IRON SPRINGS BOG
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

IRON SPRINGS BOG
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

MANAGEMENT PLAN

FOR

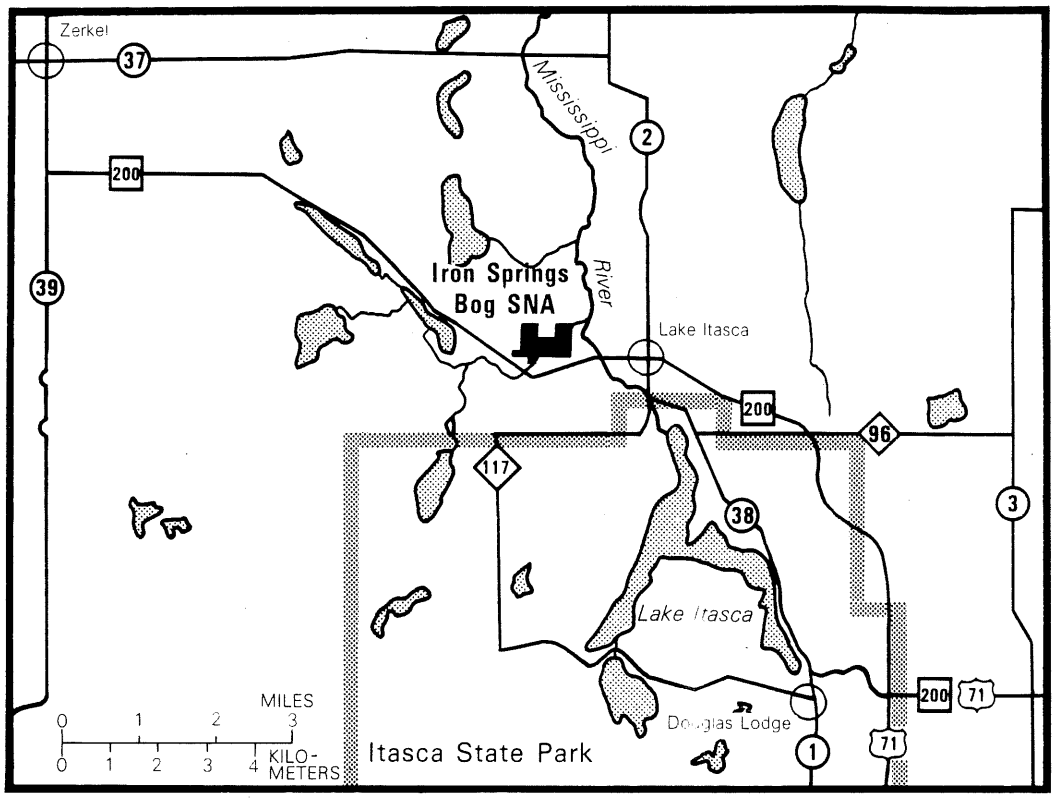
IRON SPRINGS BOG SCIENTIFIC AND NATURAL AREA

Portions of
Sections 28 and 33
Township 144 North, Range 36 West

Itasca Township
Clearwater County
Minnesota

Prepared by
Scientific and Natural Area Program
Section of Wildlife
Minnesota Department of Natural Resources

January 1986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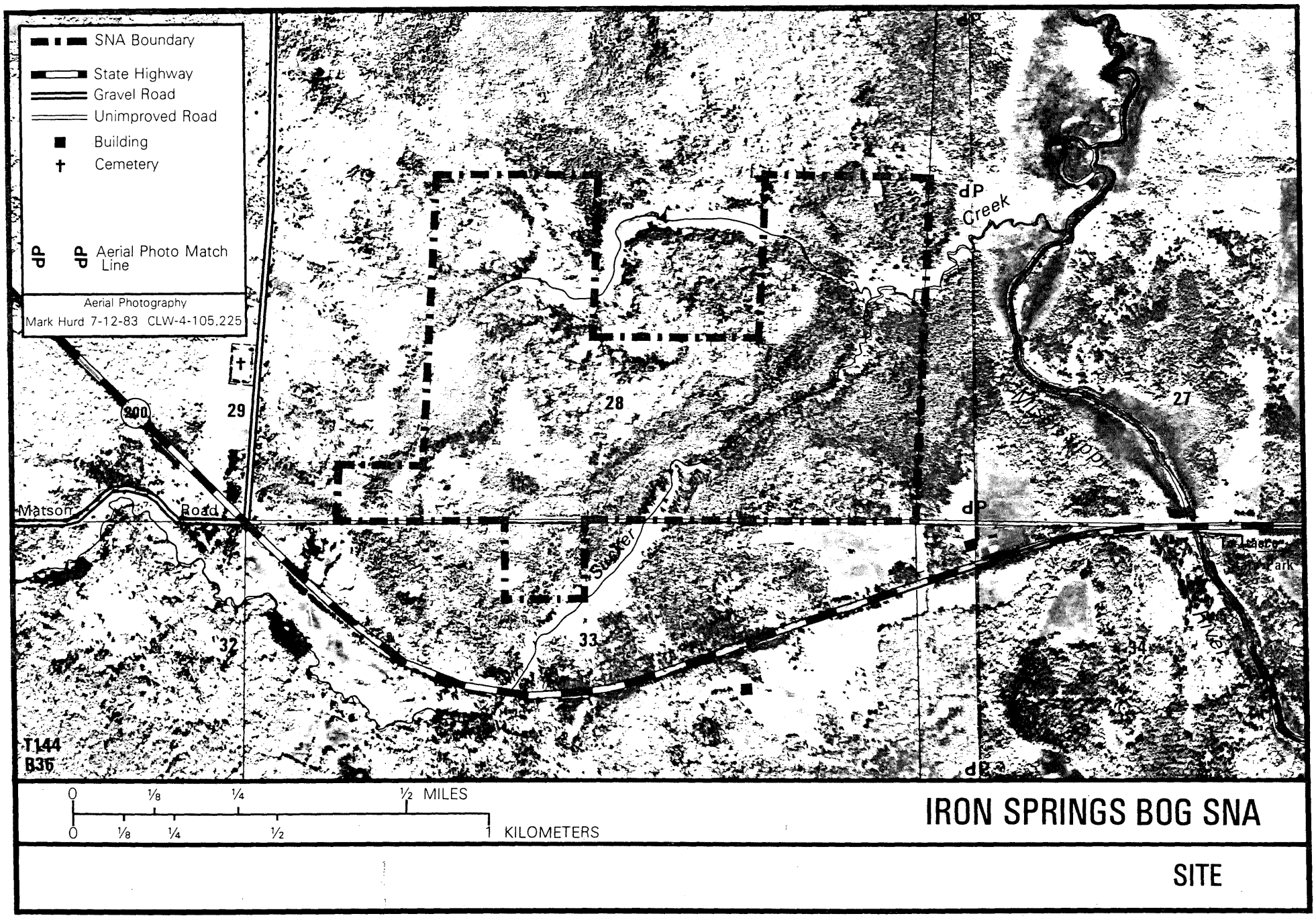
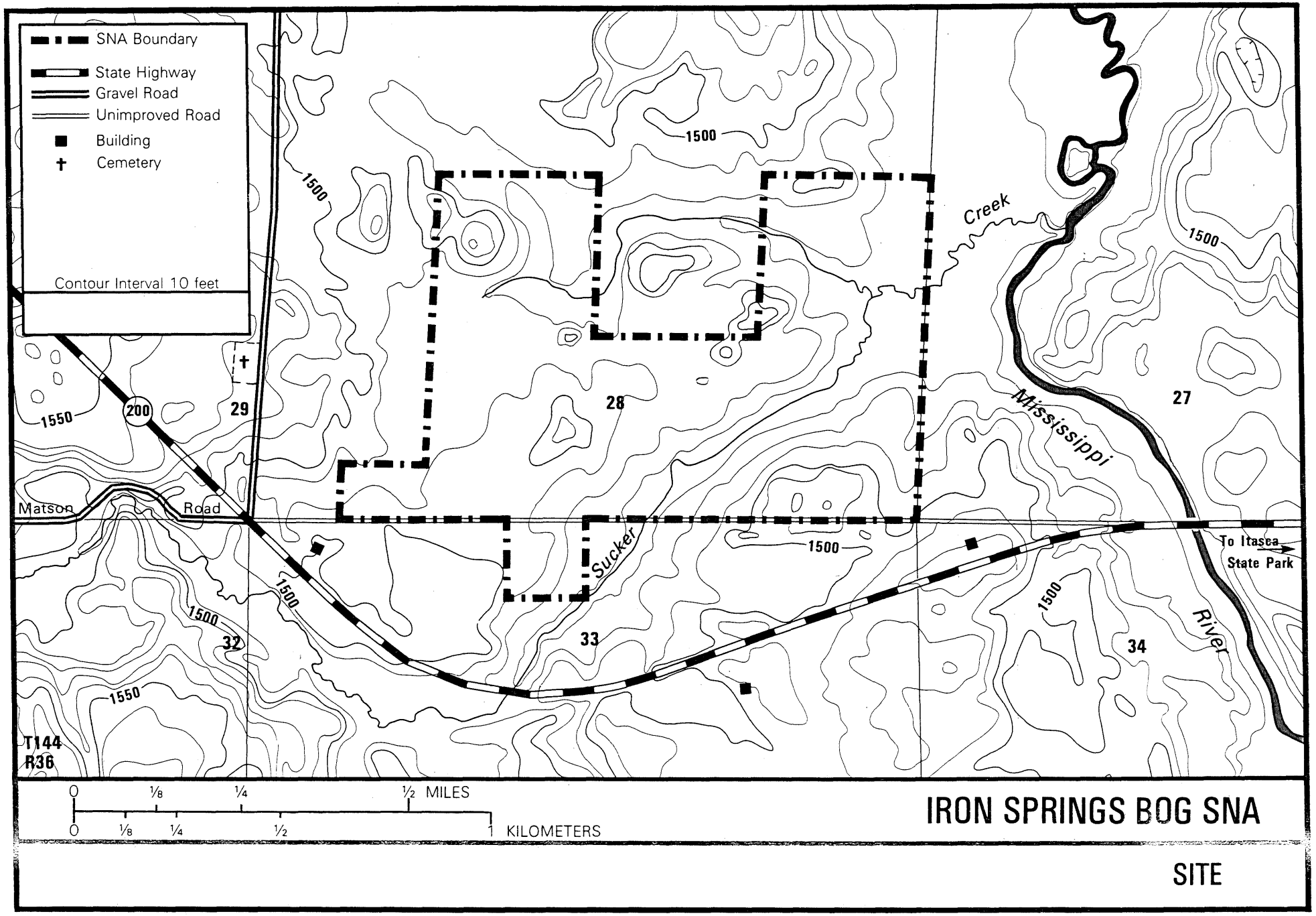


IRON SPRINGS BOG SNA

SITE


SNA Boundary
State Highway
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Creek
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T144
R36
0 1/8 1/4 1/2 MILES
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IRON SPRINGS BOG SNA
SITE

This SCIENTIFIC and NATURAL AREA was established to protect and perpetuate Minnesota's rare and unique natural resource 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 and boating.

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 qualify 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 resource management techniques employed elsewhere can be evaluated. Scientific and Natural Areas often protect some of the best remaining occurrences of a rare species or plant community. 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 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 addressed 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

Iron Springs Bog Scientific and Natural Area (SNA) is located approximately two miles west of the north entrance of Itasca State Park, in Clearwater County. It lies within the Mississippi Headwaters State Forest; the majority of the surrounding lands are county memorial forest. The SNA has long been known for its unusual conifer swamp forest community. This peatland feature occupies a seepage slope containing numerous calcareous, iron bearing springs and supporting a unique flora. The SNA encompasses 215 acres and includes conifer swamp forest, pine forest, boreal forest, and marsh/shrub swamp vegetation types. Sucker Creek, a state designated trout stream, flows through the unit.

Iron Springs Bog SNA has been used extensively by the University of Minnesota Itasca Forestry and Biological Station for research and classroom exercises since at least the 1930's. The station played a key role in getting the site protected. Iron Springs was designated a state Scientific and Natural Area in 1984.

B. Preservation Value

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 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. Iron Springs Bog SNA contains at least two rare plant species protected under the Minnesota Endangered Species Act (M.S. 97.488), 5 species proposed for listing, and one significant natural community type.

Plants

1. Ram's Head Lady Slipper (Cypripedium arietinum) - state endangered

This species has probably always been rare. Recently, however, it has suffered a general decline due to loss of habitat through logging and mining activities. In Minnesota populations of C. arietinum occur in a variety of coniferous forest habitats. Two small populations of this species are known from the SNA. They occur in the sloping conifer swamp forest type.

2. Bog adder's-mouth (Malaxis paludosa) - state endangered

This diminutive plant is often considered the rarest orchid in North America. Three populations are known to exist in Minnesota. These are the only verified locations for the species in the contiguous United States. A single plant was found in Iron Springs Bog SNA in the sloping conifer swamp forest. A large group of 30 plants, first reported in 1927, still exists just south of the SNA boundary in Section 33.

3. Mosses (5 species) - proposed special concern.

Five moss species occurring in the SNA, Calliergo richardsonii, Cratoneuron filicinum, Helodium blandowii, Sphagnum subfulvum, and Sphagnum wulfianum, will be proposed as special concern species in the next review of the Minnesota Endangered Species Act. They were collected in the sloping conifer swamp forest north of Sucker Creek in the SNA.

Plant Communities

1. Conifer Swamp Forest - seepage slope

Conifer swamp forests can be broadly defined as minerotrophic wetlands dominated by coniferous trees, especially black spruce, balsam fir, tamarack, and northern white cedar. Since swamp forests are enriched by mineral bearing groundwater they tend to be floristically more complex than bog forests which are isolated from groundwater flow and are nutrient poor.

The conifer swamp forest-seepage slope vegetation is a variant of the typical conifer swamp community. It occupies waterlogged peat soils on the north and south sides of Sucker Creek in the SNA. The peatland contains numerous iron bearing springs and there is a noticeable gradient away from the creek. This vegetation type includes an assortment of species which is floristically distinct from other conifer swamp forest communities. The occurrence of this unique feature with its active springs was a major reason for recognizing Iron Springs Bog as an SNA. The extent in Minnesota of these groundwater influenced sloping forested peatlands is unknown.

C. ORA Classification

The Iron Springs Bog SNA fully meets the designation criteria for a scientific and natural area as outlined in the Outdoor Recreation Act of 1975 (M.S. 86A.05, Subd 5). The preserve includes (1) natural features which significantly illustrate an undisturbed plant community, (2) habitat supporting the following rare, endangered, or restricted species: Cypripedium arietinum and Malaxis paludosa, 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 most important natural attributes of the Iron Springs Bog SNA are the sloping conifer swamp and its associated rare species. These elements are thought to be dependent on long-term, stable environmental conditions. The primary management goal is to protect these features by preventing disturbance and monitoring the status of the highest priority elements. Additionally, the SNA will continue to serve as a field study site for classroom and research use by the Itasca Forestry and Biological Station.

SECTION 1. GENERAL MANAGEMENT CONSIDERATIONS

A. Management Resources

The amount of management that takes place in a SNA depends both on need and on the availability of management resources. The SNA program depends heavily on the cooperation of and coordination with other DNR programs and divisions, and other agencies and organizations. Some of these resources are described below.

1. DNR offices or facilities

Iron Springs Bog is approximately 30 miles from the Region I Nongame Specialist and Area Wildlife Manager in Bemidji. The Wetland Wildlife Research Group in the Section of Wildlife is also stationed in Bemidji. The DNR Conservation Officer is located in Bagley (25 miles NW of the SNA). The District Forestry Office and Park staff are located approximately 5 miles south of the SNA in Itasca State Park. Iron Springs Bog is 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 Iron Springs Bog SNA extensively for classroom exercises and research projects. Bemidji State University has also done work in the SNA. The SNA program should continue to receive research attention from these and other educational and research institutions.

B. Lake Itasca Forestry and Biological Station

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

Iron Springs Bog has long been used by the station for research and classroom use. Data collected in these studies is reported in student papers, graduate theses, research reports, and published journal articles. The primary collection of these data is at the station library. At present, however, there is no systematic indexing of these data or studies by the SNA unit. The station and the SNA program have a shared benefit in maintaining a well documented, edited and organized data bank on Iron Springs Bog. This maximizes research effort, facilitates classroom use, and provides the basis for sound resource management decisions.

Research projects in Iron Springs Bog SNA require SNA approval and must meet program guidelines. Collecting is generally prohibited, however, certain field courses offered at the station specialize in 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 1.1 Improve the documentation and accessibility of data collected from the SNA

Considerations:

Data bank - Designate a central data bank where all investigators will file a copy of information collected on the SNA. To improve accessibility, the SNA program will cooperate with the station library to adequately organize existing studies and data, and establish future data management procedures.

Action 1.2 Allow research and classroom collecting by special use permit

Considerations:

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

Permit - A research or collection permit must be obtained from the SNA program. Collections shall be deposited as permanent specimens in a public institution.

Action 1.3 Supply the station with SNA informational materials

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.

C. Mississippi Headwaters State Forest

Approximately 90% of the SNA is within the Mississippi Headwaters State Forest. There is one 40 acre trust fund parcel administered by DNR Forestry adjacent to the northwest boundary of the SNA. The Division of Forestry will be preparing a unit forest resource plan for the Bemidji administrative area in the next 2 to 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 the private sector. SNA management actions in the Iron Springs Bog plan will be coordinated with the Bemidji Area Unit Plan.

D. Wildfire Management

Though fire was once an important ecological factor in this region, its specific relationship to the existing diverse flora and particularly the rare species in Iron Springs Bog is unpredictable. Wildfire suppression has been relatively effective in the Itasca Area since the late 1920's.

Wildfire management is the responsibility of the Division of Forestry. The SNA will be treated as a special fire management unit in the Bemidji Area Fire Plan. Forestry should take immediate action on all wildfires in the SNA using fire crews or aerial support. Mechanical firebreaks (i.e. plowlines and vehicular equipment) can be used on the old public road right-of-way (which divides Sections 28 and 33, and Sections 27 and 34) and along the perimeter of the SNA. Heavy equipment should not be used in off-road areas as sensitive plants could be irreparably damaged. Under conditions in which Regional Forestry Supervisors determine that a catastrophic fire seems likely, SNA staff should be contacted so that a control strategy can be formulated. Under critical conditions a firebreak could be constructed on mineral soil along an old logging trail running SW to NE in the SNA (see Fire Management Map). This would protect the conifer swamp-seepage slope forest type from fire out of the NW.

Because of groundwater discharge and high water tables, peat fires are unlikely. In such an event the fire will be contained. Trenching, however, should be avoided.

Action 1.4 Include Iron Springs Bog SNA in the Bemidji Area Fire plan as a special fire management unit.

Considerations:

Dispatchers - Will alert fire crews and personnel that this is a sensitive area. Maps and other information will be provided in the Fire Plan.

E. Sucker Creek

Sucker Creek is a state designated trout stream. A portion of the stream reach described as "reach #1" in the 1980, 1982, and 1983 DNR stream surveys goes through Iron Springs Bog SNA. Prior to SNA acquisition and designation, DNR fisheries acquired corridor easements from Clearwater County for stream improvements along Sucker Creek. Several of these areas, together with the stream easements, were later included in the SNA through a land exchange.

Stream management is the responsibility of the DNR Bemidji Area Fishuries Manager. Stream management activities include: 1) annual stocking with brook trout, 2) removal of beaver dams, 3) cutting of brush for in-stream use, 4) channel clean-out, and 5) construction and maintenance of in-stream structures. Fish stocking, beaver removal, use of brush and channel clean-out do not conflict with SNA management of the adjoining land base. Stream habitat improvement projects that

involve removal or cutting of vegetation outside the streambanks must take into account the rare species and ecological significance of the SNA. Cutting of trees within the SNA is not consistent with the long-term preservation of the adjacent plant community and rare species habitat, and will not be permitted.

Action 1.5 Review stream habitat improvement projects

Considerations:

Scope - to include only those Fisheries projects which might result in alteration or disturbance to the vegetation, hydrology, soil or other component of the environment outside of the stream banks in the SNA.

Objective - to provide for coordinated and compatible management of the stream and the SNA, taking into account the importance of both the trout fishery and preservation of the area's natural features.

F. Public Use

1. Rule Exceptions

In the Commissioner's Order establishing Iron Springs Bog SNA, exceptions were made to NR 300-303 permitting deer hunting and trout fishing during the regular seasons for such species. Harvesting deer is compatible with SNA management objectives since heavy deer use has a significant impact on the vegetation. Sucker Creek was a designated trout stream prior to SNA designation with easements acquired specifically for stream management. Continued use of the area for these two activities does not appear to have jeopardized any significant natural features in the SNA. Permitting both deer hunting and trout fishing was a condition agreed to in the land exchange with the county. Trapping is prohibited except that DNR Fisheries may control nuisance beaver and remove beaver dams in accordance with the stream corridor easements. The likelihood of beaver activity along the stream segment through the SNA is relatively low. Food resources in the conifer swamp forest along the stream are minimal. Beaver damming and subsequent flooding of the conifer swamp-seepage slope forest would be detrimental to this feature and its associated rare species.

2. Use Levels

The majority of visitors to Iron Springs Bog SNA are students, researchers and faculty from the Itasca Forestry and Biological Station. Most of this use has traditionally occurred west and north of Sucker Creek, in the conifer swamp-seepage slope forest type. The moss dominated ground flora of this forest type is particularly sensitive to damage from visitor use. Classes typically enter the SNA a short distance west of Sucker Creek from the old road. A number of braided footpaths extend out from this general area, decreasing with distance from the road. Anglers appear to have created a footpath paralleling the creek. Impacts from visitor use are negligible in other vegetation types.

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Fire Management

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Almost any level of use will result in some impact to the conifer swamp forest vegetation type. The level of impact caused by educational and scientific use must be balanced against benefits of this use. No real threats or conflicts have been identified between existing use patterns and preservation goals. However, increased severity, prevalence or extent of impact could endanger the biota and should be avoided. Trails are effective indicators of visitor impact because their size and condition reflect the amount and type of visitor use. If additional degradation occurs, management actions, including limiting visitor numbers, restricting use to specific areas, or confining visitors to special trails (i.e. maximizing use of former logging trails), must be initiated.

Action 1.6 Monitor visitor impact

Considerations:

Parameters - the primary indicators of impact will be the number, width, and condition of visitor trails. These should be measured using a series of permanent transects oriented perpendicular to the creek, photo points, or other replicable procedures.

Evaluation - remeasure every 2 - 4 years and determine whether conditions have changed and if corrective action is necessary.

G. Surveillance and Enforcement

Inappropriate use 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 is the responsibility of DNR enforcement officers and other division staff. Additional protection can be provided by local residents and visitors who support and recognize the values and permitted uses of the SNA. To date, the landowners on the southeast end of the SNA have been extremely helpful in monitoring use of the area. Persons wishing to report problems or who have questions regarding the SNA should contact the Regional Nongame Specialist, Area Wildlife Manager, Conservation Officer, or other DNR official.

Deer hunting and trout fishing are permitted in this SNA during the regular seasons for such species. Some unauthorized hunting does occur. Boundary survey ann posting will improve compliance and facilitate enforcement (Action 2.2). The construction and use of deer stands is not permitted except that portable tree stands may be used provided they are removed each day and do not do permanent damage to trees in which they are placed. Cutting or breaking of branches and other vegetation for the use of deer stands for clearing "shooting lanes" or for any other purpose is not permitted. (See Action 2.3).

SECTION 2. STRUCTURES AND FACILITIES

A. Access

Access to the SNA is via an unimproved public road located along the section line between Sections 27 and 34, and Sections 28 and 33 (see Site Map at the beginning of this report). This road has had numerous designations in the past, including township road, county road, and state trunk highway. The State Department of Transportation (DOT) in 1934 and 1935 purchased easements along this road which extended 100 feet from the center line. Most of the easements are still owned by DOT, but a few were conveyed back to adjacent landowners.

Motor vehicle access on the unimproved road is very limited, as it has not been maintained for many years. The segment which runs east from the Sucker Creek bridge to the intersection with Highway 200 near the Mississippi River is passable.

The portion of the road west of Sucker Creek is impassable by motorized vehicles due to seepage from the springs. No road improvements are deemed necessary, as motorized vehicle entry to the site from the west is not required.

Public access can be gained by parking on the unimproved road where it intersects Highway 200 to the west of the SNA and walking in along the unimproved road. There is parking space for 2-3 vehicles at that intersection.

Action 2.1 Request DOT to transfer road easements within SNA boundaries to DNR

B. Signing

The objectives of signing are to identify the boundaries of the unit and to provide basic visitor information. The boundaries of the SNA need to be surveyed and posted. There is presently an entrance sign and a rules and regulations sign posted near Sucker Creek. An informational sign and additional rules and regulations signs are needed.

Action 2.2 Survey and post boundaries

Considerations:

Highway Maps - Section corners and other reference points are recorded on the 1934 Highway Construction Maps (on file with DOT and in SNA site files).

Action 2.3 Post 2 additional rules and regulations signs

Considerations:

Location - at SW and SE corners of SNA, where SNA boundary meets old road. These are primary access points into the SNA.

Rule changes - These should be identified on a small aluminum sign posted with the rules and regulations sign and state that: trout fishing and deer hunting are allowed during the regular seasons for these species; and that deer stands are not allowed except that portable tree stands may be used provided they are removed each day, and cutting, breaking or otherwise damaging vegetation for the use of these stands or for any other purpose is not permitted.

C. Powerline

A Clearwater-Polk County Electric Company powerline is located on the north side of the unimproved road along the south boundary of the SNA. The Electric Company sprayed under the powerline with herbicides in 1984. This is inconsistent with SNA management objectives. Therefore, in the future the company will use manual methods to control vegetation bordering the SNA. This will be necessary approximately every two years.

Action 2.4 Request Clearwater-Polk County Electric to contact the Region I Nongame Specialist prior to line maintenance within the SNA.

Considerations:

Maintenance - herbicides should not be used. Vegetation should be cut and removed, or burned so that access into the unit is not restricted by debris piles.

SECTION 3. VEGETATION MANAGEMENT

A. Plant Communities

At present, no long-term ecological monitoring is being conducted in the SNA. Data collected from such a monitoring program will provide a measure of natural variation in the ecosystem and permit an examination of long-term trends and changes. Ecological information is also useful for measuring progress towards overall protection goals, and promotes additional educational and research interest in the site. Iron Springs Bog is particularity suited for long-term monitoring because of its proximity to the Itasca Forestry and Biological Station. In addition, the peat effectively preserves a continuous record of environmental change in the form of pollen and fossils, making the SNA a potential site for peat coring studies.

The most unique plant community type in the SNA is the conifer swamp-seepage slope forest. This peatland feature with its associated flora has been the primary focus of attention for research and classroom use. The extent and characteristics of this community type have not been systematically surveyed and defined. In addition to vegetation research, a better understanding of the local hydrology and ontogeny of the peat is necessary to adequately delineate the ecological boundaries of this natural feature. This information is important in order to evaluate the significance and determine protection needs of those portions of this community which extend beyond present SNA boundaries.

Action 3.1 Establish and maintain a set of permanent reference plots or transects

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Considerations:

Standardization - Sampling design and data collection should be standardized with measurements of similar communities on other SNA's. Methodologies should be compatible with Natural Heritage Program releve studies.

Action 3.2 Describe and delineate the ecological boundaries of the conifer swamp-seepage slope forest

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Considerations:

Purpose - to effectively determine the status and protection needs and status of this community type both within and outside of existing SNA boundaries.

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VEGETATION

SITE

a. Hydrology - identify general or specific relationships between hydrologic parameters and vegetation patterns, composition and quality. Map the extent of these hydrologic/vegetation conditions.

b. Peat - map and describe peat stratigraphy, including depth, degree of humification, botanical origin and composition of each layer of the profile, and the underlying mineral soil texture. Document vegetation change and development in the conifer swamp-seepage slope forest type.

c. Vegetation - evaluate the existing condition of the conifer swamp-seepage slope forest outside the current SNA boundary, particularly with regard to rare species characteristic of this community type.

B. Rare Species

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

At present there are two state species that should be monitored: Cypripedium arietinum and Malaxis paludosa. Both of these occur in only a few known locations in the SNA in low numbers. Both are associated with the conifer swamp-seepage slope forest type. Five moss species collected in the SNA have been proposed for special concern status. The abundance and distribution of these mosses in the SNA has not yet been determined.

Action 3.4 Monitor Cypripedium arietinum and Malaxis paludosa

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Considerations:

Scope - Establish a replicable censusing procedure to permit systematic reverification of the species' status in the SNA.

Additional species - Extend monitoring to the proposed special concern species when listed. Distribution and abundance in the SNA must be determined prior to establishing a monitoring program.

SECTION 4. ADJACENT LANDS

Lands adjacent to Iron Springs Bog SNA may be important to the protection and management of the SNA if:

1. The vegetation is continuous and of a quality similar to that being protected on the SNA.

2. They contain significant natural features.

3. Land use activities would threaten important natural features protected in the SNA.

4. They affect SNA management and/or enforcement capabilities.

The following paragraphs discuss adjacent land parcels with important protection or management features. Most of the surrounding lands are county memorial forest and managed for timber products. Unless otherwise noted, any issues relating to these county lands will be deferred until the Bemidji Area Forest Unit Plan is prepared by the DNR Division of Forestry and additional resource information is available (See Action 3.2). At that time exchange or other options should be considered for those adjoining county lands in the S 1/2 Section 28 and N 1/2 Section 33 where protection needs have been identified.

PARCEL A - a portion of the E 1/2 NW 1/4 NE 1/4, Section 33

Resources - The westerly portion of this parcel includes part of the conifer swamp-seepage slope forest type. It was clearcut sometime between 1927 and 1939. A major population of Malaxis paludosa occurs in Parcel A, possibly extending into the adjacent county land toward the creek (Parcel B).

Status - Private ownership. Malaxis paludosa is a protected species under the Minnesota Endangered Species Act.

SNA Considerations - This is a high priority species for protection and this population is one of the largest known in the United States. Only a single plant was found in the SNA. The plant has been known from this location in Section 33 since 1927.

Action 4.1 Pursue conservation action with landowner on Parcel A

Considerations:

Designation - If the landowner is willing, the SNA program should designate the rare plant habitat in Parcel A as part of the Iron Springs Bog SNA. To designate any land as a SNA, the DNR requires a property interest in the parcel. This could be accomplished through gift exchange, or acquiring fee title, partial ownership (i.e. conservation easement) or long-term lease to the portion of Parcel A containing the rare plant habitat.


SNA Boundary
State Highway
Gravel Road
Unimproved Road
Building
Cemetery
dP Aerial Photo Match Line
Aerial Photography
Mark Hurd 7-12-83 CLW-4-105.225
200
29
28
27
33
32
dP
Creek
Matson
Road
B
A
T144
R36
0 1/8 1/4 1/2 MILES
0 1/8 1/4 1/2 1 KILOMETERS
IRON SPRINGS BOG SNA
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SITE

PARCEL B - W 1/2 NW 1/4 NE 1/4, Section 33 - 10 acres

Resources: same as Parcel A

Status: Tax forfeit, designated as county memorial forest. The conifer swamp timber type is presently in a reserve status (no harvest in the next 10 years).

SNA Considerations: same as Parcel A

Action 4.2 Pursue conservation action with Clearwater County on Parcel B

Considerations:

Protection - If the county is willing, SNA designation should be pursued. In the interim, Parcel B should be withdrawn from harvesting operations and the DNR should survey and monitor the Malaxis paludosa population.

SECTION 5. MANAGEMENT COSTS AND IMPLEMENTATION

Actions recommend in this plan have been separated into two categories: (1) administrative and (2) operational. The costs of administrative 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 the 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 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 test, 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 a re 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 depends 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

ADMINISTRATIVE ACTIONS	Group	Begin Immediately	Phase I	Phase II	Comments
Action 1.4 Include SNA in Area Fire Plan	I	X			FOR
Action 1.5 Review stream habitat improvement projects	I	X	X	X	SNA/F ongoing review
Action 2.4 Request electric company to contact DNR prior line maintenance	I	X			NG
Action 4.1 Pursue conservation action w/landowner - Parcel A	I	X			SNA
Action 4.2 Pursue conservation action w/county - Parcel B	I	X			SNA
Action 1.1 Improve data archiving and accessibility	III		X		UM/SNA
Action 1.2 Allow collecting in SNA by special use permit	III		X		SNA
Action 1.3 Supply Itasca Biology Station with SNA materials	III		X		SNA
Action 2.1 Request DOT to transfer road easements	III			X	SNA
OPERATIONAL ACTIONS					
Action 1.6 Monitor Visitor Impacts	I			X	SNA
Action 2.1 Establish permanent plots or transects	I			X	SNA
Action 3.2a Investigate hydrology	I		X		SNA/Request Waters to assist, complete prior to Forest Unit Plan prep.
Action 3.2b Survey and describe peat soil unit	I		X		SNA/M complete prior to Forest Unit prep.
Action 3.2c Survey vegetation	I		X		SNA/NHP
Action 3.4 Monitor C. arietum and M. paludosa	I		X		SNA/NHP
Action 2.2 Survey and post boundaries	II		X		EG/W
Action 2.3 Post 2 rules and regulations signs	II		X		W

SNA = Scientific and Natural Areas
FOR = Forestry
F = Fisheries
NG = Nongame
UM = University of MN Field Biology Program
M = Minerals
EG = Engineering
W = Wildlife

APPENDIX

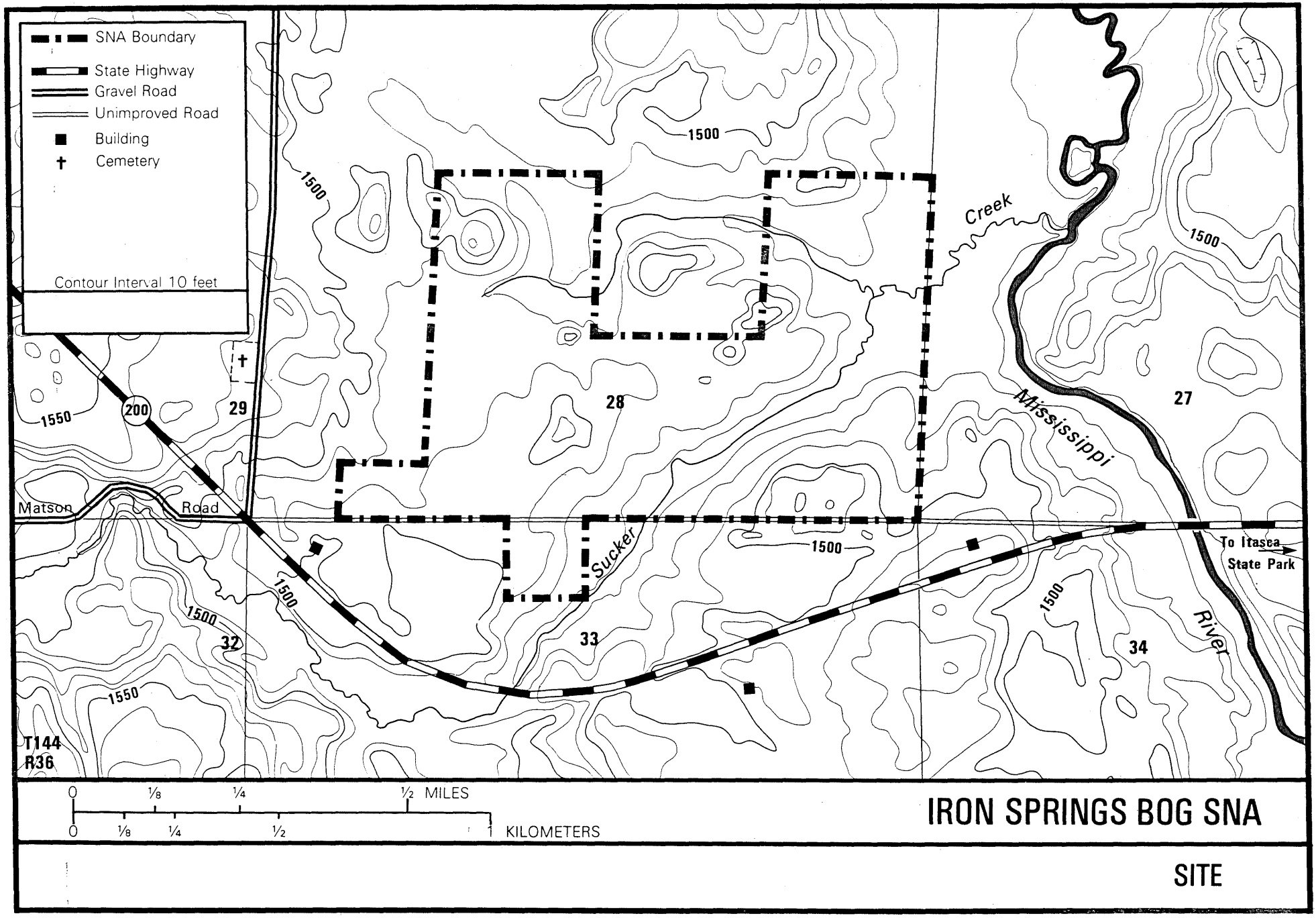
IRON SPRINGS BOG
SCIENTIFIC AND NATURAL AREA
RESOURCE INVENTORY

January 1986

Land Use History
Original Vegetation
Present Vegetation
Flora
Element Status Sheets

IRON SPRINGS BOG SNA

SITE


SNA Boundary
State Highway
Gravel Road
Unimproved Road
Building
Cemetery
Contour Interval 10 feet
1500
1550
200
29
28
27
Creek
Mississippi
Matson
Road
Sucker
To Itasca
State Park
32
33
34
River
T144
R36
0 1/8 1/4 1/2 MILES
0 1/8 1/4 1/2 1 KILOMETERS
IRON SPRINGS BOG SNA
SITE

LAND USE HISTORY

Iron Springs Bog was designated a State Scientific and Natural Area (SNA) in March, 1983. It is located approximately 2 miles northwest of Lake Itasca, the headwaters of the Mississippi River, in Clearwater County, Minnesota. It covers 320 acres in portions of Sections 28 and 33, Township 144 North, Range 36 West. Much of the SNA is coniferous swamp with scattered springs contributing to the wetland environment. The site gets its name from the iron-oxide that precipitates out from the waters in these springs.

Iron Springs Bog SNA presently provides a variety of public uses. Classes from the University of Minnesota's Biological and Forestry Station in Itasca State Park make use of the SNA for many of their field biology courses. Sucker Creek, running SW to NE through the SNA, is a state designated trout stream. Deer hunting during the open deer season is also allowed.

The land use history of Iron Springs Bog was reconstructed by research of state historical records, maps, aerial photos, original surveyors' notes of the area and old ownership records. The following pages summarize the history of the Iron Springs Bog SNA and the events that may have affected that area.

PREVIOUS OWNERSHIP

On May 14, 1877 President Rutherford B. Hayes signed swamp land patents for 200 acres of land now within the SNA boundaries (E½SW, S½SE, NESE--Sec. 28). This land was to be in the control of the State Auditor. Swamp lands were defined by Congress as "the whole of those swamp or overflowed lands which may be, or are, found unfit for cultivation." In all, the state was granted approximately 4,700,000 acres of swamp lands. These lands were transferred to the state with a trust that receipts from the lands be used permanently for specific purposes. The state had the option to retain the land or lease it. One hundred twenty acres of the SNA (E½SW, NESE) has remained trust fund land in the hands of the State ever since 1877. The remaining lands were leased to individuals, railroads, lumber companies, and other interested parties a number of times between 1877 and 1928. In 1928, all of the land currently within the SNA, excluding the trust fund lands, was tax-forfeited and became the responsibility of Clearwater County. One hundred twenty acres of that land was designated "Memorial Forest" in 1928 (S½SE Sec. 28, NENW Sec. 33). The land remained under county administration until it was purchased by the Minnesota Department of Natural Resources in November of 1982.

TRANSPORTATION

Roads

As the logging industry expanded, transportation routes were built to transport people, supplies, and timber throughout the state. Sometime around the turn of the century plans were laid out to construct a road to run directly between Sections 28 and 33. Until 1903 these lands were a

part of Beltrami County. Itasca Township records indicate that plans were laid out on April 11, 1900 for the road to run East and West from section corner 26-27-34-35 to the West side of Sections 30 and 31. Documentation for when the actual construction was completed is unavailable but the records indicate the road was completed sometime between 1900 and 1904. It was designated as a county road (State Road #1) in 1914. State Aid Road #1 was rerouted in 1931. The new routing no longer included the road segment between Sections 28 and 33, and 27 and 34. In 1934 this road segment was designated as part of Trunk Highway 92. A 200' right-of-way was established and easements purchased later that year. Department of Transportation Engineering maps describe several springs located on the western edge of the Section line. A 1934 DOT map reveals that this segment of TH 92 ran through a "spruce and tamarack swamp". Not many tree species are indicated on the map within that area but it does say "4-inch to 12-inch Jack Pine and Spruce" to the east of the bridge crossing Sucker Creek. A gravel pit exists on the north side of the road in SW¼ Section 28, probably used for the original township road bed. In 1935, before highway construction began, the alignment was changed to curving south into Sections 33 and 34. The road is in moderately passable condition on the eastern end due to periodic usage by fishermen and University classes. The western end is overgrown and impassable by car. The road segments along the section line between Sections 28 and 33, and 27 and 34 has not been publicly maintained since this time. The 1934 DOT map shows here that the new Highway 200 was proposed to run directly through stands of poplar, spruce, balsam, jack pine, and birch ranging from 15" dbh to 18" dbh. On the west side of the SNA, construction northward of County Road #107 was progressing along the western boundary of Section 28 in 1904 and by 1907 it was completed as far north as Sections 16 and 17.

Logging Trails

No other roads were built within the SNA except for the possibility of temporary ice roads by the early loggers. The logs were usually cut in winter, dragged to a clearing along skid trails and there loaded onto sleds. These sleds transported the logs via ice roads to the nearest lake or river where they were deposited. The logging roads generally followed lowlands and drainage ways, using frozen swamps, bogs, and lakes along the way.[1]

Analysis of aerial photos of 1939 indicates the presence of two such logging roads, the first running parallel with Sucker Creek in Section 28 to the northwest and the second running approximately 1000' to the northwest of the first.

LOGGING HISTORY

Early records of logging operations in Itasca township were located in the Civilian Conservation Corps logbooks. 1937 records indicate that "in the eastern part of the area operations were in White and Norway pine stands where logs were hauled to LaSalle Lake and then driven downstream into the Mississippi River. From the center of the township logs were hauled directly to the Mississippi River and thence driven downstream to various mills along the river. A logging railroad provided an outlet for the western part of the township where White and Norway pine were also the primary species cut. The railroad was owned by the Red River Lumber Company which had direct connection with the Great Northern at Chevlin (Shevlin)."[2]

The CCC records also indicate that the portable mills played an important part in the logging operations. They identify two local mills in the area and one in Bagley, adding that "these mills provide ample market for both the present and future cuts in the area."[3]

State Land

One hundred twenty acres of land currently within the SNA boundary has remained state trust fund land since 1877. From 1877 until 1931 the trust fund land was under the administration of the State Auditor. After 1931, with the organization of the Department of Conservation, the Forestry Division of the DNR was given administration of the lands. They were acquired by the SNA Program in 1977. Logging on state lands under Forestry administration has been recorded on land use cards. These cards indicate cover type, size class, density, location of cutting, the date, and permit number. Additional information is recorded on the timber appraisal report which accompanies each permit number. This report identifies the cutting regulations, slash disposal methods, exact volume of timber cut by species and supplemental remarks about the general condition of the timber.

For the Iron Springs Bog area land use cards are available from 1962 and 1976. The 1962 cards indicate that 22 cords of tamarac, 10 cords of spruce, 25 cords of balsam, 20 cords of poplar, and 4 cords of birch were cut from the SESW of Section 28. Cutting regulations were to "clearcut all merchantable tamarac, spruce, balsam, aspen, and birch". Disposal methods were "lop and scatter" and remarks on the general timber condition indicate "this timber is over mature and scattered, with old blowdown in stand."[4] The 1976 card (of the NESE Section 28) has only a cover type map of the timber and does not indicate any cuttings in the area at that time.

Non-State Land

The non-state land within the SNA has had number of land owners over the years. Individual landowners, railroads, logging companies, and a variety of other companies have all owned parts of the land at different times. The Red River Lumber Company was a major logging company that moved through this area in the early 1900's. They purchased SWSW, Section 28 in 1898. Typically, lumber companies did not purchase the land but only the timber right on the land. They preferred to cut it as soon as possible and move on to new areas. The Red River Lumber Company was involved in cutting timber within Itasca State Park around the time that they purchased the land within Section 28 so their intentions might have been to purchase surrounding lands when prices were low, and retain them until they were ready to cut in that area. The Red River Lumber Company had moved south from Mallard toward Sucker Lake and into Itasca State Park by the 1905-06 logging season so it is likely that they cut timber within Section 28 (which is just east of Sucker Lake) shortly before 1905.[5] The cutting specifications for the Red River Lumber Company were as follows: "until 1905, the Red River Lumber Company reportedly cut only the best White and Norway pine having a minimum log diameter of 8". In the following years, spruce and jack pine were also included and the minimum diameter was reduced to 6"."[6]

No extensive logging was possible within the Mississippi headwaters region prior to the development of railroad lines. There were so many lakes between Lake Itasca and Grand Rapids (the closest sawmill in the early years) that it was not practical to drive the logs that far along the river and they were interested instead in transporting them by rail. Rail transportation was also cheaper than river drives. No railroads ran directly through Iron Springs Bog but there was a railroad which ran through Sections 29 and 32 and another just east of Itasca State Park, constructed by the Red River Lumber Company around 1910.[7]

Information on the logging history of the non-state land within the SNA is not available when it was under private ownership but in 1928 all of the remaining lands within the SNA (excluding trust fund lands) became tax-forfeited. After the time those lands were under the administration of Clearwater County. The logging history of county lands is recorded on land use plan cards, very similar to the state land use cards. The earliest recorded cuttings are from 1955 and 1956 when the S½SE (Section 28) was cut of 111 cords balsam, 89 cords spruce, 102 cords jack pine, and 15 cords poplar. The next land appraisal for that part of the section was in February 1965 but no cuttings were done at that time. The land use card indicates "scientific study area - no cut." This is in reference to the University of Minnesota research projects within the bog.

Portions of the SWSW forty of Section 28 were cut five different times, according to county records. Primarily Jack Pine was cut: 66 cords in the late 50's, 63.34 cords in 1962, 8.43 cords in 1968, and 59.50 cords in 1969. The last recorded cutting there was in 1973: 38.21 cords aspen, 19.14 cords balsam, and 30.41 cords spruce-balsam.

The only remaining portion of the SNA that was under county administration is in Section 33. This area, the NENENW, was appraised in 1949 and again in 1965. In 1957 and 1958, 193 cords of spruce were cut and 53 cords of balsam fir. The next cutting was in 1966 when 27.5 cords of tamarac were cut and then 1969 when 40.89 more cords were cut.

SLASH DISPOSAL AND FIRES

Following logging there was the problem of slash disposal for the area. After 1909 all lumber companies were required by law to pile and burn their slash but such fires sometimes became uncontrolled and destroyed the pine regeneration which may have followed the logging. There is little evidence of fire in Iron Springs Bog today but it could have been burned by fires documented for Itasca State Park. Extensive fires were recorded at the north end of Lake Itasca in 1865 and 1886 and, according to historical records, major fires occurred within Itasca every every 10.3 years.[8] The wet environment of Iron Springs Bog may have offered partial protection from such fires but the exact fire history for the area is unknown.

Since natural black spruce regeneration is often dependent on fire, the last major forest fire in an area can be infered from the current age of the black spruce trees. In Iron Springs Bog, the black spruce are approximately 68 years old which would indicate the last forest fire there was in 1916. There was a fire in Itasca State Park around that time but any correlation is indefinite. Logging records on state land within the SNA indicate that the slash disposal requirements of the Minnesota Forestry Department for the years 1963-65 were "lop and scatter" with no burning. No reseeding has been done within the SNA.

CURRENT CONDITIONS

Since Iron Springs Bog SNA has been county and state land for the past 55 years no development has occurred there in that time. A number of trails run throughout the area, evidence of the usage of the bog's unique setting by the University of Minnesota students. Classes from the Forestry and Biological Station on Lake Itasca frequently use the area to study the ecology, flora, and fauna of a preserved bog system.

Deer hunters and fishermen historically have used the area since Iron Springs. A trout stream runs through the southeastern section of the SNA. Sucker Creek is a 6-mile designated State trout stream and is yearly stocked with brook trout. Little angler history is known but most say there is better fishing near the mouth of the stream and just south of the bridge. The stream is open to fishermen but it is not well known outside the immediate area. A trail is evident running parallel to the southern bank of the creek. The Fish Distribution Record at the Department of Fisheries indicates that Sucker Creek was first stocked in 1946 with 2580 Brook Trout and has been stocked every year since then with either Brook or Brown Trout. From 1948-1966 it was usually stocked with approximately 300 Brown Trout annually. Since 1966, however, only Brook Trout have been stocked, averaging about 900 annually.

FOOTNOTES

1. Norman Aaseng, Thesis.

2. CCC logbook, 1937. District Forestry Office Lake Itasca, MN

3. Ibid.

4. All from Permits #9471 and 4318. Bemidji Area Office - Forestry.

5. Norman Aaseng, Thesis.

6. Ibid. p. B-6

7. Ibid.

8. Hansen, et al. (Itasca State Park booklet)

ORIGINAL VEGETATION

Reconstruction of the state's original vegetation can be accomplished through research of the records available in the General Land Survey office. Those records include the field notes of the men who originally surveyed Minnesota during the late 1800's.

As the men surveyed each township, they walked along the section lines, marking the mile and half mile intervals by recording tree species, diameter at breast height (dbh), and distance from the survey corner to the nearest tree. Theoretically, the only criteria for selecting these bearing trees was that they had to have a minimum dbh of five inches. As the surveyors travelled through the townships, they also recorded the location of uplands, swamps, prairies, marshes, groves, and windfalls, as well as all streams, rivers, lakes, and roads. Houses, cabins, fields, and other 'improvements' were noted with less regularity, depending on the surveyor and the year the survey was done. Although there are several problems in the use of survey notes for determining past vegetation, including fraud, bias, and species name duplication, the records remain a valuable source of information regarding the nature of the vegetation prior to early settlement.

The transcription of the survey notes has been carried one step further by Francis J. Marschner (1930), who used the records to develop comprehensive maps of the state's original vegetation. Using the General Land Office Survey notes and maps as well as Marschner's map, a general description of the original vegetation of the area can be prepared.

According to these sources, Itasca Township, which includes Iron Springs Bog was gently rolling and heavily forested with spruce and pine. Although the boundary lines on the original surveyors map of 1875 may have some irregularities, they indicate that the SNA was within a tamarac swamp. Sucker Creek ran through the swamp and was 7 feet wide between Sections 28 and 33 and 10 feet wide where it crossed Section 28 into Section 27 just before entering the Mississippi River.

The timber around Section 28 was predominantly spruce and red pine although the tree species were not always recorded at each survey corner. The bearing trees of the north and west boundary lines of Section 28 were all labelled "yellow pines" (probably refer to red pine) with an average dbh of 13 inches. There were also aspen in the area with the undergrowth being a mixture of pine and aspen. The southern and eastern boundary lines of Section 28 were quite different, however. Only one tree was recorded for the southern border -- a 3 inch diameter tamarack midway along the section line. Whether this was the only nearby tree or the data was simply not gathered is unknown. (There is reference to other tamarac, pine, and aspen being in the area but none were recorded as bearing trees.) The eastern border, between Sections 27 and 28 was completely within the mapped boundary of the swamp. Only spruce trees were recorded along the survey line and at the end point (80 rods) the notes indicate 1 spruce at 287 links distant, 1 dead tamarac at 33 links distant and "no other tree near. Line nearly all in swamp."

In Section 33 the timber pattern varies from that of Section 28. The western boundary was predominantly aspen with an average dbh of 6 inches. The eastern boundary was different, however, because the swamp area of eastern Section 28 curved to the west in Section 33, therefore changing the predominant tree species. Recorded bearing trees were most often black pine (probably referring to jack pine) with an average dbh of 8 inches.

In general, the Iron Springs Bog area according to Marschner's map was "conifer bog and swamp". Surrounding the bog was "aspen-birch" timber type with White and Norway pines.

Present Vegetation

INTRODUCTION

The Iron Springs SNA lies within a well-drained, sandy outwash plain found on the edge of an end moraine. Two creeks are located within the SNA, Sucker Creek and an unnamed tributary to Sucker Creek. Both water courses are bordered by very poorly drained deposits which are underlain by artesian aquifers. The area contains numerous iron-bearing springs; the largest spring (called Iron Springs) is the source for the unnamed creek. The varied physiography and distinctive site conditions have allowed the development of a mosaic of vegetation types. Pine forest, boreal forest, and conifer swamp forest are the major vegetation types found in the SNA area. The distribution of these three types is largely controlled by the soil moisture regime which varies from dry to wet, depending largely on slope position, soil texture, and underground water. In general, pine forest is found on the driest upland slopes, boreal forest on moist, often sloping sites and conifer swamp on seepage slopes and wet, low areas bordering the creeks.

Analysis of the surveyors' records (see land use history section) indicates the entire SNA was covered with spruce, balsam fir, tamarack and cedar; these are dominant trees of the boreal and conifer swamp forest types. A general overview of both these forest communities follows.

Conifer swamp forests can be broadly defined as minerotorhic wetlands dominated by coniferous trees, especially Thuja occidentalis, Picea mariana, Abies balsamea, and Larix laricina. Swamps have some internal drainage and are often associated with spring and seepage streams. To this end, the substrate has a relatively high mineral content and a slightly acid to circum-neutral pH. Since swamp forests are enriched by mineral-bearing ground water they tend to be floristically more complex than bog forests which are isolated from ground water flow and are nutrient poor. Conifer swamp forests are typically stable over long periods of time, showing little tendency for succession to follow any regular path. However, they may, in the absence of disturbance, progress toward northern white cedar and balsam fir domination. Retrogression resulting from natural disturbance - notably fire - typically maintains these sites in successional stages. Conifer swamps are strongly influenced by changes in water level and supply. They can be dramatically altered as a result of natural and/or human-induced changes including damming of streams by beavers and construction of drainage ditches, roads, or other structures that accelerate or impede water movement.

The boreal forest in Minnesota represents a southern extension of the extensive Boreal Forest region of Canada. This forest type occurs on upland sites and is dominated by balsam fir (Abies balsamea), white spruce (Picea glauca), black spruce (Picea mariana), trembling aspen (Populus tremuloides) or white birch (Betula papyrifera) in pure stands or in general mixtures of these species. The proportions of these trees vary considerably throughout their range in response to differences in

site conditions and natural fire cycles. Balsam fir, due to its great shade tolerance, tends to form extensive stands in the absence of frequent fires. Natural disturbances, including fire, wind, and spruce budworm, are important components of this ecosystem. Such catastrophes often result in even-aged stands of spruce-fir forest. Boreal forest and swamp forest often intergrade with each other on the same site. These forests are considered, at least under certain conditions, to be related by successional trends. Some have considered the conifer swamp forest a wet ground stage of the boreal forest. The boreal forest is thought of as the terminal mesic forest on upland sites.

Relatively natural stands of conifer swamp and boreal forest are still fairly common in the Upper Midwest and Canada. They are not considered threatened natural community types in Minnesota by the Natural Heritage Program. However, an unusual variant of conifer swamp forest is found on the SNA Unit. Adjacent to the north and south of Sucker Creek, conifer swamp occupies a seepage slope with noticeable gradient away from the water course to the driest upland slopes. The peatland contains numerous iron bearing springs situated on open margins of the swamp nearest the stream. The sloping peatland was first described by Buell and Niering (1953) as a "raised bog". The occurrence of this unique sloping peatland feature with its active springs was a major reason for recognizing Iron Springs Bog as a Scientific and Natural Area. The extent of these sloping forested peatlands, influenced by calcareous ground water seepage, is unknown for Minnesota. They are certainly much less common than streamside/lakeside swamps and basin swamps which occur on level terrain. Calcareous seepage swamps have been documented in Wisconsin, Michigan, and throughout New England. Their similarity to sites in Minnesota is unknown.

METHODS

The vegetation communities on the Iron Springs SNA are mapped and described in the following section. The vegetation for this site is grouped into five types - Boreal Forest, Conifer Swamp, Conifer Swamp - seepage slope, Pine Forest, and Marsh/Shrub Swamp. This classification is based on dominance of canopy layer species and overall floristic composition. The boundaries of the vegetation types on the cover type map were identified with the use of aerial photographs, DNR forest inventory data, and on-site field evaluations. Boundaries of vegetation types are always more definitive when mapped than they appear in the field. Sharp changes between vegetation types are rare; instead, they grade on a continuum and from one type to another. Vegetation data describing in more detail the composition of the cover types were recorded using releves (a semi-quantitative vegetation sampling method).

COMMUNITY DESCRIPTIONS

Conifer Swamp - seepage slope (CS-s)

This variant of the conifer swamp community occurs on waterlogged peat soils which are found on the north and south sides of Sucker Creek. The community is not on level land but occupies seepage slopes with a noticeable gradient away from the water course to the drier upper slopes. The minerotrohic peat buildup is a result of uninterrupted

IRON SPRINGS BOG SNA

VEGETATION

SITE

water inflow from groundwater rich in minerals and high in pH. This constant water supply eminates from numerous active springs in the area. In an unpublished study of the microbiota of these springs, Blickle (1960) notes the springs are rich in calcium and magnesium bicarbonates with a water pH of 6.8 pH to 7.4 pH. This supply of high mineral content water not only determines the productivity of the microbiota within the spring, but also greatly influences the species composition and diversity of the plant community surrounding the springs. The water-saturated peat soils support an unusual assortment of fen and bog species floristically distinct from other conifer swamp communities on the SNA unit. Qualitatively, the groundwater slope peatland is distinguihed by the abundance of minerotrophic plant indicators such as false asphodel (Tofieldia glutinosa), arrow grass (Triglochin maritima), sedges (Carex capillaris, C. leptalea, C. prairea), dwarf birch (Betula pumila), showy lady slipper (Cypredium reginae), loesels twayblade (Liparis loeselii), and hoary willow (Salix candida). In addition the composition and density of the moss layer is disinct. Moss cover is high, typically ranging from 60% to continuous over, with Mnium cuspidatum dominating with Sphagnum spp. The overstory vegetation is similar to the other conifer swamps within the SNA. The dominant trees are black spruce (Picea mariana), tamarack (Larix laricina) and balsam fir (Abies balsamea). The shrub layer varies from sparse to moderate. The revalent tall shrubs are Cornus stolonifera, Corylus sp. and Alnus rugosa. Within the tamarack dominated areas, typically wet areas adjoining springs and open fen, Betula pumila, Salix candida, and Ledum groenlandicum are the dominant shrubs. The dominant groundlayer plants vary with soil moisture; the most prevalent species are similar to other conifer swamp areas. These are Linnea borealis, Caltha palustris, Vaccinium oxycoccus, Eupatorium maculatum, and Mitella nuda. Typical acid-loving plants are often found on hummocks raised above the level of alkaline seepage water; these include Sarracenia purpurea, Menyanthes trifoliata, Ledum groenlandicum, and Vaccinium oxycoccus. The sloping peatland here has no record of logging unlike the remainder of the SNA unit.

Conifer Swamp (CS)

This community is typical of conifer swamps found on level, saturated peat deposits bordering streams. It is found adjacent to the unnamed creek and north of the sloping peatland. The dominant trees are black spruce, tamarack, and balsam fir found singly or in various combinations. Less common associates include balsam poplar (Populus balsamifera) paper birch (Betula papyrifera) and black ash (Fraxinus nigra). The shrub layer is typically dominated by Alnus rugosa, although tamarack dominated areas generally have a higher cover of Ledum groenlandicum. This community type is distinguished from the sloping peatland by its relative absence of minerotrohic plant indicators, a change in both species composition and cover of the moss layer, and by the abundance of wetland sedges and reeds. These areas are subjected to intermittent flooding with periods of standing water occurring at various time. Standing water, often caused by beaver dams, results in the replacement of many minerotrophic species as well as the continuous moss cover in favor of wetland sedges and reeds. North of the sloping peatland, where the terrain along Sucker Creek becomes flat, there is a distinct change in the ground layer from a continuous moss cover to dominance by wetland sedges.

Boreal Forest (BF)

This community type occurs on moderately dry to moist soils typically on side slopes leading to lower, wetter sites dominated by conifer swamp. Boreal forest and conifer swamp grade into one another, and the transitional zones contain representatives of both community types. The boreal forest community is dominated by balsam fir, white spruce (Picea glauca), paper birch (Betula papyrifera), or trembling aspen (Populus tremuloides) or various combinations of the four species. Tree cover types vary in age and species composition largely as a result of logging history. This community type has been extensively cut over and is represented by second growth stands ranging from young (15 yrs+) stands of aspen to mature (60 yrs+) stands of spruce-fir. The shrub layer varies from moderate to dense cover; Corylus sp. is the dominant species. The groundlayer is characterized by Aster macrophyllus, Aralia nudicaulis, Cornus canadensis, Clintonia borealis, and Asarum canadensis.

Pine Forest (PF)

This community occupies the drier ridges and rolling topography above the boreal forest and conifer swamp types; it is found primarily outside the SNA unit. The pine forest is composed of young (35-60 yrs), second growth stands following logging. The dominant trees are red pine (Pinus resinosa), jack pine (Pinus banksiana), paper birch and trembling aspen. Balsam fir and white spruce are occasionally found in the understory. Shrub density varies from medium to high, and is composed primarily of Corylus spp. The ground flora is characterized by Carex cf. pensylvanica, Aralia nudicaulis, Aster macrophyllus, Maianthemum canadensis, Vaccinium angustifolium, Diervilla lonicera, and Rubus idaeus.

Marsh/Shrub Swamp (MS)

This community type typically occurs on wet level sites adjacent to water courses; it is often found as a transition between conifer swamp and streams. This community is composed of herbaceous wetland plants with coverage by wetland shrubs ranging from low to high density. The dominant shrubs are speckled alder (Alnus rugosa), red osier dogwood (Cornus stolonifera), and willows (esp. Salix petiolaris). The ground layer is chracterized by Calamogrostis canadensis, Eupatorium maculatum, Phalaris arundinacea and Thalictrum dasycarpum.

FLORA

Iron Springs Bog was searched for rare plant species in 1984. During the course of the search two state endangered species were found: (Cypripedium arietinum (ram's head lady slipper), and Malaxis paludosa (bog adder's mouth). There are two other rare species which had previously been collected in the area, but which were not relocated in 1984. These species are: Tofieldia glutinosa (false asphodel), special concern and Carex capillaris (a species of sedge), watch category. It is not known if these last two species ever occurred within the boundaries of the SNA, or if they were collected from nearby habitats. The only locational information is on the labels attached to the herbarium specimens which read "iron springs bog". Because the SNA bounaries do not encompass the entire bog, the plants could have been collected outside the SNA boundary, but within the bog. Specific information on the two endangered species is included in the attached status reports.

During the course of the rare plant search, an attempt was made to assemble a general species list. No vouchers were collected because of the history of over-collecting at this site. The list is probably 80% complete, and contains only those species for which positive identification could be made.

Abies balsamea (L.) Mill.	Balsam fir
Acer rubrum L.	red maple
Achillea lanulosa Nutt.	woolly yarrow
Actaea rubra (art.) Willd.	red baneberry
Agastache foeniculum (Pursh) Ktze.	fragrant giant hyssop
Alnus rugosa (Du Roi.) Spreng.	speckled alder
Amelanchier humilis Wieg	black-fruited juneberry
Amelanchier intermedia Spach	swamp juneberry
Anemone canadensis L.	canada anemone
Anemone quinquefolia L.	wood anemone
Antennaria neglecta Greene	smaller everlasting
Apocynum sibiricum Jacq.	dogbane
Aralia nudicaulis L.	wild sarsaparilla
Arenaria lateriflora L.	blunt-leaved sandwort
Asarum canadensis L.	wild ginger
Aster macrophyllus L.	large-leaved aster
Betula papyrifera Marsh.	paper birch
Betula pumila L.	dwarf birch
Botrychium virginianum (L.) Sev.	rattlesnake fern
Bromus ciliatus L.	fringed brome grass
Caltha palustris L.	marsh marigold
Calamagrostis canadensis (Michx.) Beauv.	blue-joint grass
Campanula aparinoides Pursh	marsh bellflower
Carex aurea Nutt.	golden-fruited sedge
Carex capillaris L.	a species of sedge
Carex chordorrhiza L.	creeping sedge
Carex deweyana Schwein.	a species of sedge
Carex disperma Dew.	a species of sedge
Carex gynocrates Wormsk.	a species of sedge
Carex interior Bailey	a species of sedge
Carex leptalea Wahl.	a species of sedge
Carex limosa L.	a species of sedge
Carex paupercula Michx.	bog sedge
Carex prairea Dew.	a species of sedge
Carex vaginata Tausch	a species of sedge
Circaea alpina L.	enchanter's nightshade
Clintonia borealis (Ait.) Raf.	yellow clintonia
Coptis groenlandica (Oeder) Fern.	goldthread
Corallorhiza trifida Chat.	early coral root
Cornus canadensis L.	dwarf cornel
Cornus stolonifera Michx.	red-osier dogwood
Cypripedium acaule Ait.	stemless lady slipper
Cypripedium arietinum R. Br.	ram's head lady slipper
Cypripedium calceolus L. var parviflorum (Salisb.) Fern.	small yellow lady slipper
Cypripedium reginae Walt.	showy lady slipper

Diervilla lonicera Mill.	bush honeysuckle
Drosera rotundifolia L.	round-leaved sundew
Elodea canadensis Michx.	canada waterweed
Epilobium leptophyllum Raf.	linear-leaved willow-herb
Equisteum fluviatile L.	water horsetail
Equisteum laevigatum A. Br.	smooth scouring-rush
Equisteum palustre L.	marsh horsetail
Equisteum sylvaticum L.	wood horsetail
Erigeron philadelphicus L.	philadelphia fleabane
Eriophorum gracile Koch	slender cotton gras
Eriophorum viridi-carinatum (Engelm.) Fern	thin-leaved cotton grass
Eupatorium maculatum L.	joe-pye weed
Fragaria vesca L.	wood strawberry
Fragaria virginiana Duchexne	virginia strawberry
Fraxinus nigra Marsh.	black ash
Galium boreale L.	northern bedstraw
Galium labradoricum Wieg.	labrador marsh bedstraw
Galium triflorum Michx.	sweet-scented bedstraw
Gaultheria hispidula (L.) Bigel.	creeping snowberry
Goodyera repens (L.) R. Br.	rattlesnake plantain
Gymnocarpium dryopteris (L.) Newm.	oak fern
Heracleum lanatum Michx.	cow-parsnip
Iris versicolor L.	blue flag
Larix laricina (Du Roi) K. Koch	tamarack
Lathyrus ochroleucus Hook.	pale vetchling
Ledum groenlandicum Oeder	labrador tea
Lemna minor L.	lesser duckweed
Linnaea borealis L.	twin-flower
Liparis loeselii (L.) Rich.	loesel's twayblade
Listera cordata (L.) R. Br.	heart-leaved twayblade
Lonicera villosa (Michx.) R. & S.	mountain fly-honeysuckle
Luzula acuminata Raf.	hairy wood rush
Lysimachia thyrsiflora L.	tufted loosestrife
Maianthemum canadensis Desf.	false lily-of-the-valley
Malaxis brachypoda (Gray) Fern.	adder's mouth
Malaxis paludosa (L.) Sw.	bog adder's mouth
Malaxis unifolia Michx.	green adder's mouth
Matteuccia struthiopteris (L.) Todaro	ostrich fern
Menyanthes trifoliata L.	buckbean
Mitella nuda L.	naked bishop's cap
Moneses uniflora (L.) Gray	one-flowered pyrola
Monotropa uniflora L.	indian pipe
Orchis rotundifolia Banks	small round-leaved orchis
Oryzopsis asperifolia Michx.	rough-leaved mountain-rice

Parnassia palustris L.	marsh grass of parnassus
Picea glauca (Moench) Voss	white spruce
Picea mariana (Mill.) B.S.P.	black spruce
Pinus banksiana Lamb.	jack pine
Platanethera dilatata (Pursh) Lindl.	tall leafy white orchid
Platanthera hyperborea (L.) Lindl.	tall leafy green orchid
Platanthera orbiculata (Pursh) Lindl.	large round-leaved orchid
Platanthera obtusata (Banks) Lindl.	blunt-leaved orchid
Populus balsamifera L.	balsam poplar
Populus tremuloides Michx.	quaking aspen
Prenanthes alba L.	rattlesnake-root
Pteridium aquilinum (L.) Kuhn	eastern bracken
Pyrola asarifolia Michx	pink-flowered pyrola
Pyrola secunda L.	one-sided pyrola
Quercus rubra L.	red oak
Rhamnus alnifolia L'Her.	dwarf alder
Ribes americanum Mill.	wild black currant
Rubus pubescens Raf.	dwarf red blackberry
Rudbeckia laciniata L.	goldenglow
Salix candida Fluegge	hoary willow
Salix pedicellaris Pursh	bog willow
Sanicula marilandica L.	black snakeroot
Sarracenia purpurea L.	pitcher plant
Schizachne purpurascens (Torr.) Swallen	false melic grass
Scutellaria lateriflora L.	mad-dog skullcap
Senecio pauperculus Michx.	groundsel
Smilacina stellata (L.) Desf.	star-flowered false solomon's seal
Smilacina trifolia (L.) Desf	three-leaved false solomon's seal
Solidago gigantea Ait.	late goldenrod
Stellaria longifolia Muhl.	long-leaved stitchwort
Thalictrum dasycarpum Fisch. & Lall.	tall meadow rue
Thalictrum dioicum L.	early meadow rue
Thelypteris palustris Schott	marsh fern
Tofieldia glutinosa (Michx.) Pers.	false asphodel
Trientalis borealis Raf.	star-flower
Triglochin maritima L.	arrow grass
Trillium cernuum L.	nodding wake-robin
Urtica dioica Muhl.	tall wild nettle
Vaccinium angustifolium Ait.	blueberry
Vaccinium oxycoccus L.	small cranberry
Viburnum trilobum Marsh.	high-bush cranberry
Vicia americana Muhl.	american vetch
Viola conspera Reichenb.	american dog violet
Viola mackloskeyi Lloyd	northern white violet
Viola nephiophylla Greene	northern bog violet
Viola renifolia Gray	kidney-leaved violet

'IRON SPRINGS BOG' SPRING FEN (ISB)
BRYOPHYTES

Jan A. Janssens 11995-12038
July 1984, update May 1985

Mosses

Amblystegium serpens
Aulacomnium palustre
Brachythecium rivulare
Brachythecium salebrosum
Bryoerythrophyllum recurvirostrum
Callicladium haldanianum
Calliergon giganteum
*Calliergon richardsonii
*Cratoneuron filicinum
Dicranum montanum
Dicranum undulatum
Drepanocladus aduncus
*Helodium blandowii
Hylocomium splendens
Hypnum lindbergii
Hypnum pallescens
Plagiomnium ellipticum
Platygyrium repens
Pleurozium schreberi
Pohlia sp.
Polytrichum strictum
Rhytidiadelphus triquetrus
Sphagnum angustifolium
Sphagnum centrale
Sphagnum girgensohnii
Sphagnum magellanicum
*Sphagnum subfulvum
Sphagnum teres
Sphagnum warnstorfii
*Sphagnum wulfianum
Tetraphis pellucida
Thuidium delicatulum var. radicans
Thuidium sp.
Tomenthypnum nitens

Liverworts

Calypogeia integristipula
Geocalyx graveolens
Ptilidium pulcherrimum

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*Proposed Special Concern Species

Cypripedium arietinum R. Br.

FAMILY: Orchidaceae

COMMON NAME: Ram's-head Lady's-slipper

STATE STATUS: Endangered

FEDERAL STATUS: None

BASIS FOR MINNESOTA STATUS: This near-legendary orchid occupies a very restricted range, within which it is rare to extremely rare. The reasons for its rarity are not known, although it clearly has always been rare (within the scale of human record keeping). Recently, however, it has suffered a general decline that could threaten the species range-wide. In Minnesota, this decline has largely been the result of loss of habitat through logging and mining activities. Fortunately, significant potential habitat does remain, and future searches will likely discover additional populations. However, the DNR has recently completed an initial 7 year inventory of Minnesota's 18 major peatlands, and documented only one population.

Cypripedium arietinum originally ranged through most of the forested region of Minnesota, but all of the recent records are from remote habitats in northcentral and northwestern Minnesota. There are, however, reliable and persistent sight records from Cook County in the northeast.

A notable population once occurred in Purgatory Swamp in southwestern Hennepin County. Plants were last seen there in 1911, and the site has now been given up to residential developments. A similar fate is suspected for the population in Wright County which has not been seen since 1927. Many of the remaining populations face a critical threat from orchid fanciers who selfishly and illicitly dig up these plants, even where they occur in State Parks and Scientific and Natural Areas. This type of "poaching" is especially tragic because plants will not survive transplantation from the wild.

PREFERRED HABITAT IN MINNESOTA: The Minnesota populations of C. arietinum occur in a variety of coniferous forest habitats. Most of these habitats occur in bogs dominated by Thuja occidentalis (northern white cedar), Larix laricina (tamarack) or Picea mariana (black spruce). Under these conditions, the plants typically occur on hummocks of Sphagnum moss. The species also occurs in upland conifer forests that may be dominated by Pinus strobus (white pine), Pinus resinosa (red pine) or Pinus banksiana (jack pine). In this situation the plants may be found in loamy or clayey soil, or even sand.

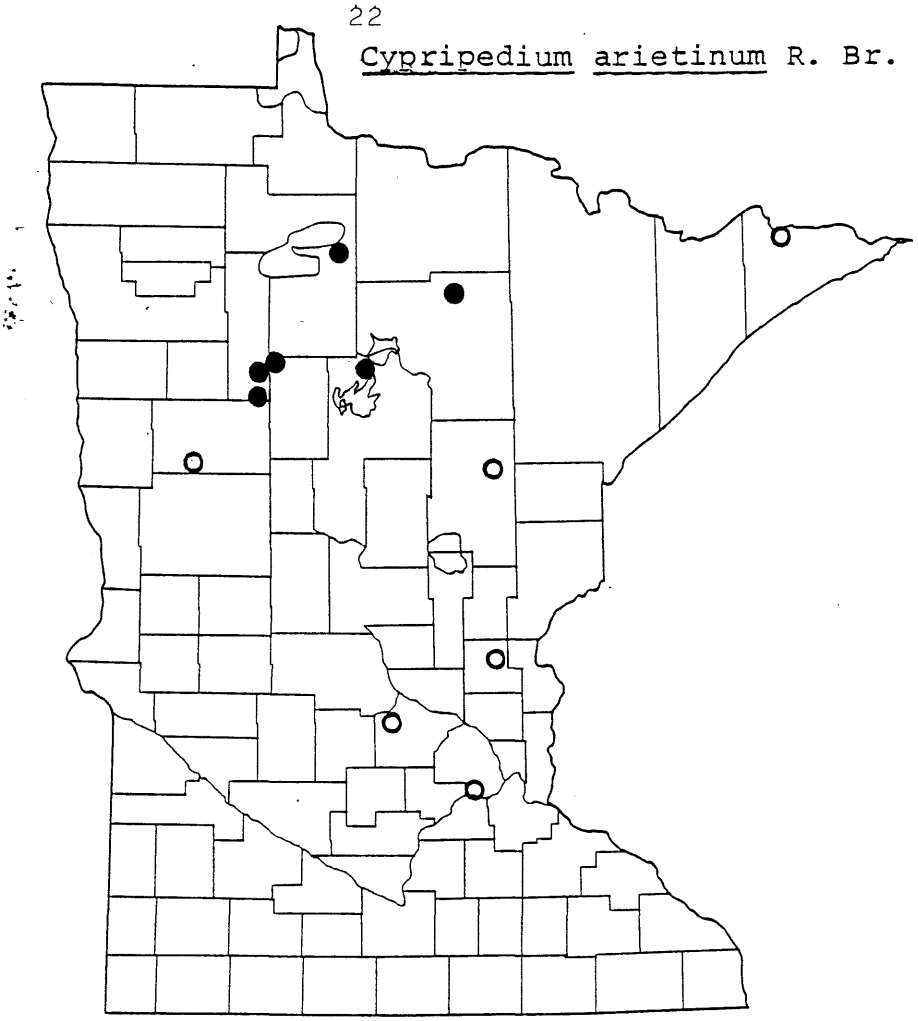
All of these habitats appear to be weakly acidic or circumneutral. Several of the sites are mineral-rich, but others are mineral-poor. The wide range of habitats occupied by the species makes it difficult to single out which factors limit its occurrence and why it is so rare.

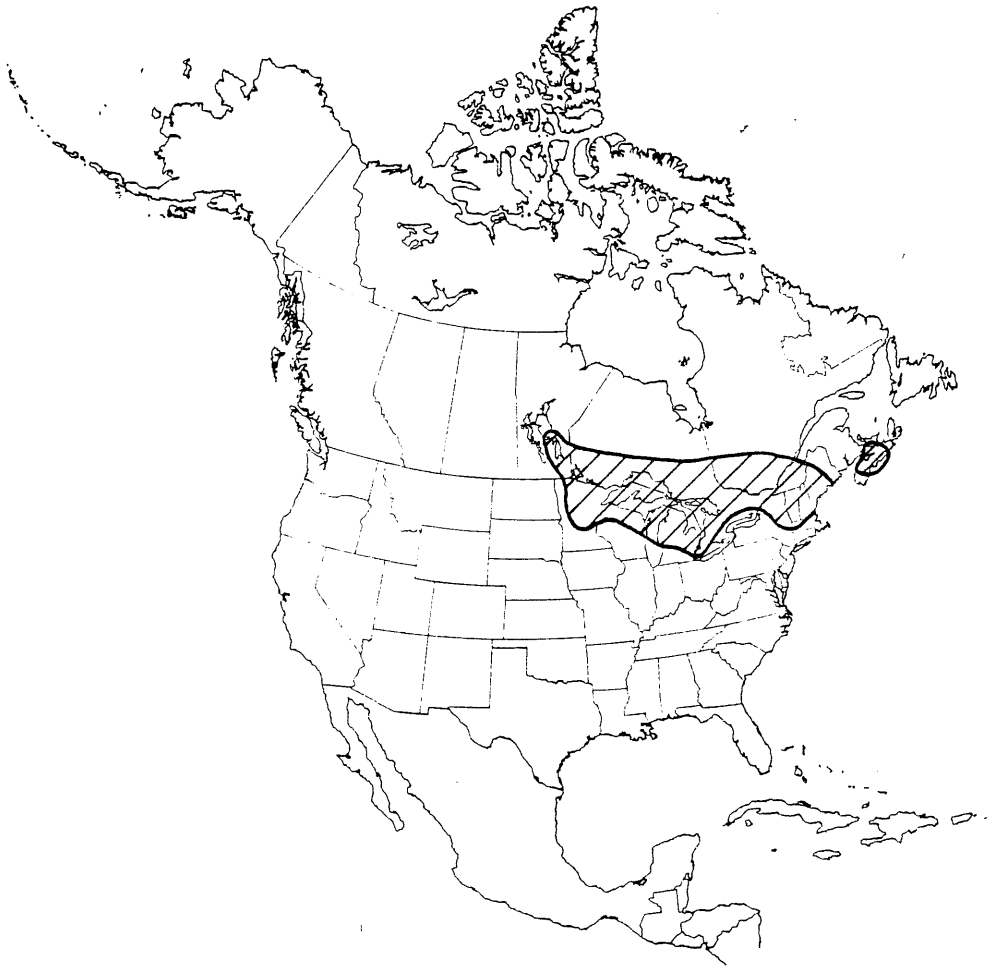
COMMENTS: Cypripedium arietinum is a very primative species and has a long history in the geological past. Evidence indicates that millions of years ago it occurred across North America and eastern Asia. All that is left of this previous distribution is the scattered remnants in eastern North America and a few populations of a vicarious counterpart in western China.

SITE SPECIFIC COMMENTS: This population was first discovered in 1974. Several plants were seen at that time, but a count was not made. The site was revisited in 1980 and only a single specimen was found. In 1984 the site was visited again, and two individuals were found. Populations of this species are known to fluctuate greatly over a period of years and casual counts of flowering plants are difficult to interpret. It is reasonable to assume that the population is well established, but existing at a fairly low number. There is no management activity that can be recommended to increase the population, but monitoring should be initiated to detect changes.

SELECTED REFERENCES: Sing-Chi, C. 1983. Two pairs of vicarious species of Cypripedium (orchidaceae) from eastern Asia and eastern North America. Brittonia, 35(2):159-163.

Cypripedium arietinum R. Br.





Malaxis paludosa (L.) Sw.

FAMILY: Orchidaceae

COMMON NAME: Bog adder's-mouth

STATE STATUS: Endangered

FEDERAL STATUS: None

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 persist 50 years after its initial discovery. Documentation spans the period between 1934 and 1984, and indicates that it has existed at the same spot throughout this period, but in numbers overaging only 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: This species was first found in the Iron Springs Bog area in 1927. The location was in section 33, just south of the present SNA boundary. This population was rediscovered in 1984 and approximately 30 plants were counted. A search was conducted within the SNA boundaries and a single plant was found. There are likely more plants within the SNA, but probably not very many. The bulk of the population certainly occurs in section 33, although there is considerable potential habitat throughout both areas. There is no management activity that can be recommended to increase the population, but monitoring or periodic searches should be instituted to detect changes.

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.