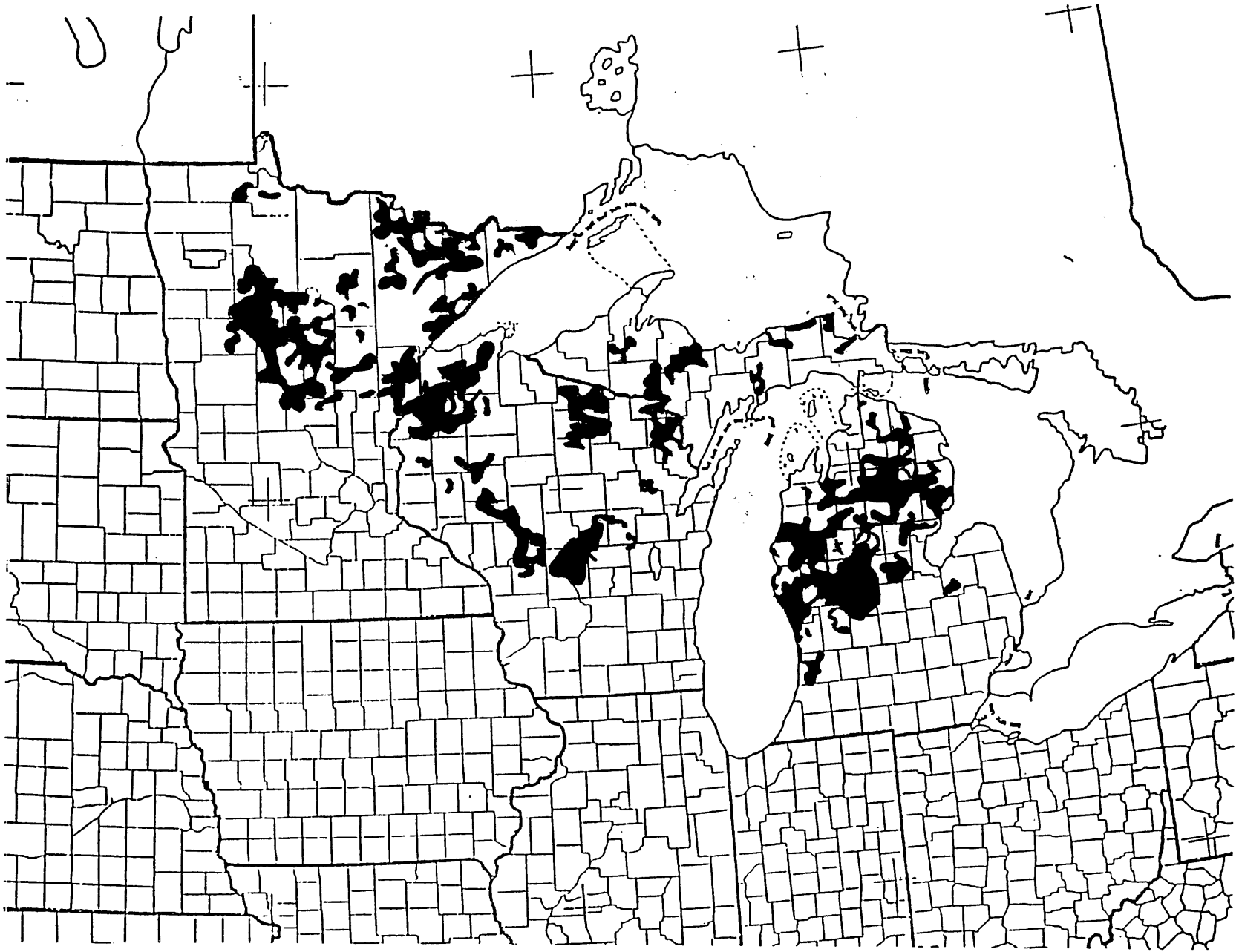
PLANT COMMUNITY
COVER TYPES: Pinus strobus, Pinus resinosa, Pinus resinosa - Pinus strobus, Pinus resinosa - Pinus banksiana

BASIS FOR CONCERN: Lumbering, beginning in the 1840's virtually eliminated the large blocks of original white pine and red pine forests from the landscape. Subsequent land clearing activities and slash fires destroyed chances for pine regeneration and resulted in their replacement with aspen, birch and other intolerant seral hardwoods and shrubs. Protected old growth pine stands are continuing to decline as the natural fires, necessary for their perpetuation, have been largely eliminated. Virgin pine stands are well represented in the Superior National Forest, less so in the Pine Moraine region (north central Minnesota), and very poorly represented in other landscape regions where they were once abundant.

REGIONAL DESCRIPTION AND DISTRIBUTION: The Great Lakes pine forest has been included under a number of classification systems including the Lake Forest Formation (Weaver and Clements 1938), the Minnesota Section of Hemlock-White Pine-Northern Hardwood Region (Braun 1950), and the Great Lakes Pine Forest according to Kuchler (1964). The Great Lakes plan forest occurs as a transition between the boreal forest and the eastern deciduous forest. It occurs in the upper Great Lakes region in Michigan, Wisconsin and Minnesota (Figure 1) and is defined by its characteristic trees, eastern white pine (Pinus strobus), red pine (Pinus resinosa) and jack pine (Pinus banksiana). Both red and white pine reach a peak of abundance in this region extending northward only to the southern fringe of the boreal forest region. Jack pine is essentially a tree of the boreal forest with most of its range lying in the boreal forest region of Canada. Characteristic hardwood associates within the Great Lakes pine forest include red oak (Quercus rubra), hills oak (Quercus ellipsoidalis), red maple (Acer rubrum), paper birch (Betula papyrifera), quaking aspen (Populus tremuloides), and big tooth aspen (Betula grandidentata). This forest type occurs most commonly on level or gently rolling sand plains, sandy glacial lake beds and thin glacial drift over bedrock.

*Element ranks for natural community types are program-defined and do not represent an official federal or state status (e.g., no legal status exists).

Figure 1. Presettlement extent of the Great Lakes pine forest (after Kuchler, 1964).



Throughout the Great Lakes pine forest, fire was the most important factor controlling the species composition and age structure of the vegetation as well as the overall vegetation patterns on the presettlement landscape. Paleoecological studies (Swain 1973, 1978; Cwynar 1978) show that white and red (or jack) pines have been associated with fire ever since their postglacial arrival within their present ranges some 1,000 to 9,000 years ago. Numerous contemporary studies have documented the dependence of pine forest communities on fire for both stand initiation and maintenance. Maissurow (1935, 1941) and Cary (1948) recognized the importance of fire in establishing white pine stands in Wisconsin, Michigan and New England. Detailed studies of fire cycles in Minnesota by Spurr (1954), Frissel (1971, 1973), and Heinselman (1973) have documented the relationship between forest fires and initiation of red, white, and jack pine stands.

In the absence of periodic fire, successional trends typically start with jack pine, pass through red pine and white pine and culminate in maple-basswood forest, or in the northern most portion of the area in spruce-fir forest. Uninterrupted, linear succession of this type - one vegetation complex replacing another on a given site in the absence of disturbance - probably rarely occurred in the presettlement Great Lakes pine forest. Fires, of varying frequency and intensity, commonly interrupted succession before any true climax vegetation was reached. Frequent fires produced a heterogeneous vegetation mosaic composed of the full spectrum of successional stages from early post-fire communities to mature, old growth communities. Heinselman (1978) succinctly summarizes the structure of the presettlement red pine - white pine forest under natural fire cycles.

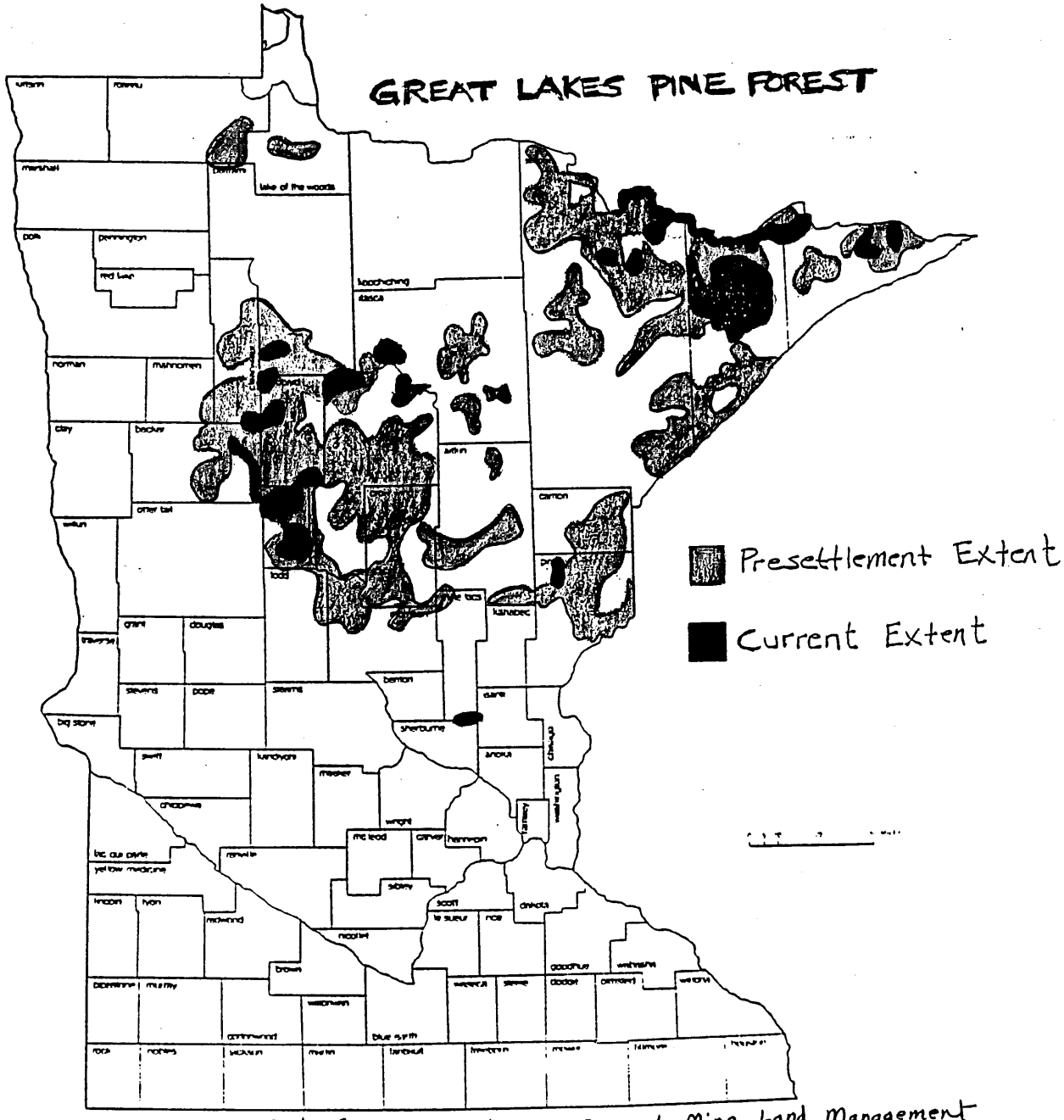
> "Throughout the region, from Maine to Minnesota, there were really two classes of pine forests from the standpoint of fire regimes: (1) The classic pure red pine-white pine groves, with little understory development, and almost no mixture with shade tolerant conifers or hardwoods. Such forests probably had a history of periodic light surface fires at 5 to 50 year intervals, in addition to severe fires at longer intervals that brought in whole new age classes of pine. These kinds of stands generally grew on the more xeric sites or in more fire-prone physiographic situations. (2) White pine forests (usually with less red pine in mixture) with significant stand components of shade-tolerant conifers or hardwoods--such as eastern hemlock, white or red spruce, balsam fir, northern white-cedar, sugar maple, beech, yellow birch, red maple or similar species. This class of stands occurred on more mesic sites, or perhaps also on sites better protected by their physiographic location from periodic surface fires. Such stands were probably more common from Michigan eastward due to heavier precipitation, while the first class was probably more common in the drier climates of Wisconsin, Minnesota, and western Ontario. The second class of stands apparently had a history of only one severe fire at very long intervals, which killed most of the previous generation and brought in a whole new forest. Fire cycles for forests of this type may have averaged 150 to 300 years."

GREAT LAKES PINE FOREST OF MINNESOTA: The Great Lakes pine forest occurred in Minnesota on a variety of landform types, principally on thin glacial till over bedrock and sandy outwash areas in the northeast (Border Lakes area) and the coarse-textured ground and end moraines, sand outwash plains, and gravelly till plains in the northcentral part of the state. Figure 2 shows the presettlement distribution of pine forest in the state. These forests were dominated by red pine or eastern white pine or a combination of the two species. Jack pine was often a component of red pine stands and also formed extensive pure stands. Forests of jack pine are considered under the boreal forest category since jack pine is a true boreal tree with the greatest percentage of its natural range found in the boreal forest region of Canada.

In general, the sequence of upland forest sites within the Great Lakes pine forest of Minnesota ranged from sterile, xeric sands dominated by jack pine, through intermediate red pine and aspen sites, to mesic, fertile loams dominated by white pine or sugar maple. The vegetation of local physiographic sites was strongly and variously affected by natural disturbances - fire, windstorms, insects, and disease. This interaction provided an unusual complexity in species composition and age structure of the major forest community types of the region. Contrary to popular belief, the Great Lakes pine forest of Minnesota was not a vast unbroken stand of old majestic red pine and white pine. The upland forest of the region was composed primarily of a mixture of aspen and birch with red, white, and jack pine stands of varying ages. In the absence of natural disturbances, on suitable soil types, spruce-fir forest and sugar maple-basswood forest were the climax forest types. Periodic natural disturbances, however, were an integral part of this ecosystem and maintained predominantly sub-climax forest types over much of the landscape. Fire was the most important disturbance feature and the dominant factor in determining the vegetation mosaic on the presettlement landscape, it is discussed in greater detail below.

Presettlement fire regimes in the Great Lakes pine forest

The Great Lakes pine forest region can not be fully understood without recognizing the crucial ecological role of fire. Fire controlled the vegetation mosaic on the landscape and also helped maintain the diversity, productivity, and long-term stability of the whole ecosystem (Heinselman 1973). The presettlement fire regimes for red pine-white pine forests have been detailed in studies conducted at Itasca State Park in north-central Minnesota and in the Boundary Waters Canoe Area (BWCA) in northeastern Minnesota. These studies have documented the significance of fire in the initiation and perpetuation of virgin pine forest in Minnesota.



Source: Modified from Marschner, 1930 and Minn. Land Management Information Center

Figure 2

Frissell (1973) worked out the fire history of Itasca State Park; he reports that "a major fire occurred in the park at an average interval of 10.3 years and that, on the average, any specific location in the park was affected by fire every 22 years." Virtually all pine components in the park were found to be of post-fire origin. Heinselman (1973) reported similar fire regimes for the BWCA. The red-white pine stands were characterized by infrequent, moderate surface fires with an average return interval of 36 years, punctuated at much longer intervals - perhaps 160 years - by severe surface fires or crown fires that killed portions of stands and brought in new age classes. Again, all significant red pine and white pine stands in the study area were of post-fire origin.

Thick insulating bark and long clear trunks make red pine and white pine well adapted to short cycle, light intensity surface fires. Fires also help create the mineral seed beds, and reduced shrub and hardwood competition necessary for pine tree reproduction (Ahlgren and Ahlgren 1960). Fire control over the last 60 years has greatly lengthened and modified the natural fire cycles which created the conditions necessary for maintenance of pine forest throughout the Great Lakes pine forest region. Fire suppression has allowed the development of dense understories of shade tolerant trees which create fuel ladders that can carry lethal crown fires into the overstory (Heinselman 1973). With continued fire protection, the understory fuel layer becomes capable of generating intense fires and restoration of presettlement fuels situation becomes increasingly difficult.

Long term fire exclusion may eventually force succession of red-white pine stands to more shade tolerant forest communities. This process is relatively slow as pine overstories are capable of persisting for 300 to 400 years without fire. Eventually, however, as the mortality rate of old pines becomes high due to windthrow and other causes they will likely be replaced by more shade tolerant species. Red pine seedlings and to a somewhat lesser extent white pine seedlings rarely succeed in competition with the more shade tolerant species which increase in the absence of fire. The studies within Itasca Park and the BWCA indicate pine will not regenerate under a forest canopy without the aid of disturbance, particularly fire. Succession on the uplands within the BWCA, without disturbance, leads to fir-birch forest and ultimately to the white cedar community type (Grigal and Ohmann, 1975). In Itasca State Park, uninterrupted succession on mesic sites leads to the sugar maple-basswood forest type, on nutrient-poor sites spruce-fir forest or transitional hardwoods may dominate (Buell and Martin 1961; Kurmis 1969; Ness 1971; Peet 1984).

Composition of red pine forest and white pine forest

In Minnesota, two natural community types are recognized within the Great Lakes pine forest-red pine forest and white pine forest. Both communities are closely related through successional trends. Variability within and between red pine forest and white pine forest is strongly related to the frequency and intensity of fire disturbance and only indirectly reflects the influence of local site factors. The general successional trend for both community types - in the

absence of disturbance - is for long-term development toward maple-basswood-oak forest. On dry, coarser-textured mineral soils subjected to relatively frequent fires, the early successional red pine forest type is easily distinguished from the more successionally advanced white pine forest found on mesic, finer textured soils generally exposed to less frequent and less intense fires. At intermediate successional stages the distinction between the two communities becomes blurred.

The red pine forest community was more abundant than the white pine community on the presettlement landscape, and commonly occurred on coarser-textured, drier sites, prone to more frequent and intense fires. Soils are typically well drained, loamy coarse sands to gravelly sandy loams. The community is dominated by red pine, typically of post fire origin, and is often associated with lesser amounts of white pine. On upper slopes and ridgetops of northeastern Minnesota, red pine occurs with scattered paper birch, red oak, and jack pine. On more mesic lower slopes, red pine is often associated with white pine, red maple, paper birch, and quaking aspen. White spruce and balsam fir may be present in some communities. One of the characteristic structural features of the red pine forest is the general openness beneath the canopy of large, old growth pines. Typically, the tall shrub layer is poorly developed. Juneberry (Amelanchier spp.), and beaked hazel (Corylus cornuta) are most common, with juniper (Juniperus communis) less common but modal to the community. Low shrubs include Rubus pubescens, Rubus idaeus, and Vaccinium angustifolium. In northeastern Minnesota, mosses and lichens are more prominent than the herbs. The common mosses and lichens are Dicranum rugosum, Calliergonella schreberi, and Cladonia rangiferina. The prevalent modal herbs, which differentiate the red pine community from the white pine community type are species indicative of open, dry conditions. These are cow-wheat (Melampyrum lineare), sweet fern (Myrica asplenifolia), bearberry (Arctostaphylos uva ursi), wintergreen (Gaultheria procumbens), pipsissewa (Chimaphila umbellata), and Dryopteris spinulosa. Associated prevalent species, which also occur commonly in the white pine forest community, include Canada mayflower (Maianthemum canadense), large-leaf aster (Aster macrophyllus), wild sarsaparilla (Aralia nudicaulis), bunchberry (Cornus canadensis) and bracken fern (Pteridium aquilinum). In the absence of fire, the accumulating litter layer restricts the reproduction of red pine. Under these conditions red maple followed by quaking aspen and red oak are the dominant reproducing trees. Balsam fir, white spruce and to a less extent white pine may also be found in the understory. With continued fire exclusion a well developed subcanopy of shade tolerant trees and shrubs replaces the previous open structure of the community.

The white pine forest community occurs on more favorable sites and on sites generally having a history of less intense fires than the drier red pine forest sites. The best developed white pine stands occur in northern Minnesota on mesic sites of lake margins and lower slopes; optimal growth occurs on moderately well drained deep loams and sandy loams. On all sites, white pine is strongly dominant, often forming relatively pure even-aged stands of post-fire origin. Associate trees are balsam fir, paper birch, white spruce, red maple, and sugar maple.

The understory layer of white pine forests have a moderately developed tall shrub layer which may include Diervilla lonicera, Corylus cornuta, Acer spicatum, Amelanchier spp., Viburnum rafinesquienum, Cornus rugosa, and Dirca palustris. The prevalent ground layer herbs and ferns include Aster macrophyllus, Maianthemum canadense, Aralia nudicaulis, Clematis virginiana, Fragaria virginiana, Mitella nuda, Lathyrus ochroleucus, Linnaea borealis, Cornus canadensis, Vaccinium myrtilloides, Clintonia borealis, Anemone quinquefolia, Trientalis borealis, Galium trifolium, Pteridium aquilinum, Athyrium Filix-femina, and Carex pensylvanica. The moss and lichen layer is less prominent than the herb layer and includes Pleurozium schreberi, Hylocomium splendens, Cladonia rangiferina, Hypnum cristacassrensis, and Dicranum rugosum. White pine may establish seedlings under its own canopy and advance to the sapling stage - at least where competition from fast growing or shade tolerant trees is not too severe. This community, similar to the red pine forest, however, is favored by periodic surface fires which eliminates competing understory trees and shrubs. In the absence of periodic fires sugar maple along with basswood, red oak ironwood, red maple, and ironwood are the most abundant reproducing species. In northeastern Minnesota (BWCA) balsam fir, white spruce and white cedar may dominate tree reproduction. With long-term fire protection, on fertile loams, the white pine community typically forms a two layered forest with a supercanopy of white pine (up to 400 years old) and a canopy of northern hardwoods or balsam fir/white cedar.

CURRENT STATUS AND THREATS: The red pine-white pine forests were one of the most thoroughly exploited natural resources in the Upper Midwest (Curtis 1959). The great economic demand for pine resulted in the removal of the large blocks of pine groves throughout their original range. A century of logging, slash burning, and land clearing activities had substantially reduced or eliminated most of the virgin pine forest as well as the seed sources for pine regeneration. Heinselman (1954) stated in Minnesota, Wisconsin, and Michigan alone, some 5 to 6 million acres of white and red pine forest were converted to essentially pure aspen and birch stands - almost totally devoid of pine seed trees.

In Minnesota, large, remnant stands of both red pine forest and white pine forest have been protected in the Border Lakes, and Pine Moraine landscape regions (Figure 3). In other regions, where pine forests were once abundant, they are poorly protected. Figure 2 shows the drastic reduction of pine forest since settlement in the mid 1800's.

The original pine forest vegetation and associated physiographic features of the Border Lakes landscape region are well represented within the Boundary Waters Canoe Area (BWCA) and Voyageurs National Park. Much of the BWCA region was little affected by the early logging era. Heinselman (1973) suggests that recurrent forest fires had maintained 75 percent of the region in commercially immature forests, hence only a small fraction of the BWCA was subjected to logging. Today, the BWCA contains 532,000 acres of virgin landscape with approximately 17,300 acres of unlogged red pine forest (Heinselman, 1973). White pine forest is less common in the BWCA; no acreage figures are available. Heinselman's study of the BWCA indicates that

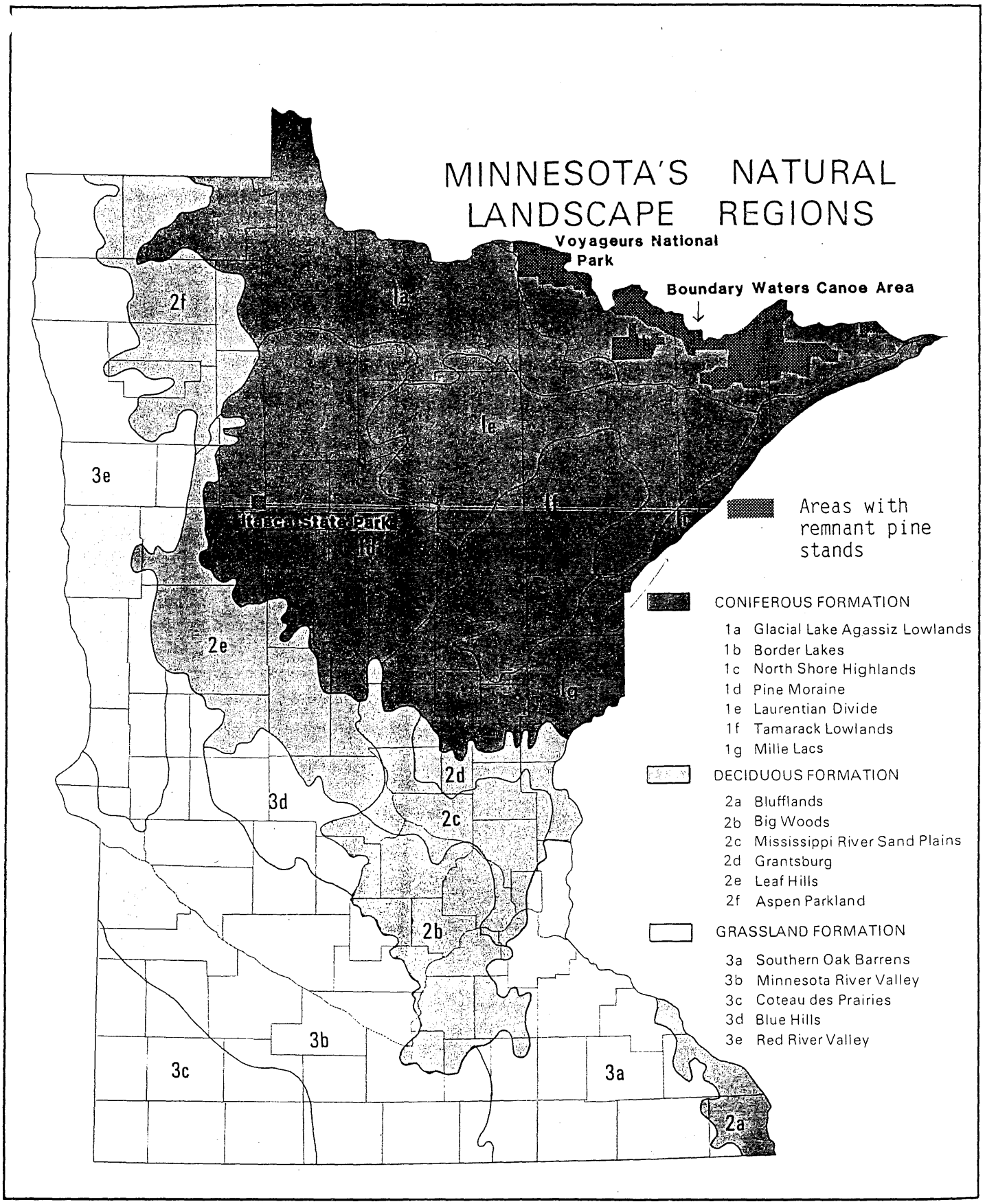


Figure 3. Areas protecting large, remnant red pine and white pine stands

essentially all the pine areas burned at sometime in the past 400 years and much of the present virgin forest is represented by post-fire successional communities 110 years or less in age. The oldest stand in the study area was a 360 year white pine stand. Deterioration of the old pines has resulted in advanced succession to a fir-spruce-cedar community. Virgin red-white pine stands are much rarer in Voyageurs National Park. They are restricted to scattered stands that would have been too young for logging in the early 1900's (Kurmis et al., 1980).

Itasca State Park in north central Minnesota was created in 1981 to save a remnant of the "primeval pine forest" associated within the Mississippi headwaters (Hansen et al., 1974). Although many former pine stands within the 32,000 acre park have been converted to aspen and other seral hardwoods, the park today contains some 5,000 acres of red pine forest and 1,200 acres of white pine forest (Kurmis et al. 1972). The pine forest is represented primarily by mature (90-150) years old) and old-growth (over 200 years old) stands of post-fire origin. Under existing conditions, establishment and growth of red pine seedlings, and to a somewhat lesser extent white pine seedlings, is severely restricted. Young pine stands are almost absent in the park. Fire protection, advance regeneration of shrubs and hardwoods, and excessive deer population prior to 1945 are the main factors preventing adequate pine regeneration (Kurmis 1969; Ness 1971; Frissell 1973).

Outside of the BWCA, the Chippewa National Forest, and Itasca State Park, old growth pine stands are rare and exist only as small, isolated remnants. Many of Minnesota's protected old growth pine stands are undergoing compositional change due to the elimination of natural fires and lack of active management. The most evident change has been a reduction in the pine component of these forests and a rapid increase in the more shade tolerant hardwoods. Other threats to the continuity of protected pine forests are the introduction of white pine blister rust, and predator control resulting in excessive populations of deer and other browsing animals. The influences of these dynamic factors on pine stands have been documented most thoroughly in Itasca State Park (Ross et al., 1970; Hansen et al., 1974; Peet 1984).

Presettlement forest diversity within the Great Lakes pine forest was closely tied to a variety of natural disturbance factors, notably fire and windthrow. Preserving examples of the original vegetation communities within this ecosystem suggests preserves be large enough to incorporate disturbance generated patches necessary for internal regeneration of the characteristic pines and other seral species. More active management approaches, in particular, prescribed burning and/or management of natural fires may be necessary to maintain the "naturalness" of virgin pine forests. The artificial protection of these forests from fire has greatly reduced the possibilities for perpetuating these fire-dependent, seral communites.

REPRESENTATIVE SITES: Lac La Croix RNA, BWCA (Border Lakes)
Cathedral Grove (North Shore Highlands)
Itasca State Park (Pine Moraine)
Pine Point RNA (Pine Moraine)

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FLORA

During 1984, Itasca Wilderness sanctuary SNA was inventoried for the occurrence of rare plant species. The inventory process began with a search of the Heritage Program data base, which revealed two records for the site. The most significant of the two is Malaxis paludosa (bog adder's-mouth), a state endangered species. The second species is Botrychium matricariaefolium (matricary grape-fern), a rare species in Minnesota, but one that is not officially listed as endangered, threatened or special concern.

An attempt was made during the summer of 1984 to relocate these two species in the SNA. An attempt was also made to determine if other rare species occur in the SNA that had not been previously reported. The two species previously collected on the SNA were not relocated, but one new rare species was discovered. The species is Malaxis brachypoda (white adder's-mouth), and is considered rare in Minnesota, but does not have official status. Descriptions of these species along with site specific comments are presented in accompanying status reports.

During the course of the rare plant search, a general species list for the SNA was initiated. It contains species which could be reliably identified in the field. Because of the history of over-collecting at this site, no voucher specimens were taken. The species list has been annotated with species reported by G. B. Ownbey to occur in the SNA (Ownbey, G.B. 1969. Annotated checklist of the reed plants, ferns and fern allies for Clearwater County and Itasca State Park Minnesota, Department of Botany, University of Minnesota).

Itasca Wilderness Area
Plant species List

Scientific name	Common name
Abies balsamea (L.) Mill.	Balsam Fir
Acer rubrum L.	Red Maple
Acer saccharum 1.	Hard Maple; Sugar Maple
Acer spicatum Lam.	Mountain Maple
Achillea lanulosa Nutt.	Wooly Yarrow
Acorus calamus L.	Sweet Flag
Actaea rubra (Ait.) Willd.	Red Baneberry
Agastache foeniculum (Pursh) Ktze.	Fragrant Giant Hyssop
Alnus rugosa (Du Roi) Spreng.	Speckled Alder
Amelanchier huronensis Weig.	A Species of Juneberry
Amphicarpa bracteata (L.) Fern.	Hog Pea-nut
Andromeda glaucophylla Link	Bog Rosemary
Anemone canadensis L.	Canada Anemone
Anemone quinquefolia L.	Wood Anemone
Antennaria neglecta Greene	A Species of Everlasting
Antennaria neodioica Greene	Smaller Everlasting
Aquilegia canadensis L.	Wild Columbine
Aralia nudicaulis L.	Wild Sarsaparilla
Aralia racemosa L.	American Spikenard
Arenaria lateriflora L.	Blunt-leaved Sandwort
Arisaema triphyllum (L.) Schott	Jack-in-the-Pulpit
Asarum canadense L.	Long-tipped Wild Ginger
Aster macrophyllus L.	Large-leaved Aster
Aster puniceus L.	Red-stalk Aster
Asclepias incarnata L.	Swamp Milkweed
Asclepias syriaca L.	Common Milkweed
Athyrium filix-femina (L.) Roth.	Lady Fern
Betula lutea Michx.	Yellow Birch
Betula papyrifera Marsh.	Paper Birch
Betula pumila L.	Bog Birch

Botrychium multifidum (Gmel.) rupr.	Leathery Grape Fern
Botrychium virginianum (L.) Sw.	Rattlesnake Fern
Calamagrostis canadensis (Michx.) Beauv.	Blue-joint Grass
Calopogon tuberosa	
Calla palustris L.	Wild Calla
Caltha palustris L.	Marsh Marigold
Calypso bulbosa (L.) Oakes	Calypso
Campanula aparinoides Pursh	Marsh Bellflower
Campanula rotundifolia L.	Harebell
Cardamine pennsylvanica Muhl.	Pennsylvanian Bitter Cress
Chamaedaphne calyculata (L.) Moench	Leather-leaf
Carex aurea Nutt.	Golden-fruited Sedge
Carex chordorrhiza L.	Creeping Sedge
Carex crawfordii Fern.	A Species of Sedge
Carex diandra Schrank.	Lesser Panicled Sedge
Carex disperma Dewey	A Species of Sedge
Carex granularis Muhl.	A Species of Sedge
Carex interior Bailey	A Species of Sedge
Carex intumescens Rudge	Bladder Sedge
Carex leptalea Wahl.	A Species of Sedge
Carex oligosperma Michx.	A Species of Sedge
Carex paupercula Michx.	Bog Sedge
Carex saximontana Mack.	A Species of Sedge
Carex tenuiflora Wahl.	A Species of Sedge
Carex tuckermani Dewey	A Species of Sedge
Cicuta bulbifera L.	Bulb-bearing Water Hemlock
Cicuta maculata L.	Water Hemlock
Cinna latifolia (Trin.) Griseb.	Slender Wood Reed Grass
Circaea alpina L.	Smaller Enchanter's Nightshade
Cirsium arvense (L.) Scop.	Canada Thistle
Cirsium muticum Michx.	Swamp Thistle
Cirsium vulgare (Savi) Tenore	Bull Thistle
Clintonia borealis (Ait.) Raf.	Yellow Clintonia
Commandra richardsiana Fern.	False Toad-flax
Coptis groenlandica (Oeder) Fern.	Goldthread
Corallorrhiza maculata Raf.	Spotted Coral Root

Corallorrhiza striata Lindl.	Striped Coral Root
Corallorrhiza trifida Chat.	Early Coral Root
Cornus canadensis L.	Bunchberry
Corylus cornuta Marsh.	Beaked Hazelnut
Cryptotaenia canadensis (L.) DC.	Honewort
Cynoglossum boreale Fern.	Northern Hound's-tongue
Cypripedium acaule Ait.	Pink Moccasin Flower
Cypripedium calceolus L. var. parviflorum (Salisb.) Fern.	Small Yellow Lady Slipper
Cypripedium calceolus L. var. pubescens (Willd.) Correll	Large Yellow Lady Slipper
Cypripedium reginae Walt.	Showy Lady Slipper
Cystopteris bulbifera (L.) Bernh.	Bulblet Bladder Fern
Danthonia spicata (L.) Beauv.	Common Wild Oat Grass
Diervilla longicera Mill.	Bush Honeysuckle
Drosera rotundifolia L.	Round-leaved Sundew
Dryopteris cristata (L.) Gray	Crested Shield Fern
Dryopteris spinulosa (Mueller) Watt	Spinulose Shield Fern
Dulichium arundinaceum (L.) Britt.	Dulichium
Eleocharis intermedia (Muhl.) Schultes	Matted Spike Rush
Eleocharis ovata (Roth) R. & S.	Ovoid Spike Rush
Equisteum arvense L.	Field Horestail
Equisteum fluviatile L.	Water Horsetail
Equisteum pratense Ehrh.	Meadow Horsetail
Equisteum scirpoides Michx.	Dwarf Scouring-rush
Erigeron philadelphicus L.	Philadelphia Fleabane
Erigeron strigosus Muhl.	Rough Fleabane
Eriophorum tenellum Nutt.	Delicate Cotton Grass
Eriophorum viridicarinatum (Engelm.) Fern.	Thin-leaved Cotton Grass
Eupatorium maculatum L.	Joe-Pye Weed
Eupatorium perfoliatum L.	Common Boneset
Fragaria vesca L.	American Wood Strawberry
Fragaria virginiana Duchesne	Virginia Strawberry
Fraxinus nigra Marsh.	Black Ash
Fraxinus pennsylvanica Marsh.	Ash
Galium boreale L.	Northern Bedstraw

Galium trifidum L.	Small Bedstraw
Galium triflorum Michx.	Sweet-scented Bedstraw
Gaultheria hispidula (L.) Bigel.	Creeping Snowberry
Gaultheria procumbens L.	Checkerberry
Gymnocarpium dryopteris (L.) Newm.	Oak Fern
Helenia deflexa (Smith) Griseb.	Spurred Gentian
Hepatica americana (DC.) Ker	Round-lobed Liverleaf
Heracleum lanatum Michx.	Masterwort
Hystrix patula Moench	Bottle-brush Grass
Impatiens capensis Meerb.	Spotted Touch-me-not
Iris versicolor L.	Blue Flag
Juncus dudleyi Wieg.	Dudley's Rush
Larix laricina (Du Roi) K. Koch	Tamarack
Lathyrus ochroleucus Hook.	Pale Vetchling
Lathyrus palustris L.	Marsh Vetchling
Lathyrus venosus Muhl.	Veiny Pea
Ledum groenlandicum Oeder	Labrador Tea
Lemna minor L.	Lesser Duckweed
Lemna trisulca L.	Ivy-leaved Duckweed
Linnaea borealis L.	Twin-flower
Liparis loeselii (L.) Rich.	Loesel's Twayblade
Listera cordata (L.) R. Br.	Heart-leaved Twayblade
Lobelia siphilitica L.	Great Lobelia
Lonicera canadensis Marsh.	American Fly-honeysuckle
Luzula acuminata Raf.	Hairy Wood Rush
Luzula multiflora (Retz.) Lejeune	Upright Wood Rush
Lychnis alba Mill.	White Campion
Lycopodium annotinum L.	Bristly Clubmoss
Lycopodium dendroideum Michx.	Round-branch Groundpine
Lycopus uniflorus Michx.	Northern Bugle Weed
Lysimachia thyrsiflora L.	Tufted Loosestrife
Malaxis brachypoda (Gray) Fern.	White Adder's Mouth
Malaxis paludosa (L.) Sw.	Bog Adder's Mouth
Malaxis unifolia Michx.	Green Adder's Mouth
Matteuccia struthiopteris (L.) Todaro	Ostrich Fern
Megalodonta beckii (Torr.) Greene	Water Marigold

Melampyrum lineare Desr.	Cow Wheat
Mentha arvensis L.	American Wild Mint
Menyanthes trifoliata L.	Buckbean
Mimulus ringens L.	Monkey Flower
Mitella nuda L.	Naked Bishop's Cap
Moneses uniflora (L.) Gray	One-flowered Pyrola
Monotropa hypopitys L.	Pinesap
Monotropa uniflora L.	Indian Pipe
Muhlenbergia glomerata (Willd.) Trin.	Wild Timothy
Nuphar variegatum Engelm.	Large Yellow Pond Lily
Nymphaea tuberosa Paine	Large Water Lily
Onoclea sensibilis L.	Sensitive Fern
Oryzopsis asperifolia Michx.	Rough-leaved Mountain-rice
Oryzopsis pungens (Torr.) Hitchc.	A Species of Mountain-rice
Osmorhiza claytoni (Michx.) Clarke	Wooly Sweet Cicely
Osmunda cinnamomea L.	Cinnamon Fern
Osmunda claytoniana L.	Interrupted Fern
Ostrya virginiana (Mill.) Koch	Hop Hornbeam
Panicum lanuginosum Ell. var. fasciculatum (Torr.) Fern	A Species of Panic Grass
Panicum perlongum Nash	Long-stalked Panic Grass
Parnassia palustris L.	Marsh Grass of Parnassus
Parthenocissus inserta (Kern.) Fritsch	Thicket Creeper
Petasites sagittatus (Pursh) A. Gray	Arrow-leaved Sweet Coltsfoot
Phragmites communis Trin.	Common Reed Grass
Picea glauca (Moench) Voss	White Spruce
Picea mariana (Mill.) B.S.P.	Black Spruce
Pilea fontana (Lunell) Rydb.	Black-fruited Clearweed
Pinus banksiana Lamb.	Jack Pine
Pinus resinosa Ait.	Norway Pine
Pinus strobus L.	Eastern White Pine
Platanthera hyperborea (L.) R. Br.	Tall Leafy Green Orchid
Platanthera obtusata (Pursh) Richards.	Blunt-leaved Orchid
Platanthera orbiculata (Pursh) Torr.	Large Round-leaved Orchid
Poa languida Hitch.	A Species of Blue Grass
Poa palustris L.	Fowl Meadow Grass

Polygonum amphibium L.	Floating Smartweed
Populus balsamifera L.	Balsam Poplar
Populus grandidentata Michx.	Large-toothed Aspen
Populus tremuloides Michx.	Quaking Aspen
Potamogeton foliosus Raf.	Leafy Pondweed
Potentilla palustris (L.) Scop.	Marsh Cinquefoil
Prenanthes alba L.	Rattlesnake-root
Prunus virginiana L.	Choke Cherry
Pteridium aquilinum (L.) Kuhn	Eastern Bracken
Pyrola asarifolia Michx.	Pink-flowered Pyrola
Pyrola elliptica Nutt.	Common Pyrola
Pyrola secunda L.	One-sided Pyrola
Pyrola virens Schweigg	Green-flowered Pyrola
Quercus macrocarpa Michx.	Bur Oak
Quercus rubra L.	Northern Red Oak
Ranunculus abortivus L.	Smooth-leaved Crowfoot
Ranunculus flabellaris Raf. f. riparius Fern.	Yellow Water Crowfoot
Ranunculus recurvatus Poir.	Hooked Crowfoot
Ranunculus reptans L.	A Species of Crowfoot
Rhamnus alnifolia L'Her.	Dwarf Alder
Rhus radicans L.	Poison Ivy
Ribes lacustre (Pers.) Poir.	Swamp Black Currant
Rubus pubescens Raf.	Swamp Blackberry
Sagittaria cuneata Sheld.	Arum-leaved Arrow-head
Sagittaria latifolia Willd.	Broad-leaved Arrow-head
Salix candida Fluegge	Hoary Willow
Salix pedicellaris Pursh	Bog Willow
Sambucus pubens Michx.	Red-berried Elder
Sanicula marilandica L.	Black Snakeroot
Sarracenia purpurea L.	Pitcher Plant
Scheuchzeria palustris L.	No Common Name
Schizachne purpurascens (Torr.) Swallen	False Melic Grass
Scirpus Smithii Gray	Smith's Club Rush
Scirpus validus Vahl	American Great Bulrush
Scutellaria epilobifolia Hamilt.	Marsh Skullcap
Scutellaria lateriflora L.	Mad-dog Skullcap

Sium suave Walt.	Hemlock Water Parsnip
Smilacina racemosa (L.) Desf.	False Solomon's Seal
Smilacina stellata (L.) Desf.	Star-flowered False Solomon's Seal
Smilacina trifolia (L.) Desf.	Three-leaved False Solomon's Seal
Solidago flexicaulis L.	Zig-zag Goldenrod
Solidago graminifolia (L.) Salisb.	Bushy Goldenrod
Solidago uliginosa Nutt.	A Species of Goldenrod
Sonchus arvensis L.	Corn Sow Thistle
Sparganium fluctuans (Morong) Robins.	Floating Bur-reed
Thuja occidentalis L.	White Cedar
Ulmus americana L.	American Elm
Utricularia vulgaris L.	Greater Bladderwort
Viburnum trilobum Marsh.	High-bush Cranberry
Vitis riparia Michx.	Frost Grape
Zizania aquatica L.	Wild Rice

Malaxis paludosa (L.) Sw.
Bog adder's-mouth — Orchidaceae

OFFICIAL STATUS: Endangered

BASIS FOR MINNESOTA STATUS: This diminutive orchid presents an interesting problem in plant distribution. It is generally regarded as frequent in northern Europe, but it is extremely rare in North America. In fact, it was unknown on the continent until 1904 when it was collected by H. L. Lyon at an unknown location near New York Mills, Minnesota (Otter Tail County). Since then it has been found at isolated locations in Canada and Alaska, but fewer than 30 collection sites have been reported, including six in Minnesota. For this reason, M. paludosa is often considered the rarest orchid in North America. Although it is unquestionably rare, it is also easily overlooked. This is because of its small stature (its flowers may be the smallest of any North American orchid) and its habit of growing on moss hummocks where its greenish color makes it difficult to see.

Of the six populations reported from Minnesota, three are known to still exist. The most interesting of these was discovered in 1927, but its forest habitat was soon clearcut (sometime prior to 1939). However, by 1984 the forest had regenerated itself, and M. paludosa was again well established there. It is not known if the original population survived the clearcutting, or if another population recolonized the site once the forest had returned. In any case, detailed case histories are needed before it will be possible to prescribe forestry techniques that are compatible with this species. Another population is known to still persist 50 years after its initial discovery. It has apparently existed at the same site since 1934, but in numbers as low as five or six plants.

Of the three unconfirmed populations, one was discovered in 1924 when a single individual was found. There were further reports of one or two plants there until 1934, but none since. Another unconfirmed population was first found in 1915 and likewise consisted of only a single plant. The last report at this site was in 1949, but no description was recorded then. Both these sites were extensively searched as recently as 1984, but no plants were found. The last unconfirmed population is at the original collection site near New York Mills. Unfortunately, the locational information is vague and ambiguous, and it may never be possible to relocate the exact site.

Comments. This species exhibits several interesting adaptations, including an unusual form of vegetative propagation. In some instances, small bulblet-like structures develop at the margins of the leaves. When the leaf is detached, these structures may develop into plantlets, and ultimately new individuals (ramets). This may explain why plants often appear in "clumps".

PREFERRED HABITAT IN MINNESOTA: All three known populations in Minnesota occur in conifer swamps characterized by Thuja occidentalis (white cedar), Picea mariana (black spruce) and Larix laricina (tamarack). Two of these sites may be better described as forested fens, because they occur on moderate slopes and receive their moisture from groundwater. Swamps and fens, as used in this context, are nearly neutral in pH with moderate levels of dissolved minerals. This habitat

type differs from typical bogs which receive their moisture entirely from precipitation and are therefore quite acidic and mineral poor. Some of the historical collection sites may have been in bog habitats, but that is not well documented.

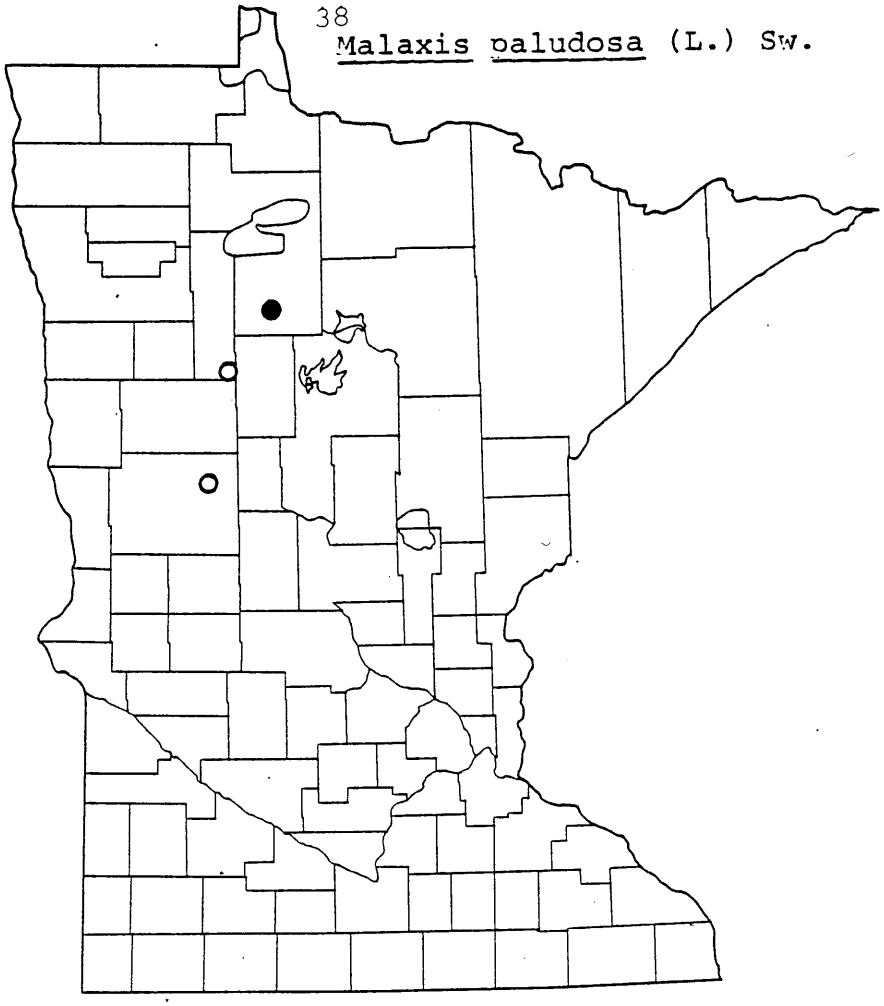
In their chosen habitat, M. paludosa generally occurs on hummocks of Sphagnum or Polytrichum moss. Individuals sometimes appear to be "perched" on the moss as if they were not actually rooted.

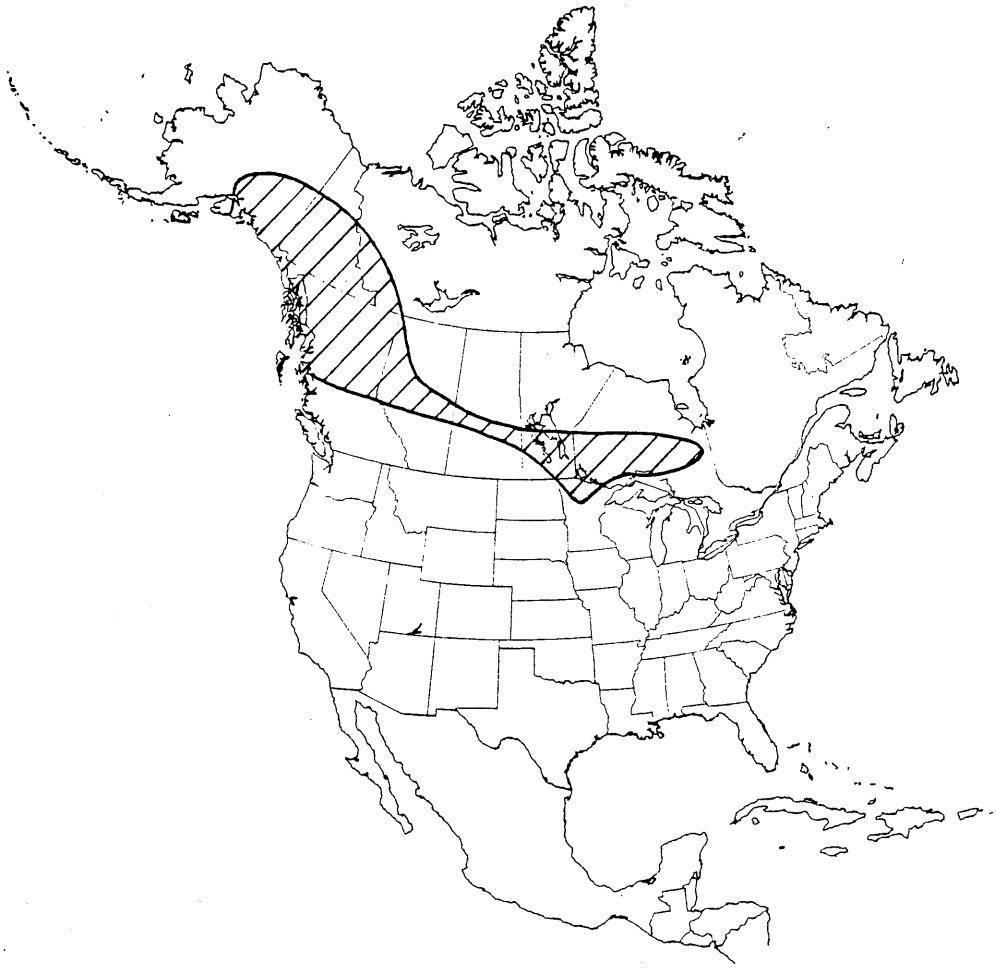
SITE SPECIFIC COMMENTS: Our knowledge of this species in the Itasca Wilderness sanctuary is based largely on a herbarium specimen in the University of Minnesota Herbarium (MIN), collected by S.C. Brayton on July 21, 1915. The site was described as a spruce-tamarack swamp behind Garrison Point at the southwest end of Lake Itasca. This site appears to be located in the NE 1/4 SW 1/4 sec 15. According to Brayton, a single plant was seen (and collected) on a Sphagnum hummock. Apparently Brayton returned the following year, but could not find any plants. There is a specimen of M. paludosa in the University of Wisconsin herbarium at Madison (MAD) collected by N.C. Fassett on August 23, 1949, which may also be from this site. The location is given only as "Garrison Point", Clearwater County. Nothing more is known about this collection.

The conifer swamp directly west of Garrison Point is believed the most likely source of these specimens. This area was searched in early and late July 1984 for the purpose of relocating this species. Although suitable habitat occurs at the site, no specimens of M. paludosa were found. The area is small and was searched intensively, but because of the small size of M. paludosa, it may have been overlooked.

SELECTED REFERENCES: Luer, C. A. 1975. The native orchid's of the United States and Canada. The New York Botanical Garden, New York. 361pp.

Malaxis paludosa (L.) Sw.





Malaxis brachypoda Gray
White adder's-mouth

OFFICIAL STATUS: None; unofficial watch list

BASIS FOR STATUS: This rare orchid has a broad trans-continental range, but with local and sporadic distribution. There are eight records from Minnesota, but only three are recent ones. There is currently too little information to determine if the species is declining or stable. It is apparent that the species has always been rare in Minnesota, and may be overlooked because of its small size.

SITE SPECIFIC COMMENTS: This species was not known to occur in the Itasca Wilderness sanctuary until July 1984, when a single specimen was discovered in the spruce-tamarack swamp southwest of Garrison Point. This site is located in the SW 1/4 SW 1/4 section 15. The search that discovered this population was moderately intensive, and yet only one individual was found. It is likely that more plants occur there, but were not observable at the time of the search.

Botrychium matricariaefolium A. Br. Ophioglossaceae
Matricary grape-fern

OFFICIAL STATUS: None; unofficial watch list

BASIS FOR STATUS: This unusual fern is quite rare in Minnesota, and may be suffering a decline linked to the loss of old-growth forests. There are nine records of this species from Minnesota, but only two of them are recent records. If further documentation becomes available which substantiates the apparent decline, the species will be proposed for protection status.

SITE SPECIFIC COMMENTS: The record of B. matricariaefolium in the Itasca Wilderness sanctuary dates from 1934. It was collected on that date by Dr. J.B. Moyle in a hardwood stand in the NW¼NW¼ Section 10. In July 1984, this area was searched in an attempt to relocate this population, but no plants were found. It is possible that this species still exists there, but was overlooked during the search.