The 1979 Resource Inventory for Pennington Orchid Bog Scientific and Natural Area Beltrami County, Minnesota

NW¼ Section 3,
Township 146 North, Range 30 West
Pennington Quadrangle

Prepared by
The Scientific and Natural Areas Section
~~Division of Parks and Recreation~~
Minnesota Department of Natural Reosurces
SECTION OF FISH AND WILDLIFE

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INTRODUCTION

Scope and Organization

This report documents the information collected during a 1979 inventory of Pennington Orchid Bog. The inventory recorded information on climate, geology, hydrology, plant communities, flora, birds, mammals, amphibians, reptiles, and land use history of the natural area. Data supplied by this document will be used by the Minnesota Natural Heritage Program and other evaluators to assess the site as a potential Scientific and Natural Area (SNA). The document can also be used by scientists, educators, and others interested in the area. Should the site be designated an SNA, management plans can be written using this document as a reference.

This report is divided into five sections including: introduction, abiotic, vegetational, and zoological components, and land use history of the site. Methodologies and results are presented for each section.

The inventory of Pennington Orchid Bog was part of a larger 1979 effort in which eighteen natural areas in east central, northwest, and southeast Minnesota were surveyed. Inventory team members were: John Borowske, SNA Planning Coordinator; Cherry Keller, Karen Lustig, Deb Schowalter, and Jeff Weigel, Researcher/Writers; Kathy Bolin, Community Specialist; and Nancy Berlin, Tony Busche, Barbara Eikum, Peter Farrell, Joanne Herman, Laura Hill, Susan Ottoson, Deanna Schmidt, Marianne Severson, Angela Tornes, and James Ziegler, Researchers. Gerald Jensen, Coordinator,

Scientific and Natural Areas Program, and Mark Heitlinger, Coordinator of Preserve Management, The Nature Conservancy, Minnesota Chapter served as inventory advisors. Michael Rees, Project Editor, The Nature Conservnacy, provided editorial assistance. Other individuals who assisted in the preparation of the inventory are mentioned in the appropriate sections. Their help is gratefully acknowledged.

Description of Study Area

Pennington Orchid Bog is a 108 acre unit in southern Beltrami County, approximately 20 miles east of Bemidji, Minnesota. The area's climate is mid-continental, relatively cool and moist, with warm summers and cold winters. The tract is part of a ground moraine adjacent to extensive areas of outwash deposits. The wet, nearly level natural area is bisected by a westward flowing intermittent stream flowing into a nearby shallow lake. Poorly drained, mucky and peaty soils have formed at Pennington Orchid Bog in glacial drift under coniferous vegetation. Present vegetation is primarily White Cedar bog. Smaller Black Spruce bog and mixed upland forest areas are also present.

The flora and fauna of Pennington Orchid Bog are mostly typical of natural Minnesota communities. Species observed on the tract include: 118 vascular plants, 44 birds, 7 mammals, and 8 amphibians. The natural area lies in an area known for pulpwood and lumber production. Some selective cut logging was done on the tract prior to preservation.

Preliminary Assessment of Significance

This section lists features identified by the Minnesota Natural Heritage Program (MNHP) as potential elements[1], and identifies other aspects of the preserve believed by the authors to be important components of Minnesota's natural diversity, or which otherwise might qualify the site for SNA designation. Criteria for SNA evaluation are enumerated in "Minnesota Department of Natural Resources Policy Plan for Scientific and Natural Areas", dated July 6, 1979.

Pennington Orchid Bog is notable as a virtually undisturbed tract of native vegetation providing critical habitat for a diverse assemblage of plant species. The Small Round Leaved Orchis (Orchis rotundifolia), listed as a potential element of state significance by the Minnesota Natural Heritage Program, occurs here. Many other noteworthy plants, including at least 15 species of the family Orchidaceae, protected by Minnesota law, are found at Pennington Orchid Bog. Several vegetation types are present, represented by species such as White Cedar (Thuja occidentalis), Balsam Fir (Abies balsamea), Paper Birch (Betula papyrifera), Black Spruce (Picea mariana), Black Ash (Fraxinus nigra), and Trembling Aspen (Populus tremuloides). Noteworthy herb layer species include Showy Lady-Slipper (Cypripedium reginae), Dragon's Mouth (Arethusa bulbosa), Calypso (Calypso bulbosa), Round-Leaved Orchis (Habenaria orbiculata), One-Sided Pyrola (Pyrola secunda), Pitcher-Plant (Sarracenia purpurea), and Twinflower

1 An element is a natural feature of particular interest because it is exemplary, unique, threatened, or endangered on a national or statewide basis.

(Linnaea borealis). An unusual lichen found at Pennington Orchid Bog is Heterodermia casarettiana, a species more typical of the southeastern United States. It had previously been collected only as far north as southern Illinois (Esslinger, 1979).

ABIOTIC FACTORS

The abiotic resources of an area provide a framework necessary to the existence of all life. The role of physical factors, involving processes of climate, geology, and water is important in ecology. Biotic characters such as range, distribution, and diversity of plant and animal life are ultimately determined by potential limiting factors of the physcial environment. These factors must be considered in any analysis of the biota of a natural area.

The natural diversity of an area must be assessed in terms of abiotic as well as biotic elements. Unique physical characterisitics, such as influential hydrologic conditions or landforms illustrating geologic processes contribute to overall diversity. The preservation value of a particular area may rest wholly on its abiotic features. The following sections describing climate, geology, and hydrology are an effort to describe the abiotic setting of Pennington Orchid Bog.

CLIMATE

Methods

Climatological data were gathered by researching reports from the National Oceanic and Atmospheric Administration (NOAA), Minnesota Agricultural Experiment Station, and Soil Conservation Service (SCS). Most numerical data were obtained from the NOAA station at Bemidji approximately 20 miles west of Pennington Orchid Bog.

Regional Climate

The climate of northwestern Minnesota is typical of areas in the central part of the North American continent. Sharp seasonal contrasts in temperature and precipitation result from a lack of moderating factors, such as location near a large body of water. During summer months, southerly winds carry warm, moist air masses northward from the Gulf of Mexico, making summer the season of greatest precipitation. During winter, cold air masses invade from the north, making the winter months cold and dry.

Discussion

The mean temperature for June, July and August in the Pennington Orchid Bog area is 65^{o} F; the December, January and February mean is 7^{o} F. On the average, there are five days above 90^{o} F. in the summer and 67 days below 0^{o} F. in the winter. The average duration of the freeze-free season is 110 days. The length of the total crop season, which includes the growing period for both cool and warm season plant species, averages 180 days, (Baker and Strub, 1963b).

About 80%, or slightly less than 18 inches, of the area's annual precipitation (water equivalent) falls during the period of April through September. June is the wettest month, with numerous thunderstorms accounting for an average of 3.7 total inches of rain. Rainfall intensities of 2.0 inches per day every year, 3.6 inches per day every ten years, and 4.7 inches per day every 50 years are expected to occur. The precipitation during the winter months usually falls as snow, with an average seasonal total of 39 inches. About 135 days a year have a ground snow cover of one inch or more. Total annual precipitation exceeds total annual evaporation in the area. Prevailing winds blow from the west and southwest, except during late summer and early fall, when they shift to the south and southeast.

Damaging storms such as severe blizzards, tornadoes, and ice storms occur infrequently in the area. The occurrence of ice storms averages less than once a year. However, heavy rains, winds, and hail associated with thunderstorm squall lines occur each year. Table 1 is a summary of selected climatic data from the Bemidji area.

Sources of Information

Baker, D.G., and J.H. Strub, Jr. 1963a. Climate of Minnesota: Part I. Probability of Occurrence in Spring and Fall of Selected Low Temperatures. Minnesota Agricultural Experiment Station Tech. Bulletin 243.

_____1963b. Climate of Minnesota: Part II. The Agricultural and Minimum Temperature Free Seasons. Minnesota Agricultural Experiment Station Tech. Bulletin 245.

Baker, D.G., D.A. Haines, and J.H. Strub, Jr. 1967. Climate of Minnesota: Part V. Precipitation Facts, Normals, and Extremes. Minnesota Agricultural Experiment Station Tech. Bulletin 254.

U.S. Department of Agriculture, Soil Conservation Service. 1975. Hydrology Guide for Minnesota. St. Paul.

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_____1973. Monthly Normals of Temperature, Precipitation, and Heating and Cooling Degree Days 1941-70. Climatography of the U.S. #81. Asheville, N.C.

Table 1. Selected Weather Data for Bemidji.

TEMPERATURE	°F	°C
Mean annual temperature	37.5	3.1
Highest temperature recorded (18 August 1955)	98	36.7
Lowest Temperature recorded (21 January 1954)	-48	-53.3
Mean temperature warmest month		
Month: July	67.0	19.4
Mean daily maximum	78.9	26.1
Mean daily minimum	55.0	12.8
Mean temperature coldest month		
Month: January	1.9	-16.7
Mean daily maximum	13.6	-10.2
Mean daily minimum	-9.7	-23.2
Average date last freeze (Spring)[a]	c. 27 May	
Average date first freeze (fall)[b]	c. 16 Sept	
Average days freeze-free period[c]	110	
Average days total crop season[d]	180	

PRECIPITATION	in.	cm.
Mean annual precipitation	22.29	56.6
Mean precipitation wettest month		
Month: June	3.54	9.00
Mean precipitation driest month		
Month: February	0.40	1.00
Mean annual snowfall	39.3	99.8
Mean snowfall heaviest		
Month: January	8.4	21.3

[a]Based on Figure 3. Baker, D. G., and J. H. Strub, Jr. 1963a. Climate of Minnesota: Part I. Probability of Occurrence in Spring and Fall of Selected Low Temperatures. Minnesota Agr. Exp. Sta. Tech. Bull. 243.

[b]Based on Figure 4. Baker and Strub, 1963a.

[c]Based on Figure 16. Baker, D. G., and J. H. Strub, Jr. 1963b. Climate of Minnesota: Part II. The Agricultural and Minimum-Temperature-Free Seasons. Minnesota Agr. Exp. Tech. Bull. 245.

[d]Based on Figure 14. Baker, D. G., and J. H. Strub, Jr. 1963b. Climate of Minnesota: Part II. The Agricultural and Minimum-Temperature-Free Season Minnesota Agr. Exp. Sta. Tech. Bull. 245.

GEOLOGY

Methods

Geologic information was primarily obtained through a literature search. Field observations using topographic maps and aerial photographs aided in interpretation.

Historical Geology

Glaciation during the past two million years (the Pleistocene Epoch) has dominated development of the landscape of Minnesota. The most recent ice advances of the Wisconsin Stage of glaciation are responsible for the majority of the state's landforms. North central Minnesota was subjected to glaciation by two major ice lobes, the Wadena lobe, and the St. Louis sublobe of the Des Moines lobe, during the Wisconsin Stage. Both left characteristic deposits of grey, calcareous glacial drift.

Prior to 35,000 B.P. (years before present; Bray, 1977), the Wadena lobe advanced southeastward out of Manitoba into the Red Lakes lowland area. Before retreating, this lobe eventually covered much of west and central Minnesota about as far south as Mankato. Northward retreat of the Wadena lobe was interrupted by short readvance to the Park Rapids area about 20,000 B.P. (Wright, 1972). This produced the east-west trending Itasca moraine and a large outwash fan deposited by meltwaters flowing south out of the moraine. Continued recession left deposits of unsorted ground moraine in the Bemidji area to the north of the Itasca moraine. Many unmelted ice blocks of varying size were left behind, either partially or totally buried by till of the ground moraine. As they melted, ice block kettle basins were formed. Before the larger ice

blocks completely melted, however, new ice advances of the late Wisconsin Des Moines lobe began.

The Des Moines lobe advanced southward out of Manitoba, scouring out the Red River lowland before reaching a terminus near Des Moines, Iowa about 14,000 B.P. (Wright, 1972). The Des Moines lobe proper produced an eastward flowing component called the St. Louis sublobe, which spread across the Red Lakes lowland about as far east as the St. Louis River. Drift from this ice was deposited over Wadena lobe drift in north central Minnesota.

During the maximum extent of the St. Louis sublobe, meltwater streams fed by wasting ice formed numerous drainageways in the vicinity of Pennington Orchid Bog. Extensive deposits of outwash sands were laid down by these streams. Disjunct ice blocks of both Wadena and St. Louis age ice were scattered randomly in the outwash. Eventually they melted, forming ice block kettle basins. When the St. Louis sublobe retreated, it deposited ground moraine rather than outwash. The southern edge of the ice apparently extended as far south as Cass Lake in eastern Beltrami County (4 miles south of the natural area), based on the extent of St. Louis age ground moraine in the area (University of Minnesota, 1978). Thus, Pennington Orchid Bog lies in a flat to gently rolling ground moraine bordered by outwash deposits.

Most drainage patterns formed by St. Louis sublobe meltwaters are still followed today, although postglacial activity has modified them in some cases. Sucker Creek, a small meandering stream, originating approximately 2½ miles north of the site in Moose Lake, drains Pennington Orchid Bog into Kitchi Lake, a shallow lake of probable ice

block origin. Kitchi Lake flows into Cass Lake, which is today drained eastward by the Mississippi River. These patterns may have differed prior to St. Louis time. Nonetheless, wet conditions at the natural area today are primarily a result of drainage patterns formed in St. Louis age ground moraine and outwash by glacial meltwaters and post-glacial streams.

Topography and Bedrock

The site is flat and level nearly throughout, with no prominent relief features. Total relief is about 10 feet. Higher, better drained upland areas are found on the east side of the tract; lowest areas are located in and adjacent to Sucker Creek, which bisects the preserve.

Glacial drift deposits approximately 300 feet thick are found in the vicinity of the natural area (USGS, 1968); no bedrock outcrops are found nearby. Therefore, bedrock configurations has largely been inferred from gravity and aeromagnetic data. Volcanic rocks of probable Lower Precambrian age underlie the glacial drift. These and nearby sedimentary rocks of similar age were regionally intruded by granitic rocks during the Algoman mountain building period approximately 2.7 billion years ago. Heat and pressure associated with this period caused low grade metamorphism to occur in the volcanic and sedimentary sequences. Metavolcanic rocks such as those found under the natural area are found in complex with metasedimentary and intrusive granitic rocks throughout the northern part of the state (Sims & Morey, 1972).

Sources of Information

Allison, Ira S. 1932. The Geology and Water Resources of Northwestern Minnesota. Minnesota Geological Survey Bulletin 22. University of Minnesota, Minneapolis.

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Melchoir, Robert C. No date. Field Trip Guide to the Glacial Geology of the Bemidji Region. Bemidji State University.

Morey, G.B. 1976. Geologic Map of Minnesota. 1:3,168,000. Minnesota Geological Survey. University of Minnesota, Minneapolis.

Sims, P.K., and G.B. Morey, editors. 1972. Geology of Minnesota: A Centennial Volume. Minnesota Geological Survey. University of Minnesota, Minneapolis.

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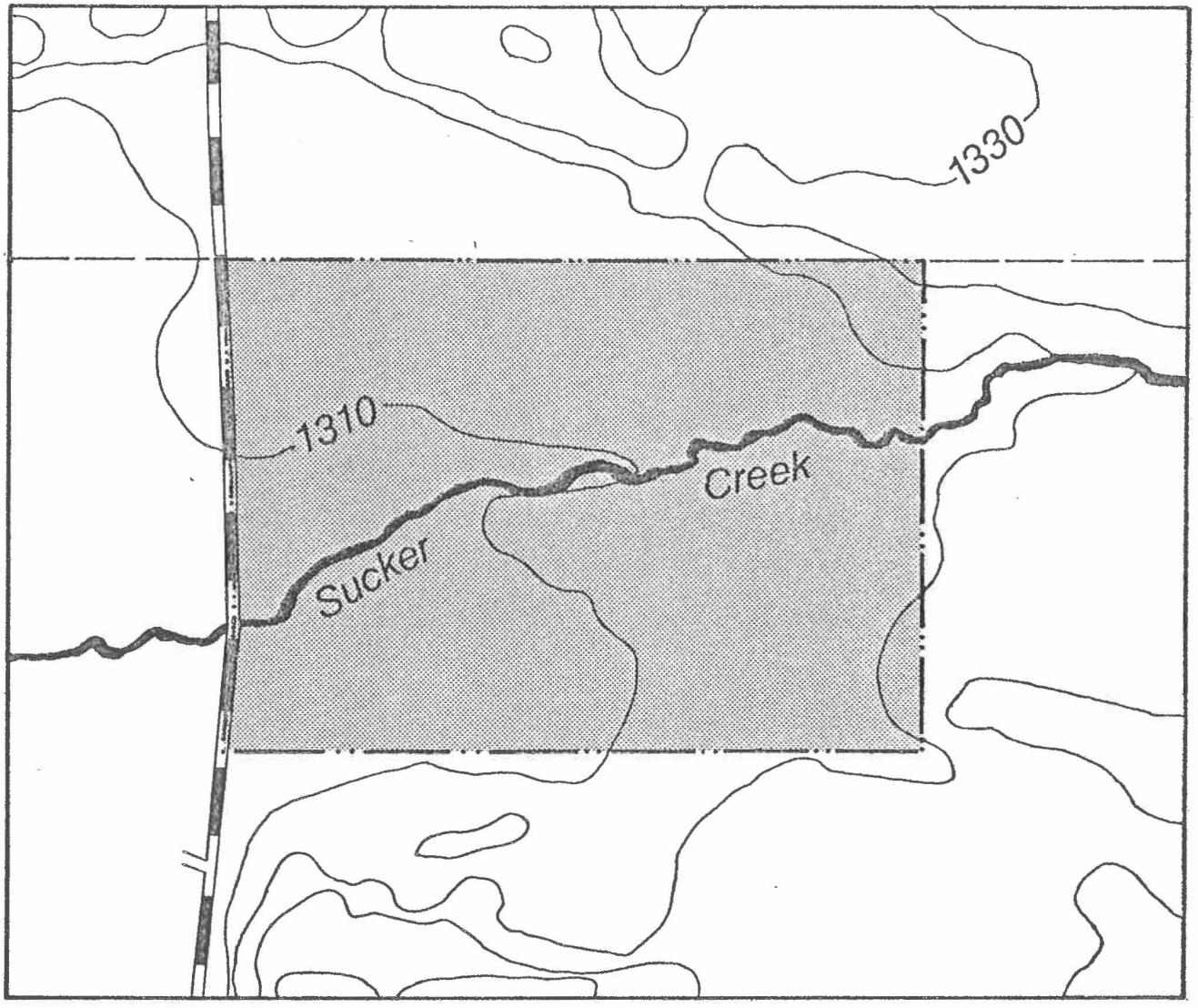

Figure 1. Topography of Pennington Orchid Bog adapted from U.S. Geological Survey - Pennington Quadrangle (1:24000) 1971.

HYDROLOGY

Methods

Hydrologic conditions of the site were investigated using topographic maps, aerial photographs, and literature sources. Field observations were also used in determining relief and drainage patterns.

Hydrology of Pennington Orchid Bog

Past geologic events associated with the most recent ice advances of the Wisconsin Stage of glaciation are primarily responsible for the hydrologic conditions present at the Pennington Orchid Bog today. Nearly level glacial ground moraine deposits are found at the natural area. The morphology of these deposits and the soils formed in them dictate the flow patterns of both surface and subsurface waters at the site. The entire preserve lies within the small Sucker Creek watershed. This watershed may be important as a storage area for large amounts of moisture as both surface and ground water.

The Pennington Orchid Bog owes its wet conditions mainly to the high water table present. Other factors possibly contributing to wetness are: damming activities by beavers (active damming was observed on and adjacent to the northeast section of the tract in 1979) and the hinderance of natural drainage flow from the site by the presence of an improved roadway on the western boundary. These and other influences, such as variation in seasonal and annual precipitation patterns, probably cause cyclic fluctuations in the water table that affect Pennington Orchid Bog's moisture regime.

Sucker Creek is shallow, fast stream with a predominantly sandy and gravelly bottom. In some areas of the preserve the stream is narrow

and bounded by steep cut banks, while in other locations the adjacent land is flat and only slightly above water level. The stream does not appear to be sediment-laden; it was clear to the bottom in all but the deepest pools in 1979. Near the southwestern boundary of the natural area Sucker Creek widens into a small marsh before passing through a culvert under a roadway.

The natural area is part of the larger upper Mississippi River watershed. Ground water flows generally southeastward towards the Mississippi from morainic uplands to the north (USGS, 1968).

Sources of Information

Minnesota Department of Natural Resources, Division of Waters. 1976. Ground Water Resources in Minnesota. Division of Waters Bulletin 27. St. Paul.

U.S. Department of the Interior. Geological Survey (USGS) 1971. Pennington Quadrangle. MN: 7.5 Minute Series Orthophotomap (Topographic). 1:24,000. Denver, Colorado.

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_____, Scientific and Natural Areas Section. 1979. Color infrared aerial photograph of Pennington Orchid Bog.

VEGETATIONAL COMPONENTS

Plants and plant communities are a major part of the ecosystems present on a natural area. Vegetation reflects the combined influences of all physical factors, and provides the primary energy source for all other living organisms. A description of the flora provides information on the natural area's diversity, as well as an understanding of the origin and recent history of the vegetation. An inventory of vegetational components was conducted to: 1) document the area's species diversity and communities, 2) obtain baseline data so changes can be discerned, and 3) identify rare, sensitive, or representative species and communities.

VEGETATIVE COMMUNITIES

Methods

Vegetative communities were mapped and described according to their cover type. Vegetation maps were produced by delineating major communities visible on aerial photographs. Recent color infrared and/or black and white photographs were used. Communities were described by walking through the area and recording the dominant (i.e., most abundant) species present based on visual estimation. It should be noted that all variations in vegetation were not distinguished on the map. Rather, major types are separated and variations within each type are discussed in the text.

Releves were conducted on selected communities to supplement field inspection and provide further information on species composition. Visual estimates were made of the abundance (% cover) of each species found in a prescribed plot. Plot locations were chosen to represent homogeneous stands of vegetation within a community type. Releves were conducted in mid-July and late August according to the methods described by Heitlinger (1979). All releve data is given in Appendix 1.

Photo points were established to give a visual description of vegetation, and to allow documentation of any future changes. All photo point slides are on file, Scientific and Natural Areas Section, St. Paul and The Nature Conservancy, Minneapolis Field Office.

Overview of Regional Plant Communities

Pennington Orchid Bog is located in the Pine Moraine landscape region (Figure 2). Prior to European settlement, this area contained

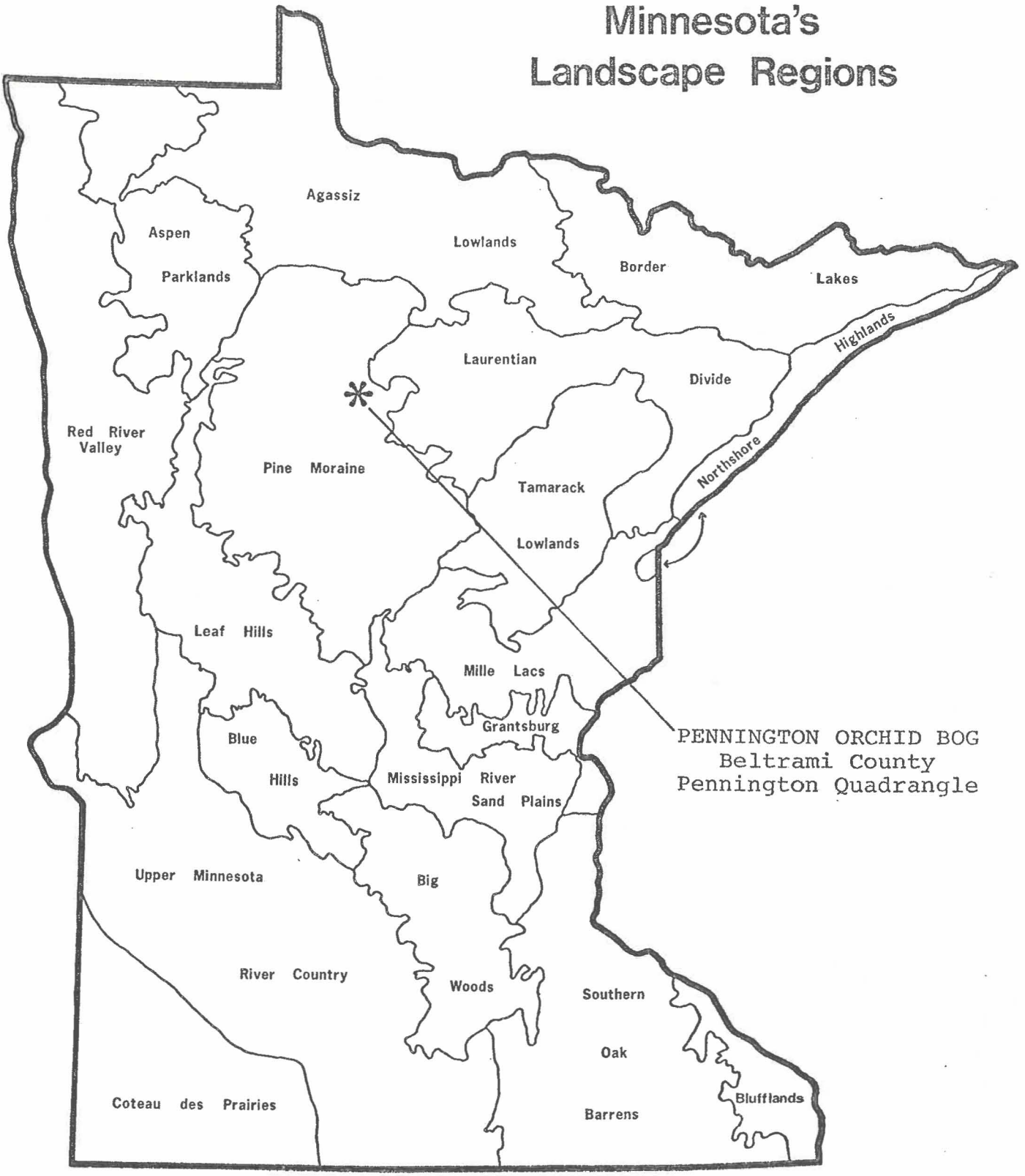


Figure 2. Pennington Orchid Bog in relation to Minnesota's landscape regions. Adapted from T. Kratz and G.L. Jensen, an ecological geographic division of Minnesota (Unpublished, 1977).

a variety of coniferous forests with hardwoods occurring on the uplands, and bogs and swamps in the lowlands. The vegetation of Pennington Orchid Bog was conifer bog, surrounded by hardwoods, marsh and pine woods (Marschner, 1930; Figure 3). Though logging has occurred in some of the surrounding areas, the conifer bog is still present on the area today.

Results

The vegetative communities of Pennington Orchid Bog are mapped in Figure 4. The area is primarily a cedar bog divided by a small creek (Sucker Creek). A section of black spruce bog occurred in the northwest corner and an area of mixed woods is found along the eastern border. A description of each community mapped is given below.

CEDAR/FIR BOG: 52 acres, 48% of preserve.

The overstory of this community is dominated by White Cedar (Thuja occidentalis) approximately 10-15 meters high. The understory consists of Balsam Fir (Abies balsamea) and/or young White Cedar. The herb layer is usually dominated by Sphagnum Moss (Sphagnum sp.) and Labrador Tea (Ledum groenlandicum), but also includes Bunchberry (Cornus canadensis), Golden Thread (Coptis trifolia), Showy Lady-Slipper (Cypreped̲ium reginae), One-Sided Pyrola (Pyrola secunda), and Naked Mitrewort (Mitella nuda).

Though the species composition is similar throughout this community, there is variation in both the density of vegetation at each strata and in dominant understory species. Most of this community has a canopy estimated at 50-75% coverage, with the majority of young Cedar and Balsm Fir less than 1 meter. However, south of the creek in the eastern half of this community the canopy is sparse, and there is a dense mixture of

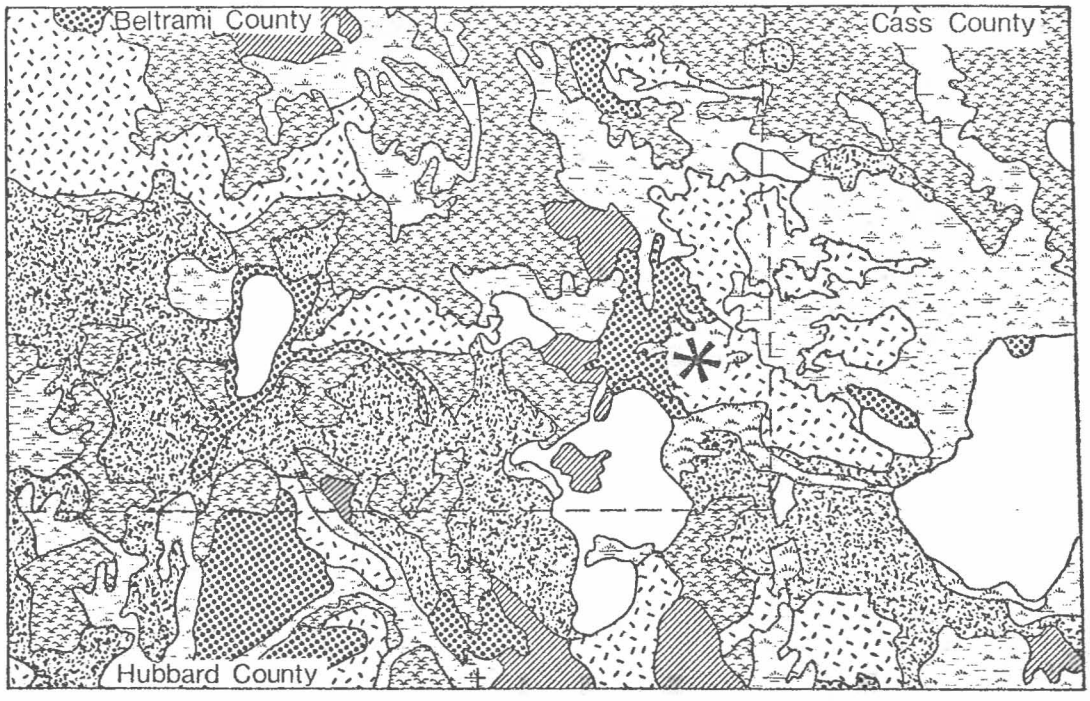
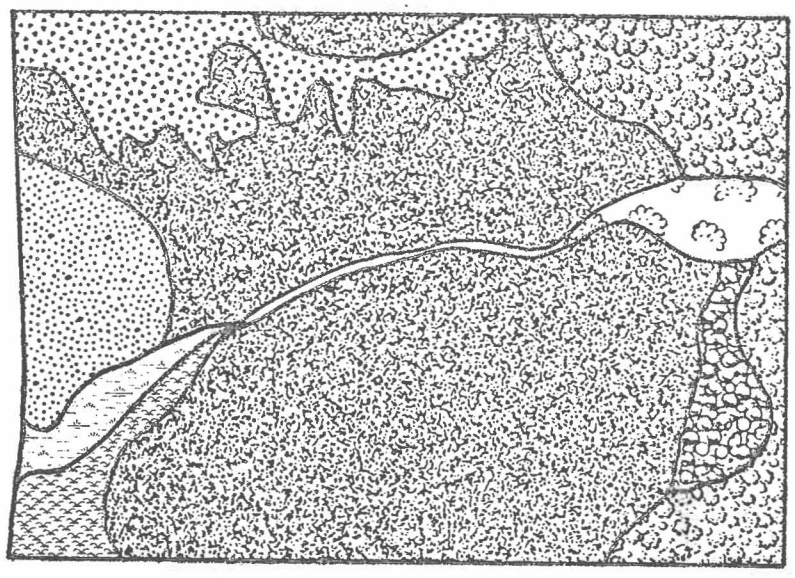


Figure 3. The original vegetation of northwest Minnesota in the vicinity of Pennington Orchid Bog. Adapted from F.J. Marschner, The Original Vegetation of Minnesota, 1:500,000.



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SCALE: 8" = 1 MILE

KEY

- Mixed Woods
- Balsam Fir Woods
- Ash Woods
- Cedar/Fir Bog
- Cedar Bog
- Black Spruce Bog
- Alder Swamp
- Marsh

Figure 4. Vegetation communities identified on Pennington Orchid Bog.

Cedar and Balsam Fir 2 meters high. The western extremes of this community on both sides of the creek supports a more extensive overstory of Cedar with only Cedar saplings present in the understory. These variations are not easily distinguished on aerial photographs and are therefore not mapped. But to the observer in the field the difference is very apparent. Source of information: field inspection.

MIXED WOODS: 16 acres, 15% of preserve.

The overstory is dominated by Balsam Fir (Abies balsamea) and Paper Birch (Betula papyrifera) with occasional White Cedars (Thuja occindentalis) present. Speckled Alder (Alnus rugosa) and Red Osier Dogwood (Cornus stolonifera) are dominant understory shrubs. Quaking Aspen (Populus tremuloides) and Bracken Fern (Pteridium aquilinum) become common on the drier sites in this community. Source of information: field inspection.

CEDAR BOG: 12 acres, 11% of preserve.

The dense canopy of this community consists of tall (15-20 m) White Cedar with occasional Black Spruce (Picea mariana) and Paper Birch (Betula papyrifera). There is a relatively clear understory with Sphagnum Moss, White Cedar and Labrador Tea dominating the herb layer (0-2 m). Some selective cutting of Cedar has occurred in the past, creating a few patches of younger Cedar stands within this community.

A variety of orchids and other bog species occur here including One-Flowered Wintergreen (Moneses uniflora), Showy Lady-Slipper (Cypreped̲ium reginae), Blunt-Leaf Orchid (Habenaria obrusata), Dwarf Rattlesnake Plantain (Goodyera repens), Green Adder's Mouth (Malaxis unifolea) and Small Round-Leaved Orchis (Orchis rotundifolia). Source of information: field inspection and releve POB-4.

BLACK SPRUCE BOG: 12 acres, 11% of preserve.

The overstory is dominated by Black Spruce (Picea mariana) and Tamarack (Larix laracina). White Cedar (Thuja occidentalis) dominates the understory from 2 -10 meters in height. The herb layer is dominated by Sphagnum Moss, (Labrador Tea (Ledum groenlandicum) Buckbean (Menyanthes trifoliata). Three-Leaved False Solomon's Seal (Smilacina trifolia), Twin Flower (Linnaea borealis), and Naked Mitrewort (Mitella nuda).

There are frequent openings in this community where Pitcher Plants (Sarracenia purpurea) and Bog Rosemary (Andromeda glaucophylla) are common. A variety of orchids occur throughout the community including the Showy Lady-Slipper (Cyprepedium reginae), Stemless Lady-Slipper (Cypredpedium acaule), Dragon's Mouth (Arethusa bulbosa), Calypso (Calypso bulbosa), Round-Leaved Orchis (Habenaria orbiculata) and Green Adder's-Mouth (Malaxis unifolea). Source of information: field inspection and releve POB-1.

ALDER SWAMP: 4 acres, 4% of preserve.

Adjacent to the marsh is an Alder swamp dominated by Speckled Alder (Alnus rugosa) 2-4 meters high, and Red Osier Dogwood (Cornus stolonifera) in the understory. Source of information: field inspection.

ASH WOODS: 4 acres, 4% of preserve.

This community occurs along the edge of the creek. Dominant over-story species are Ash (Fraxinus sp.) and Paper Birch (Betula papyrifera). The herb layer is dominated by Sedges (Carex sp.) and Ostrich Fern (Matteuccia struthiopteris) among patches of bare sand. Source of information: field inspection and releve POB-2

BALSAM FIR WOODS: 4 acres, 4% of preserve.

On the lowest portion of the slope leading to the upland woods, Balsam Fir (Abies balsamea) provides a nearly complete canopy. Ground

Pine (Lycopodium sp.), Bunchberry (Cornus canadensis), and Clintonia (Clintonia borealis) are prominent in the herb layer. Source of information: field inspection.

MARSH: 4 acres, 3% of preserve.

At the southwestern portion of the preserve, Sucker Creek broadens to a flooded marsh. Marsh Reed Grass (Calamagrostis canadensis) and Sedges (Carex sp.) dominate the center of the marsh with low Willows (Salix sp.)and Red Osier Dogwood (Cornus stolonifera) occurring on the margins. Source of information: field inspection.

Source of Information

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Heitlinger, M. 1979. Vegetation Analysis for 1979 SNA-MDNR Inventory. Unpublished report. Scientific and Natural Areas Office. St. Paul, Minnesota.

Marschner, F.J. 1930. The Original Vegetation of Minnesota. (Map). USDA. North Central Forest Exp. Sta. St. Paul.

FLORA

Methods

Pennington Orchid Bog was visited on a weekly basis, when weather conditions permitted, from 1 May to 31 August 1979. Flowering or fruiting plants and some nonvascular specimens were collected and pressed. Habitat, associated species, and collection date was recorded for all specimens. Locations of specimens were indicated on an aerial photograph of the area or grid field map.[1] Specimens were deposited at the University of Minnesota Herbarium, Botany Department, St. Paul.

A phenological record of the flowering plants was also kept. The recording began on the first visit to the area and ended on the last visit.

Plants were identified using several references (cited at the end of this section). John W. Moore, retired Associate Scientist, University of Minnesota, identified 10 specimens. Gerald Wheeler, Graduate Student, Botany Department, University of Minnesota, identified all species of the genus Carex. Dr. Gerald Ownbey, Curator of the Herbarium, University of Minnesota verified the remaining specimens. Any specimens identified in the field but not collected, are indicated as such in the list. Plants were designated alien if described as "introduced" in northeastern United States by both Fernald (1950) and Gleason and Cronquist (1963). Plants were designated possibly alien if described as "introduced" by one of these authorities and native by the other.

1 On file, Scientific and Natural Areas Section, St. Paul.

Results

Table 2 is an annotated list of the plants identified on the tract.[1] A total of 118 vascular plant species,[2] representing 39 families, and 41 nonvascular species were recorded on the unit in 1979.[3] None of these species are alien. The families with the largest number of species were: Orchidaceae with 15 species (13% of total), Cyperaceae with 10 species (8.47% of total), Rosaceae with 9 species (7.6% of total), and Ericaceae with 8 species (6.8% of total).

Figure 5 illustrates the number of species in flower on each visit to the preserve. A total of 72 species were included. The peak of blooming occurred in July.

1 Nomenclature is according to Gleason and Cronquist (1963).

2 This total does not include additional plant species identified in releve plots.

3 The following list of additional Orchid species were observed at Pennington Orchid Bog by Forest Service Biologist John Mathisen: Cypripedium calceolus var. pubescens, Cypripedium reginae form albiflora, Cypripedium arietinum, Orchis rotundifolia var. linneata, Flabenaria clavellata, Habenaria hookeri, Habenaria viridis var. bracteata, Corallorhiza striata.

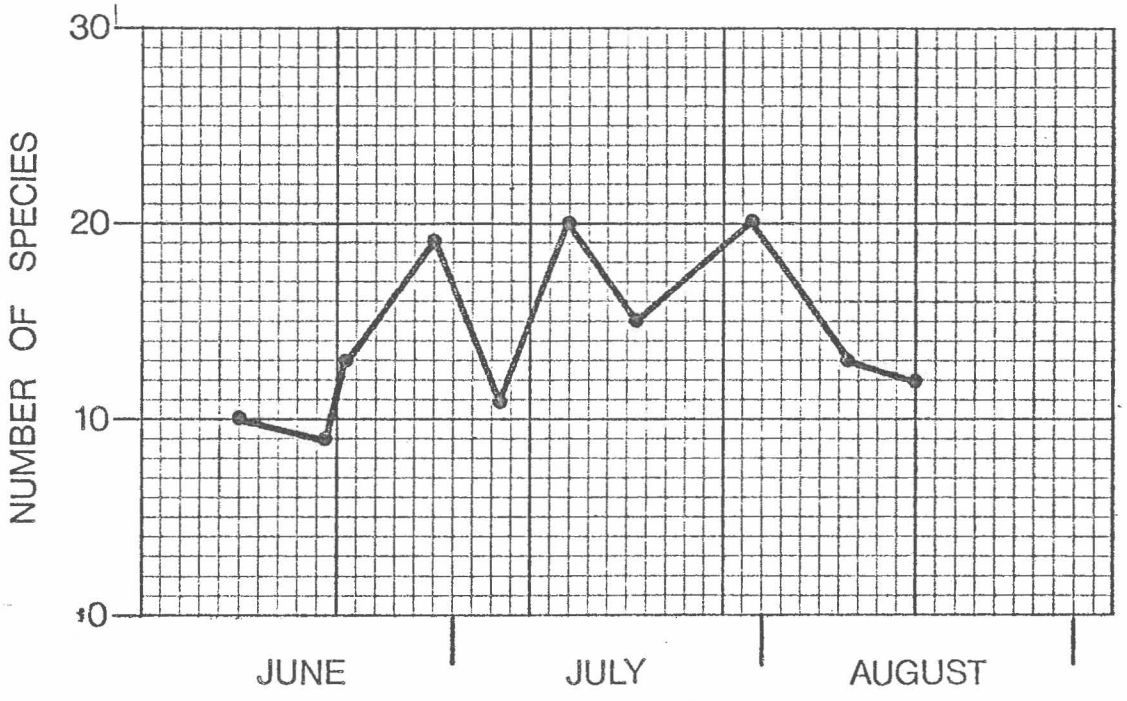

Figure 5. The 1979 blooming phenology on Pennington Orchid Bog. Graph illustrates the number of plant species blooming on each trip to the preserve.

Table 2., Annotated List of Plants for Pennington Orchid Bog.

Format: Scientific name. Common name. Collection number of voucher specimen. Community in Pennington Orchid Bog. Designated "alien" or "possible alien" if not native to Minnesota. Special significance of collection, if known. A (+) indicates a species was noted but not collected. Asterisk (*) if specimen was identified by John Moore. Species of the genus Carex were identified by Gerald Wheeler, all other specimens were verified by Dr. Gerald Ownbey.

PTERIDOPHYTA - Spore-Bearing Plants

OPHIOGLOSSACEAE - Adder's Tongue Family
Botrychium virginianum (L.) Sw. - Rattlesnake Fern. #131. Mature Cedar Bog.

POLYPODIACEAE - Polypody Family
Cystopteris bulbifera (L.) Bernh. - Bladder-Fern. #129. Cedar Bog.
Gymnocarpium robertianum (Hoffm.) Newm. - Oak Fern. #127. Cedar Bog.
Thelypteris palustris Schott. - Marsh Fern. #120. Cedar Bog.

SPERMATOPHYTA - Seed Plants

GYMNOSPERMAE - Gymnosperms

CUPRESSACEAE - Cypress Family
Thuja occidentalis L. - White Cedar. #81. Cedar Bog.

PINACEAE - Pine Family
Abies balsamea (L.) Mill. - Balsam Fir. #83. Mixed Coniferous Bog.
Larix laricina (DuRoi) K. Koch. - Tamarack. #82. Tamarack/Cedar Bog.
Picea mariana (Mill.) BSP. - Black Spruce. +

TAXACEAE - Yew Family
Taxus canadensis Marsh. - American Yew. #11. Cedar Bog.

ANGIOSPERMAE - Angiosperms

MONOCOTYLEDONEAE - Monocots

ARACEAE - Arum Family
Arisaema triphyllum (L.) Schott. - Jack in the Pulpit. #15. Wet Woods.

CYPERACEAE - Sedge Family
Carex disperma Dew. - Soft-Leaved Sedge. #4851. Moist Cedar Swamp.
Carex gynocrates Wormsk. - Northern Bog Sedge. #125. Cedar Bog.
Carex hystericina Muhl. - Porcupine Sedge. #134. Cedar Bog.
Carex interior Bailey. - Inland Sedge. #101. Cedar Bog.

Carex intumescens Rudge. (C. intumescens Rudge. var fernaldii Bailey. in Fernald, 1950) - Bladder Sedge. #76. Cedar Bog.
Carex leptalea Wahlenb. - Bristle-Stalked Sedge. #4855.
Carex paupercula Michx. - Bog Sedge. #122. Opening in Cedar Bog.
Carex retrorsa Schwein. - Retrorse Sedge. #76. Cedar Bog.
Eriophorum angustifolium Honck. - Cotton Grass. #103. Cedar Bog.
Scirpus atrovirens Willd. (S. adrovirens Willd. var georgianus (Harper) Fern. in Fernald, 1950) - Georgian Bulrush. #157. Stream Edge in Cedar Bog.

IRIDACEAE - Iris Family
Iris versicolor L. - Blue Flag. #46. Stream Edge in Cedar Bog.

JUNCACEAE - Rush Family
Luzula acuminata Raf. - Wood Rush. #10. Cedar Bog. *
Luzula campestris (L.) DC. var multiflora (Ehrh.) Celak. (L. multiflora L. in Fernald, 1950) - Wood Rush. #3. Moist Woods.

LILIACEAE - Lily Family
Clintonia borealis (Ait.) Raf. - Clintonia. #84. Cedar Bog.
Maianthemum canadense Desf. - Wild Lily-of-the-Valley. #30. Cedar Bog.
Smilacina trifolia (L.) Desf. - Three-Leaved False Solomon's Seal. #25. Bog.
Steptopus amplexifolius (L.) DC. (S. amplexifolius (L.) DC. var. denticulatus Fassett. in Fernald, 1950) - Twisted Stalk. #141. Cedar Bog. *
Streptopus roseus Michx. - Twisted Stalk. #71. Cedar Bog.
Trillium cernuum L. - Nodding Trillium. #14. Cedar - Balsam Fir Bog.

ORCHIDACEAE - Orchid Family
Arethusa bulbosa L. - Dragon's Mouth. #39. Cedar Bog.
Calopogon pulchellas (Sw.) R. Br. - Grass Pink. #88. Cedar Bog.
Calypso bulbosa (L.) Oakes. - Calypso. #4. Cedar Bog.
Corallorhiza trifida Chat. - Northern Coral-Root. #22. Cedar Bog.
Cypripedium acaule Ait. - Stemless Lady-Slipper. #26. Cedar Bog.
Cypripedium calceolus L. (C. calceolus L. var parviflora (Salisb.) Fern. in Fernald, 1950) - Yellow Lady-Slipper. #36. Cedar Bog.
Cypripedium reginae Walt. - Showy Lady-Slipper. #56. Opening in Cedar Bog.
Goodyera repens (L.) R. Br. - Dwarf Rattlesnake Plantain. #142. Cedar Bog.
Habenaria dilatata (Pursh) Hook. - Tall White Orchid. #166. Cedar Bog.
Habenaria hyperborea (L.) R. Br. - Tall Leafy Green Orchid. #77. Cedar Bog.
Habenaria obrusata (Pursh) Richards. - Blunt-Leaf Orchid. #86. Cedar Bog.
Habenaria orbiculata (Pursh) Torr. - Round-Leaved Orchis. #114. Opening in Cedar Bog.
Listera cordata (L.) R. Br. - Heart-Leaved Twayblade. #6. Cedar Bog.
Malaxis unifolea Michx. - Green Adder's Mouth. #113. Opening in Cedar Bog.
Orchis rotundifolia Banks. - Small Round-Leaved Orchis. #38. Cedar Bog. Potential Heritage Element.

POACEAE - Grass Family
Calamagrostis canadensis (Michx.) Beauv. - Blue-Joint. #133. Cedar Bog.
Calamagrostis inexpansa Gray. - Northern Reed Grass. #123. Cedar Bog.
Elymus virginicus L. - Virginia Wild Rye. #158. Stream Edge in Cedar Bog. *
Glyceria striata (Lam.) Hitchc. - Fowl Manna Grass. #60. Cedar Bog. *
Poa palustris L. - Fowl Meadow Grass. #130. Mature Cedar Bog. *

DICOTYLEDONEAE - Dicots

APIACEAE - Parsley Family
Cicuta maculata L. - Water Hemlock. #73. Tamarack Swamp.
Osmorhiza claytoni (Michx.) Clarke. - Sweet Cicely. #163. Moist Woods.
Sium suave Walt. - Water-Parsnip. #149. Stream Edge.

ARALIACEAE - Ginseng Family
Aralia naudicaulis L. - Wild Sarsaparilla. #92. Cedar Bog.
Aralia racemosa L. - Spikenard. #78. Cedar Bog.

ARISTOLOCHIACEAE - Birthwort Family
Asarum canadense L. - Wild Ginger. #16. Cedar Bog.

ASTERACEAE - Composite Family
Aster lateriflorus (L.) Britt. - Calico Aster. #160. Stream Edge in Cedar Bog.
Aster puniceus L. - Purple Stemmed Aster. #154. Stream Edge in Cedar Bog.
Cirsium muticum Michx. - Swamp Thistle. #156. Stream Edge in Cedar Bog.
Erigeron philadelphicus L. - Common Fleabane. #109. Stream Edge in Cedar Bog.
Eupatorium maculatum L. - Joe-Pye Weed. #145. Cedar Bog.

BALSAMINACEAE - Touch-Me-Not Family
Impatiens biflora Walt. - Touch-Me-Not. #148. Stream Edge.

BETULACEAE - Birch Family
Alnus rugosa (DuRoi) Spreng. - Speckled Alder. #981. Clearing in Cedar Bog.
Betula papyrifera Marsh. - Paper Birch. #97. Stream Edge.
Betula pumila L. Swamp-Birch. #63. Cedar Bog.

CAMPANULACEAE - Harebell Family
Campanula aparinoides Pursh. - Marsh Bellflower. #112. Opening in Cedar Bog.

CAPRIFOLIACEAE - Honeysuckle Family
Diervilla lonicera Mill. - Northern Bush Honeysuckle. #94. Balsam Fir-Cedar Bog.
Linnaea borealis L. - Twinflower. #51. Cedar Bog.
Lonicera canadensis Marsh. Fly Honeysuckle. #8. Cedar Bog.
Lonicera oblongifolia (Goldie) Hook. Fly Honeysuckle. #137. Clearing in Cedar Bog.
Lonicera villosa (Michx.) R. & S. - Northern Honeysuckle. #65. Cedar Bog.

Viburnum opulus L. - High-Bush Cranberry. #48. Cedar Bog.

CARYOPHYLLACEAE - Pink Family
Stellaria longifolia Muhl. - Large-Leaved Chickweed. #58. Cedar Bog.

CORNACEAE - Dogwood Family
Cornus canadensis L. - Bunchberry. #29. Cedar Bog.
Cornus stolonifera Michx. - Red Osier Dogwood. #47. Cedar Bog.

DROSERACEAE - Sundew Family
Drosera rotundifolia L. - Round-Leaved Sundew. #118. Opening in Cedar Bog.

ERICACEAE - Heath Family
Ledum groenlandicum Oeder. - Labrador-Tea. #20. Cedar Bog.
Moneses uniflora (L.) Gray. - One-Flowered Wintergreen. #68. Mature Cedar Bog.
Monotropa uniflora (L.) Gray. - Indian Pipe. #144. Cedar Bog.
Pyrola asarifolia Michx. - Pink Pyrola. #87. Cedar Bog.
Pyrola secunda L. - One-Sided Pyrola. #90. Clearing in Young Cedar Bog.
Pyrola virens Schweigg. - Greenish-Flowered Pyrola. #93. Dense Balsam Fir Woods.
Vaccinium angustifolium Ait. - Blueberry. #139. Cedar Bog.
Vaccinium oxycoccos L. - Small Cranberry. #85. Cedar Bog.

FABACEAE - Bean Family
Amphicarpa bracteata (L.) Fern. - Hog Peanut. #150. Stream Edge.

GENTIANACEAE - Gentian Family
Halenia deflexa (Sm.) Griseb. var deflexa. - Spurred Gentian. #89. Clearing in Cedar Bog.
Menyanthes trifoliata L. - Buckbean. #19. Cedar Bog.

LAMIACEAE - Mint Family
Lycopus uniflorus Michx. - Bugleweed. #146. Young Cedar Bog.
Mentha arvensis L. - Wild Mint. #151. Stream Edge in Cedar Bog.
Scutellaria lateriflora L. - Mad Dog Skullcap. #147. Stream Edge in Cedar Bog.
Stachys palustris L. - Woundwort. #153. Stream Edge in Cedar Bog.

OLEACEAE - Olive Family
Fraxinus pennsylvanica Marsh. - Green Ash. #105. Stream Edge.

ONAGRACEAE - Evening-Primrose Family
Circaea alpina L. - Enchanter's Nightshade. #40. Cedar Bog.

POLYGALACEAE - Milkwort Family
Polygala paucifolia Willd. - Flowering Wintergreen. #13. Cedar Bog.

PRIMULACEAE - Primrose Family
Lysimachia ciliata L. - Fringed Loosestrife. #99. Clearing in Cedar Bog.

Lysimachia thyrsiflora L. - Tufted Loosestrife. #43. Stream Edge in Cedar Bog.
Trientalis borealis Raf. - Starflower. #17. Cedar Bog.

RANUNCULACEAE - Crowfoot Family
Actaea rubra (Ait.) Willd. - Baneberry. #72. Cedar Bog.
Anemone canadensis L. - Canada Anemone. #41. Cedar Bog.
Caltha palustris L. - Marsh Marigold. #27. Cedar Bog.
Hepatica americana (DC.) Ker. - Round-Lobed Hepatica. #1. Moist Mixed Woods.
Ranunculus abortivus L. - Small-Flowered Crowfoot. #54. Cedar Bog.
Ranunculus gmelini DC. var. hookeri (D. Don) Benson. - Small Yellow Water Crowfoot. #32. Stream Through Cedar Bog. *
Ranunculus recurvatus Poir. - Hooked Buttercup. #52. Cedar Bog.

RHAMNACEAE - Buckthorn Family
Rhamnus alnifolius L'Her. - Alder-Leaved Buckthorn. #45. Cedar Bog.

ROSACEAE - Rose Family
Amelanchier canadensis (L.) Medic. (A. intermedia Spach. in Fernald, 1950) - Intermediate Juneberry. #116. Opening in Cedar Bog. *
Fragaria vesca L. - Wood Strawberry. #53. Cedar Bog.
Fragaria virginiana Duchesne. - Wild Strawberry. #18. Cedar Bog.
Geum alepicum Jacq. var. strictum (Ait.) Fern. - Yellow Avens. #75. Moist Woods.
Potentilla palustris (L.) Scop. - Marsh Cinquefoil. #164. Stream Edge in Cedar Bog.
Prunus virginiana L. - Choke-Cherry. #106. Cedar Bog.
Rubus acaulis Michx. - Arctic Raspberry. #24. Cedar Bog.
Rubus strigosus Michx. - Red Raspberry. #31. Cedar Bog.
Spirea alba DuRoi. - Meadow Sweet. #44. Cedar Bog.

RUBIACEAE - Madder Family
Galium labradoricum (Wieg.) - Labrador Marsh Bedstraw. #50. Cedar Bog. *
Galium triflorum Michx. - Sweet-Scented Bedstraw. #67. Cedar Bog.

SALICACEAE - Willow Family
Populus balsamifera L. - Balsam Popular. #42. Edge of Stream in Cedar Bog.
Salix discolor Muhl. - Pussy-Willow. #61. Cedar Bog.
Salix pedicellaris Pursh. - Bog-Willow. #64. Cedar Bog.

SARRACENIACEAE - Pitcher-Plant Family
Sarracenia purpurea L. - Pitcher-Plant. #37. Cedar Bog.

SAXIFRAGACEAE - Saxifrage Family
Mitella nuda L. - Naked Mitrewort. #21. Cedar Bog.
Parnassia glauca Raf. - Grass of Parnassus. #143. Opening in Cedar Bog.
Ribes americanum Mill. - Wild Black Currant. #35. Cedar Bog.
Ribes glandulosum Grauer. - Skunk Currant. #74. Cedar Bog.
Ribes hirtellum Michx. - Swamp Gooseberry. #115. Cedar Bog.

Ribes hudsonianum Richards. - Wild Black Currant. #104. Cedar Bog. *
Saxifraga pensylvanica L. - Swamp Saxifrage. #49. Cedar Bog.

SCROPHULARIACEAE - Figwort Family
Mimulus ringens L. - Square Stemmed Monkey Flower. #155. Stream Edge in Cedar Bog.

VIOLACEAE - Violet Family
Viola pallens (Banks) Brainerd. - Northern White Violet. #9. Stream Edge in Cedar Bog. *

The following list of additional plant species were identified on releve plots. Voucher specimens were not collected.

ANACARDIACEAE
Rhus radicans

BETULACEAE
Corylus americana
Betula glandulosa

CAPRIFOLIACEAE
Viburnum opulus

CORNACEAE
Cornus racemosa

ERICACEAE
Andromeda glaucophylla

FAGACEAE
Quercus macrocarpa

OLEACEAE
Fraxinus rugra

POLYPODIACEAE
Matteuccia struthiopteris

RANUNCULACEAE
Coptis trifolia
Thalictrum dioicum
Thalictrum dasycarpum

ROSACEAE
Prunus serotina
Rubus pubescens

RUBIACEAE
Galium boreale

SAXIFRAGACEAE
Ribes cynosbati

ULMACEAE
Ulmus rubra

VIOLACEAE
Vida pubescens

VITACEAE
Vitis cf. vulpina

The following nonvascular plant species were collected by Calvin R. Sperling, Scientific and Natural Areas volunteer and Dr. Ted Esslinger, Professor, North Dakota State University. Voucher specimens were deposited in the University of Minnesota herbarium, Botany Department, St. Paul, Minnesota.

BRYOPHYTES

Aulocomnium palustre (Hedw.) Schwaegr. #B749
Climacium dendroides (Hedw.) Web. & Mohr
Dicranum polysetum Sw. #753
Dicranum sp.
Frulania sp. #7002
Hylocomnium splendens (Hedw.) BSG #6996
Mnium sp. #7012
Orthotrichum sp.
Platygyrium repens (Brid.) BSG #7022
Polytrichum juniperinum Hedw.
Rhytideadelphus triquetrus (Hedw.) Warnst. #755
Sphagnum capillifolium (Weiss) Schrank #647
Sphagnum centrale C. Jens. #B645
Sphagnum girgensohnii Russ.
Sphagnum wulfianum Girg. #B644
Thuidium sp. #7008

LICHENS

Bacidia sabuletorum (Schreb.) Lett. #7010
Cetraria halei Culb. #784
Cladina rangiferina (L.) Harm. #7013
Cladonia coniocraea (Flk.) Spreng. #6993
Cladonia gracilis (L.) Willd. #6987
Cladonia sp. #6997
Evernia mesomorpha Nyl. #782
Heterodermia casarettiana (Mass.) Trev. #7011
Hypogymnia physodes (L.) Nyl. #7018
Leptogium corticola Tayl. #7017
Parmelia rudecta Ach. #7014
Parmelia saxatilis (L.) Ach. #B769
Parmelia squarrosa Hale #6985
Parmelia subrudecta Nyl. #7023
Parmelia sulcata Tayl. #7024
Peltigera canina (L.) Willd.
Peltigera leucophlebia (Nyl.) Gyeln. #6991
Peltigera membranacea (Ach.) Nyl. #7005
Peltigera polydactyla (Neck.) Hoffm. #6986
Physconia sp. #7021
Pseudoparmelia baltimorensis (Gyel. & For.) Hale #7025
Pseudoparmelia caperata (L.) Hale #7000
Ramalina sp. #B790
Usnea cavernosa Tuck. #6989
Usnea sp. #B793

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Britton, N.L. and H.A. Brown. 1970. An Illustrated Flora of the Northern United States and Canada. Dover Publications, Inc. New York. 3 vols.

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Gleason, H.A. and A. Cronquist. 1963. Manual of Vascular Plants of Northeastern United States and Adjacent Canada. D. Van Nostrand Co., New York.

McGregor, R.L., coordinator and T.M. Barkley, editor. 1977. Atlas of the Flora of the Great Plains. Iowa State University Press, Ames.

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Rosendahl, Carl O. 1975. Trees and Shrubs of the Upper Midwest. University of Minnesota Press, Minneapolis.

Stevens, O.A. 1963. Handbook of North Dakota Plants. North Dakota Institute for Regional Studies, Fargo, N.D.

U. S. Department of Agriculture Soil Conservation Service. 1968. Key to the Native Perennial Grasses - Midwest Region East of the Great Plains. Abstracted from Hitchcock's Manual of the Grasses.

ZOOLOGICAL COMPONENTS

Animals are an important part of virtually all of Minnesota's natural areas. Their diversity is determined by both abiotic and vegetational components of the environment. Reciprocally, the zoological components may have a limited effect on the vegetational and abiotic resources of an area; seed dispersal, soil aeration, and water levels, for example, are often influenced by animals. In addition, certain animal species, by their presence or absence, are considered ecological indicators that provide information on changes occurring in the area. An inventory of birds, mammals, amphibians, and reptiles was conducted to: 1) document the area's species diversity, 2) obtain baseline data so changes can be discerned, and 3) identify rare, sensitive, or representative species and communities.

BIRDS

Methods

A bird census was made by walking through the area approximately once a week from 21 May to 19 July. Species identification was based on visual observations, songs, and/or nest characteristics. Locating nests was done on an incidental basis throughout the field season.

Results

The results of the 1979 bird inventory are presented in the form of an annotated list, Table 3. Forty-four species of birds, representing 19 families, were observed on, above, or adjacent to Pennington Orchid Bog. One species was found nesting on the area.[1]

Sources of Information

Harrison, Hal H. 1975. A Field Guide to Birds' Nests, Peterson Field Guide Series #21. Houghton Mifflin Company, Boston.

Pettingill, Olin Sewall Jr. 1970. Ornithology in Laboratory and Field. Burgess Publishing Company, Minneapolis.

Robbins, Chandler S., B. Bruun, H.S. Zim. 1966. Birds of North America. Golden Press, New York.

Robbins, Chandler S. 1978. Census Techniques for Forest Birds. Proceedings of the Workshop Management of Southern Forests for Non-game Birds. U.S. Department of Ag. Forest Service General Technical Report SE-14:142-163.

Additional Sources of Information

Peterson Field Guide. A Field Guide to Bird Songs. Eastern and Central North America. 1971. Houghton Mifflin Company, Boston.

Sounds of Nature Series. Vol IV Warblers, Vol VI Finches, Federation of Ontario Naturalists.

1 Additional information, in the form of field data sheets and secondary sources, is on file, Scientific and Natural Areas Section, St. Paul.

Key to Table 3

FAMILY/SCIENTIFIC NAME: Names are in phylogenetic order, according to Green and Janssen, 1975.

DATE: Date of first observation.

HABITAT: All habitats where a given species was observed are listed.

StMB - Stream through mixed bog
Mh - Marsh
St - Stream
MiWo - Mixed Woods
CB - Cedar Bog
AsWo - Aspen Woods
CoB - Coniferous Bog
C/SB - Cedar/Spruce Bog
AlSw - Alder Swamp

RESIDENCY: Represents a basic breakdown based on breeding populations in Minnesota (Green and Janssen, 1975).

M - Migrant
P - Permanent Resident
S - Summer Resident
WV - Winter Visitant

BREEDING STATUS:

● - Positive Nesting - nest with eggs, adult sitting on nest constantly, or eggshells near nest; young in nest; downy young or young still unable to fly seen away from nest (Green and Janssen, 1975).

O - Inferred Nesting - adults seen building nest, in distraction display, carrying fecal sac, or carrying food; fledglings seen in area (Green and Janssen, 1975).

◍ - Inferred Breeding - based on the Point Count Method (Robbins, 1978), a minimum of two noncontemporaneous occurrences of a species at a given observation station.

TABLE 3. ANNOTATED LIST OF BIRDS OBSERVED AT PENNINGTON ORCHID BOG

FAMILY/SCIENTIFIC NAME	COMMON NAME	DATE	HABITAT	RESI-DENCY	BREEDING STATUS	REMARKS
GAVIIDAE						
Gavia immer	Common Loon	28 June		S		Observed Flying
ARDEIDAE						
Ardea herodias	Great Blue Heron	21 May	StMB	S	•	Nest 5/21
Botaurus lentiginosus	American Bittern	21 May		S		
ANATIDAE						
Anas platyrhynchos	Mallard	21 May	Mh St	S		
Aix sponsa	Wood Duck	28 June		S		Observed Flying
ACCIPITRIDAE						
Buteo platypterus	Broad-Winged Hawk	21 May	MiWo CB	S		
TETRAONIDAE						
Bonasa umbellus	Ruffed Grouse	21 May	MiWo	P		
SCOLOPACIDAE						
Capella gallinago	Common Snipe	21 May	Mh	S		
STRIGIDAE						
Strix varia	Barred Owl	20 June	CB	P		
PICIDAE						
Dendrocopus villosus	Hairy Woodpecker	28 June	AsWo StCB	P		
TYRANNIDAE						
Myiarchus crinitus	Great Creasted Flycatcher	28 June	StCB	S		
Sayornis phoebe	Eastern Phoebe	21 May	StCB	S		
CORVIDAE						
Cyanocitta cristata	Blue Jay	21 May	StCB	P		
Corvus brachyhnchos	Gray Jay	21 Sept	CB	P		

TABLE 3 (Continued) ANNOTATED LIST OF BIRDS OBSERVED AT PENNINGTON ORCHID BOG

FAMILY/SCIENTIFIC NAME	COMMON NAME	DATE	HABITAT	RESI-DENCY	BREEDING STATUS	REMARKS
PARIDAE						
Parus huatricapillus	Black-Capped Chickadee	12 July	CB	P		
Parus hudsonicus	Boreal Chickadee	5 July	StCB	P		
SITTIDAE						
Sitta carolonensis	White-Breasted Nuthatch	21 May	StCB	P		
Sitta canadensis	Red-Breasted Nuthatch	28 June	CB	P		
CERTHIIDAE						
Certhia familiaris	Brown Creeper	21 May	StCB	M		
TROGLODYTIDAE						
Troglodytes troglodytes	Winter Wren	30 June	CB	S		
Cistothorus platensis	Short-Billed Marsh Wren	28 June	Mh	S		
MIMIDAE						
Dumetella carolinensis	Gray Catbird	21 May	CB	S		
TURDIDAE						
Turdus migratorius	American Robin	20 June	CB	S		
Catharus guttatus	Hermit Thrush	28 June	C/SB			
Catharus ustulatus	Swainson's Thrush	21 May	MiWo	S		
Catharus fuscescens	Veery	28 June	CB	S		
VINEONIDAE						
Vineo olivaceus	Red-Eyed Vineo	28 June	AsWo MiWo	S		
PARULIDAE						
Mniotitia varia	Black-and White Warbler			S		
Vermivora chrysoptera	Golden-Winged Warbler	28 June	AlSw	S		
Vermivora ruficapilla	Nashville Warbler	21 May	StCB	S		
Parula americana	Northern Parula	28 June	CB	S		
Dendroica petechia	Yellow Warbler	5 July	AlSw	S		
Dendroica magnolia	Magnolia Warbler	21 May	MiWo	S		

TABLE 3 (Continued) ANNOTATED LIST OF BIRDS OBSERVED AT PENNINGTON ORCHID BOG

FAMILY/SCIENTIFIC NAME	COMMON NAME	DATE	HABITAT	RESI-DENCY	BREEDING STATUS	REMARKS
PARULIDAE Con't.						
Dendroica Coronata	Yellow-Rumped Warbler	21 May	MiWo	S		
Dendroica vinens	Black-Throated Green Warbler	21 May	StCB	S		
Dendroica pensylvanica	Chestnut-Sided Warbler	28 June	CB	S		
Seiurus aurocapillus	Ovenbird	28 June	MiWo	S		
Oporornis philadelpha	Mourning Warbler	28 June	SB	S		
Geothlypis trichas	Common Yellowthroat	21 May	Mh	S		
Wilsonia pusilla	Wilson's Warbler	21 May	CB	S		
Setophaga ruticilla	American Redstart	21 May	StCB MiWo	S		
FRINGILLIDAE						
Spizella pasevina	Chipping Sparrow	12 July	CB	S		
Zonotorchia albicollis	White-Throated Sparrow	21 May	CB AsWo	S		
Melospiza georgiana	Swamp Sparrow	28 June	AlSw	S		

MAMMALS

Methods

Mammals were identified by sight, track, sound and collection. Collection tools used were drift fences, live and snap traps. The 1979 mammal inventory was conducted late in the summer; incidental observations were made throughout the summer.

The mammal inventory was conducted over a three day period during which traps were set and scent stations were made. A trapline was set in each of the major habitat types. Each line consisted of 15 Museum Special snap traps and five Sherman live traps set approximately 8 m. apart. Traps were baited with a peanut butter and oatmeal mixture. Victor Pocket Gopher traps were set in gopher mounds. The drift fences used during the amphibian and reptile inventory were reopened. Scent stations, 1 m. diameter, were established on mounds of soil excavated by pocket gophers. Artificial scent was placed in the center of these stations.

Traps and scent stations were checked once daily over a three day trapping period. The specimens were collected for measurements and identification, live duplicates were released. A male and female of each species collected were deposited in the Bell Museum of Natural History, University of Minnesota, Department of Ecology and Behavioral Biology, as voucher specimens.

Table 4. Mammals Identified on Pennington Orchid Bog.

Family Name/ Scientific Name	Common Name	Habitat
SORICIDAE		
Sorex cinereus	Masked Shrew	
SCIURIDAE		
Tamiasciures hudsonicus	American Red Squirrel	
CASTORIDAE		
Castor canadensis	American Beaver	
CRICETIDAE		
Peromyscus leucopus	White-Footed Mouse	Mixed Woods, Black Spruce Bog, Cedar Bog
Clethrionomys gapperi	Gapper's Red-Backed Vole	Black Spruce Bog, Mixed Woods
ZAPODIDAE		
Zapus hudsonius	Meadow Jumping Mouse	Mixed Woods
CERVIDAE		
Odocoileus virginianus	White-tailed Deer	

Results

The results of the 1979 mammal inventory are presented in the form of an annotated list, Table 4[1]. Seven species, representing six families, were observed or captured on Pennington Orchid Bog.[2]

Sources of Information

Banfield, A.W.F. 1974. The Mammals of Canada. University of Toronto Press, Toronto.

Burt, William H., Richard Grossenheider. 1964. A Field Guide to the Mammals. Houghton Mifflin Company, Boston.

Gunderson, Harvey L. and James R. Beer. 1953. The Mammals of Minnesota. University of Minnesota Press, Minneapolis.

1 The following additional mammal species were observed at or in the vicinity of Pennington Orchid Bog SNA by DNR Resource Management Coordinator, Paul Rundell: Blarina brevicauda, Myotis lucifugus, Eptesicus fuscus, Procyon lotor, Mystela erminea, Mustela frenata, Mustela vison, Lutra canadensis, Taxidea taxus, Mephitis mephitis, Marmota monax, Eutamias minimus, Tamias striatus, Glaucomys volons, Synaptomys cooperi, Microtus pennsylvanicus, Ondrata zibethica, Erethizon dorsatum, Lepus americanus.

2 Additional information, in the form of field data sheets and secondary sources, is on file, Scientific and Natural Areas Section, St. Paul.

AMPHIBIANS AND REPTILES

Methods

Amphibians and reptiles were recorded both by sound identification and by hand collecting.[1] Collection of frogs and toads was mainly done in the spring. At this time of year they congregate and can be identified, using their breeding vocalizations, located and hand captured. Salamanders, frogs and toads were captured at night, using head lamps. Snakes, lizards and turtles were collected by hand during the day in the summer. Incidental sightings were recorded throughout the field season.

Voucher specimens were placed in the Bell Museum of Natural History, University of Minnesota, Department of Ecology and Behavioral Biology.

Results

The results of the 1979 amphibian and reptile inventory are presented in the form of an annotated list, Table 5. Eight amphibians were identified on Pennington Orchid Bog.

Sources of Information

Breckenridge, W.J. 1944. Reptiles and Amphibians of Minnesota. The University of Minnesota Press, Minneapolis.

Conant, Roger. 1958. A Field Guide to Reptiles and Amphibians. Houghton Mifflin Company, Boston.

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1 Field work in the spring and early summer was conducted by Scientific and Natural Areas volunteers Bruce Brecke and Mike Pappus.

Table 5. Amphibians and Reptiles Observed on Pennington Orchid Bog.

AMPHIBIA

AMBYSTOMATIDAE
Ambystoma laterale (Blue Spotted Salamander)

BUFONIDAE
Bufo americanus (American Toad)

HYLIDAE
Hyla crucifer (Spring Peeper)
Hyla versicolor (Gray Treefrog)
Pseudacris triseriata maculata (Boreal Chorus Frog)

RANIDAE
Rana septentrionalis (Mink Frog)
Rana pipiens pipiens (Northern Leopard Frog)
Rana sylvatica (Wood Frog)

LAND USE HISTORY

Virtually all "natural areas" have been affected to some degree by the activities of people. Farming, grazing, logging, drainage of wetlands, and the suppression of fire are some of the ways people have affected the land. Knowledge of historical land use practices helps explain the present condition of the land and its resources. Surrounding land use practices also affect the viability of all natural areas.

Methods

The land use information presented here is based on aerial photographs and inspections of Pennington Orchid Bog.

Recent Land Use History

Bogs are little disturbed by man's activities because of their low accessibility as an area for farming, grazing or building. Historically, Pennington Orchid Bog has had little disturbance because it has been the property of the State of Minnesota Swamp Trust Fund and was managed by Forestry, prior to designation as a Scientific and Natural Area. The area had been selectively logged, especially for the White Cedar although the extent of logging and date of last logging are unknown.

Appendix 1.

The following is a summary of the species identified in each releve plot during 1979. Releve plots were surveyed twice during the season; the dates and people conducting each survey are given in the heading. If the abundance of a species was recorded differently in the two surveys, the summary includes the greatest abundance noted. Species are grouped into grasses and forbes, or, woody and herb catagories. Species are then listed by abundance within each catagory.

A list of the symbols used in recording releve data are given below. Data is recorded in the following format:

Species name	Height Class cover-abundance/sociability

Coverage for height classes were also estimated and recorded in the blocks at the top of the list. It should be noted that stratification below 2 meters was not separated. Height class 3 represents the 0 - 2 meter strata.

SYMBOLS USED FOR RELEVE DESCRIPTIONS

Height Class (Stratification)

8	35 m
7	20 - 35 m
6	10 - 20 m
5	5 - 10 m
4	2 - 5 m
3	0 - 2 m

Coverage for Height Classes

75%	continuous
50 - 75%	interrupted
25 - 50%	parklike, patchy
5 - 25%	sparse
5%	sporatic to very scarce

Cover-abundance, for species

r	single occurrence
+	occasional, cover 1%
1	plentiful, cover 1-5%
2	very numerous, cover 5-25%
3	any number of individuals, cover 25-50%
4	any number of individuals, cover 50-75%
5	any number of individuals, cover 75-100%

Sociability (dispersion)

1	growing singly
2	grouped, few individuals
3	large group, many individuals
4	small colonies, extensive patches, broken mat
5	extensive mat

Certainty of Identification

(no notation)	positive
?	some doubt

DATE: 5 July and 16 August 1979 SURVEYOR: 7/5 Cherry Keller / Deb Schorr
8/16 Cherry Keller

PLOT #: POB - 1

LOCATION: Pennington Orchid Bog

COVER TYPE:

SOIL SERIES:

PLOT SIZE: 20 m x 20m

Height Classes

	8	7	6	5	4	3	2	1
Coverage for Height Class -			20%	8 %	10%	75%		

Species	8	7	6	5	4	3	2	1	Remarks
WOODIES									
Picea mariana			2/1		1/1	1/1			
Larix laracina			+/1			+/1			
Thuja occidentalis			r/1	1/1	1/1	1/1			
Alnus rugosa				r/1		+/1			
Salix sp.					r/1				
Corylus americana						+/1			
Cornus stolonifera						+/1			
Rhamnus alnifolia						+/1			
Betula glandulosa						+/1			
Betula pumila						r/1			
Salix pedicellaris						+/1			
Rhubus pubescence						1/1			
Andromeda glaucophylla						+/1			
Vaccinium oxycoccus						+/1			
Ledum groenlandicum						3/1			
Menyanthes trifolia						2/1			
Smilacina trifolia						2/1			
Linnea borealis						2/1			
Mitella nuda						2/1			
Galium labradoricum						1/1			
Galium triflorum						1/1			
Sarracenia purpurea						1/1			
Cornus canadensis						1/1			
Potentilla palustris						1/1			
Habenaria hyperborea						1/1			
Cyprepidium reginae						1/1			
Coptis trifolia						1/1			
Orchis rotundifolia						1/1			
Caltha palustris						1/1			
Campanula aparinoides						+/1			
Habenaria orbiculata						+/1			
Malaxis unifolia						+/1			
Drosera rotundifolia						+/5			
Glyceria striata						+/1			
Eriophorum sp.						+/1			
Lysimachia thirsiflora						+/1			

DATE: 5 July & 16 Aug. 1979 SURVEYOR: _____

PLOT #: 1 cont'd

LOCATION: Pennington Orchid Bog

COVER TYPE: _____

SOIL SERIES: _____

PLOT SIZE: 20m x 20m

Height Classes

Coverage for Height Class -	8	7	6	5	4	3	2	1
						75%		

Species	8	7	6	5	4	3	2	1	Remarks
Branus sp						1/1			
Fragaria virginiana						+/1			
Lonicera villosum						r/1			
mosses						5/5			

DATE: 12 July 1979 and 16 August 1979 SURVEYOR: Cherry Keller 7/5 & 8/16

PLOT #: POB-2

LOCATION: Pennington Orchid Bog

COVER TYPE: Ash Woods

SOIL SERIES:

PLOT SIZE: 20m x 20m

Height Classes

	8	7	6	5	4	3	2	1
Coverage for Height Class -			70%	25%	20%	75%		

	Species	Remarks
WOODIES	Fraxinus	4/1 2/1 2/1 2/1
	Betula papyrifera	1/1
	Alnus rugosa	r/1
	Abies balsamea	r/1 +/1
	Corylus americana	1/1
	Rhamnus alnifolia	1/1
	Cornus stolonifera	1/1
	Amelanchier sp.	+/1
	Viburnum trilobum	+/1
	Ribes americanum	+/1
	Ribes cynosbati ?	+/1
	Ulmus rubra	+/1
	Prunus serotina	+/1
	Vitis vulpina	/1
SEDGES	Carex sedge	2/1
FORBS	Impatiens biflora	1/1
	Amphicarpa bracteata	1/1
	Glyceria striata	1/1
	Matteuccia Struthiopteris "Ostrich Fern"	1/1
	Rhubus pubescens	1/1
	Viola sp.	1/1
	Circaea alpina	1/1
	Caltha palustris	1/1
	Amphicarpa bracteata	1/1
	Galium triflorum	1/1
	Mitella nuda	1/2
	Bromus sp.	1/1
	Equisetum sp.	1/1
	Senecio sp.	+/1
	Iris versicolor	+/1
	Thalictrum dioicum	+/1
	Arisaema triphyllum	+/1
	Thalictrum dasycarpum	+/1
	Aralia nudicaulis	+/1

DATE: 12 July & 16 Aug 1979 SURVEYOR: _____

PLOT #: 2 cont'd

LOCATION: Pennington Orchid Bog

COVER TYPE: _____

SOIL SERIES: _____

PLOT SIZE: 20m x 20m

Height Classes

Coverage for Height Class -	8	7	6	5	4	3	2	1
						75%		

Species	Remarks
Geum aleppicum	+/1
Asarum canadense	+/1
Viola pubescence	+/1
Quercus macracarpa	r/1
Aralia racemosa	r/1
Erigeron philadelphicus	r/1
Bare sand	2/1
Cicuta maculata	r/1

DATE: July 12, 1979 SURVEYOR: CBK

PLOT #: 3

LOCATION: POB - S. of stream

COVER TYPE: Young Cedar Bog

SOIL SERIES:

PLOT SIZE: Aprox 20 m x 20 m

Height Classes

	8	7	6	5 (5-10)	4 (2-5)	3 (0-2)	2	1
Coverage for Height Class -				50%	25%			

Species	Remarks
White Cedar	—
Swamp Raspberry	Fr
Bunchberry	Bl-Fr
~~Clintonia borealis~~	
Sticky Wild Geranium	Bl
Caltha palustris	Fr
Cyperaceads sp's	—
Black Ash	—
Abies balsamifera	—
Aralia nudicaulis	—
Pyrola secunda	Bl
Mitella nuda	Fr
Galium boreale	
Rattlesnake Fern	
Cypripidium reginae	Bl
Rhus toxicodendron	
Grey Dogwood?	
Enchanters Nightshade	
Actea rubra	
Cornus stolonifera	—
Skunk Currant	Fr
Unknown Currant	Fr
Coralorhiza sp.	Fr
Star Flower	Fr
Unknown ragged leaved - Chestnut like shrub?	
Goldenrod	Fr
Jewelweed	—
Thalictrum early	—
Myanthemum canadensis	— Fr
Linnaea borealis	Bl.
Spiknard	Bl
V - Violet	
Smilacina trifoliata	
Violets sp'	

DATE: 12 July and 16 August 1979 SURVEYOR: Cheny Keller

PLOT #: POB-4

LOCATION: Pennington Orchid Bog

COVER TYPE:

SOIL SERIES:

PLOT SIZE: 20m x 20m

Height Classes

	8	7	6	5	4	3	2	1
Coverage for Height Class -			50%	20%	20%	75%		

Species	15-20m								Remarks
Thuja occidentalis			3/1	2/1	2/1	3/1			
Abies balsamea					2/1	1/1			
Betula papyrifera				+/1					
Picea mariana				+/1		1/1			
Alnus rugosa				r/1					
Cornus stolonifera						+/1			
Corylus americana						+/1			
Ledum groenlandicum						2/1			
Cornus canadensis						1/1			
Coptis trifolia						1/1			
Linnea borealis						1/1			
Mitella nuda						1/1			
Trientalis borealis						1/1			
Glyceria striata						+/1			
Lonicera villosa						+/1			
Clintonia borealis						+/1			
Maianthemum canadensis						+/1			
Viola sp.						+/1			
Fragaria virginiana						+/1			
Halenia deflexa						+/1			
Moneses uniflora						+/1			
Galium triflorum						+/1			
Cypripidium reginae						+/1			
Habenaria obtusata						+/1			
Goodyera repens						+/1			
Malaxis unifolia						+/1			
Lonicera canadensis						+/1			
Pyrola sp. (FF)						+/1			
Eriophorum						+/1			
Orchis rotundifolia						+/1			
Andromeda glaucophylla						+/1			
Carex sp.						2/1			