The 1979 Resource Inventory for Boot Lake Natural Area Anoka County, Minnesota

Section 17, 18, 19, 20,
Township 33 North, Range 22 West
Coon Lake Beach and Linwood Quadrangles

Prepared by
The Scientific and Natural Areas Section
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Minnesota Department of Natural Resources

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INTRODUCTION

Scope and Organization

This report documents the information collected during a 1979 inventory of Boot Lake natural area. The inventory recorded information on climate, geology, soils, hydrology, plant communities, flora, birds, mammals, amphibians, reptiles, and land use history. Data supplied by this document will be used by the Minnesota Natural Heritage Program and other evlauators 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 Boot Lake 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 Conservancy, 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

Boot Lake natural area is a 400 acre unit in northeastern Anoka County, approximately 18 miles southeast of Cambridge, Minnesota. The area's climate is mid-continental, relatively cool and moist, with warm summers and cold winters. The basin of Boot Lake was formed from the melting of an ice block located in a preglacial valley. It is part of a long string of similarly formed lake basins in Anoka County. Wooded areas of various elevation surround a lake with floating mat, emergent vegetation, and open water zones at the site. A small creek southwest of the tract drains into Boot Lake proper, which empties to the northeast through a chain of lakes leading to the Sunrise River. Sandy mineral and mucky organic soils formed under deciduous forest and wetland vegetation on Boot Lake natural area. Present vegetation is primarily dry to wet deciduous and coniferous forest, with wet meadow, bog, shrub, and various aquatic communities also present. About 43 acres were formerly cultivated and now support old field vegetation.

The flora and fauna of Boot Lake represent a diverse assortment of natural communities. Species observed on the tract include: 319 vascular

plants, 72 birds, 11 mammals, 7 amphibians,and 6 reptiles. The natural area lies within a corn, soybean, oats, and hay farming area, although wetness prevents extensive agriculture. Land use at Boot Lake has included logging, grazing, haying, row cropping, homesteading, and other activities.

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.

Boot Lake natural area supports a diverse array of flora in a noteworthy succession of vegetation types. The preserve is significant geologically as part of a chain of ice-block basin lakes lying in a subglacially formed feature called a tunnel valley. A continuum of plant communities is found, from the emergent vegetation and floating mats bordering the lake, to wet meadows, shrub thickets, and wet forests in low areas, through the oak forest found on driest upland sites. Long Bearded Hawkweed (Hieracium longipilum) and Sea-Beach Triple-Awned Grass (Aristida tuberculosa), listed as potential plant elements of state sig-

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

nificance by the Minnesota Natural Heritage Program, occur on the site.

Oak forest, covering 32% of the tract, is representative of one type of original vegetation occurring in this area, as described by Marschner (1930). Marschner's "oak openings", consisting primarily of scattered Bur Oak (Quercus macrocarpa) with prairie understory, has succeeded to an oak forest due to cessation of fire in the area (Curtis, 1959). On Boot Lake's sandy soils, Pin Oak (Q. ellipsoidalis) and White Oak (Q. alba), rather than Bur Oak are present.

The lowland vegetation at Boot Lake includes a combination of northern and southern species. Typical northern species such as Tamarack (Larix laricina), Red Maple (Acer rubrum), and Starflower (Trientalis borealis) are mixed in wet forest communities with typical southern plants such as Poison Sumac (Rhus vernix) and Huckleberry (Gaylussacia baccata). These lowland communities are representative of Marschner's "conifer bogs and swamps", as interpreted by Heinselman (1974). At Boot Lake they are dominated by species such as Tamarack, Red Maple, Paper Birch (Betula papyrifera), Speckled Alder (Alnus rugosa), White Pine (Pinus strobus), and Jack Pine (P. banksiana). An unusual lowland bog type found at the site consists of Jack Pine overstory, with Sphagnum (Sphagnum sp.) and various ericaceous shrubs dominating the herb layer.

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, soils, 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 physical 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 characteristics, 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, soils, and hydrology are an effort to describe the abiotic setting of Boot Lake natural area.

CLIMATE

Methods

Climatological data were gathered by researching National Oceanic and Atmospheric Administration (NOAA), Minnesota Agricultural Experiment Station, and Soil Conservation Service reports. Most numerical data were obtained from the NOAA station at Cambridge, approximately 18 miles north of Boot Lake natural area.

Regional Climate

The climate of east central 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 Boot Lake area is 68° F; the December, January, and February mean is 13° F. On the average, there are 14 days above 90° F. in the summer and about 45 days below 0° F. in the winter. The average duration of the freeze-free season is 140 days. The length of the total crop season, which includes the growing period for both cool and warm season species, averages 210 days (Baker and Strub, 1963b).

Table 1 Selected Weather Data for Cambridge.

TEMPERATURE	°F	°C
Mean annual temperature	42.0	5.6
Highest temperature recorded (14 July 1936)	109	42.8
Lowest temperature recorded (1 January 1935)	-42	-41.1
Mean temperature warmest month		
Month: July		
Mean daily maximum	81.1	27.3
Mean daily minimum	59.0	15.0
Mean temperature coldest month		
Month: January	8.5	-13.1
Mean daily maximum	18.4	-7.6
Mean daily minimum	-1.4	-18.6
Average date last freeze (Spring)[a]	c. 7 May	
Average date first freeze (Fall)[b]	c. 1 Oct.	
Average days freeze freeze season[c]	140	
Average days total crop season[d]	210	

PRECIPITATION	in.	cm.
Mean annual precipitation	28.47	72.3
Mean precipitation wettest Month		
Month: June	4.77	12.1
Mean precipitation driest month		
Month: January	0.69	1.7
Mean annual snowfall	42.4	107.7
Mean snowfall heaviest month		
Month: December	9.3	23.6

[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.

About 80%, or more than 21 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 4.8 total inches of rain. There are about 36 thunderstorms per year. Rainfall intensities of 2.3 inches per day every year, 4.1 inches per day every ten years, and 5.2 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 42 inches. About 100 days a year have a ground snow cover of 1 inch or more. Precipitation of 0.01 inch or more can be expected about 110 days a year in the area. Total annual precipitation about equals total annual evaporation in the area. Prevailing winds blow from the west and northwest during the winter, and from the south and southeast during the summer.

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

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GEOLOGY

Methods

Geologic information was primarily obtained through a literature search. Field observations using topographic maps and aerial photos 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. The Superior lobe and the Grantsburg sublobe of the Des Moines lobe covered the Boot Lake area at different times during the Wisconsin Stage. Both left characteristic deposits of glacial drift.

About 20,000 B.P. (years before present; Wright, 1972), the Superior lobe advanced southwestward out of a lowland now occupied by Lake Superior; it extended about as far south as the Twin Cities area. This lobe left deposits of sandy, reddish, noncalcareous glacial drift. A large drift deposit called the St. Croix end moraine was formed at the Superior lobe ice front. A number of other geomorphic features were formed by the Superior lobe, including drumlins, eskers, and tunnel valleys. Of these, only tunnel valleys are found near the natural area. Tunnel valleys developed during wastage of the Superior lobe when subglacial streams fed by basal meltwaters eroded gorges in the material underlying the ice. These valleys are as much as half a mile wide, 200 feet deep, and 100 miles long (Wright, 1972), although burial by younger drift has reduced

their size in many cases. The topographic position of many present day lakes and streams, including Boot Lake, are a direct result of the locations of tunnel valleys.

Following recession of the Superior lobe, a tongue of ice called the Grantsburg sublobe of the Des Moines lobe pushed northeastward over the St. Croix moraine and into the Boot Lake area. This sublobe eventually advanced across east central Minnesota to a terminus near Grantsburg, Wisconsin about 16,000 B.P. (Wright, 1972). The Grantsburg sublobe diverted Glacial Mississippi River drainage northeastward around the ice front and into the St. Croix River valley. Mississippi and St. Croix waters combined with Grantsburg sublobe meltwaters to form a large proglacial lake, Glacial Lake Grantsburg, to the north of Boot Lake. Further wastage of stagnant Grantsburg ice opened channels which drained the lake; however, meltwaters and Mississippi waters continued to flow on and around the ice front. These waters deposited a series of coalescing sandy outwash fans over east central Minnesota until the Grantsburg sublobe disintegrated completely. Eventually the Mississippi broke through the St. Croix moraine near Minneapolis and established its modern course. The large glaciofluvial deposit left behind by the Mississippi and Grantsburg sublobe waters is called the Anoka Sandplain.

Calcareous, grey, silty drift was left by the Grantsburg sublobe, in contrast to the older, red sandy Superior material also found in the area. The Grantsburg outwash buried stagnant ice blocks of both Superior and Grantsburg ice. Many of these ice blocks were left in Superior lobe tunnel valleys; they eventually melted to form chains of ice block lake basins in outwash. Boot Lake is part of such an ice block lake

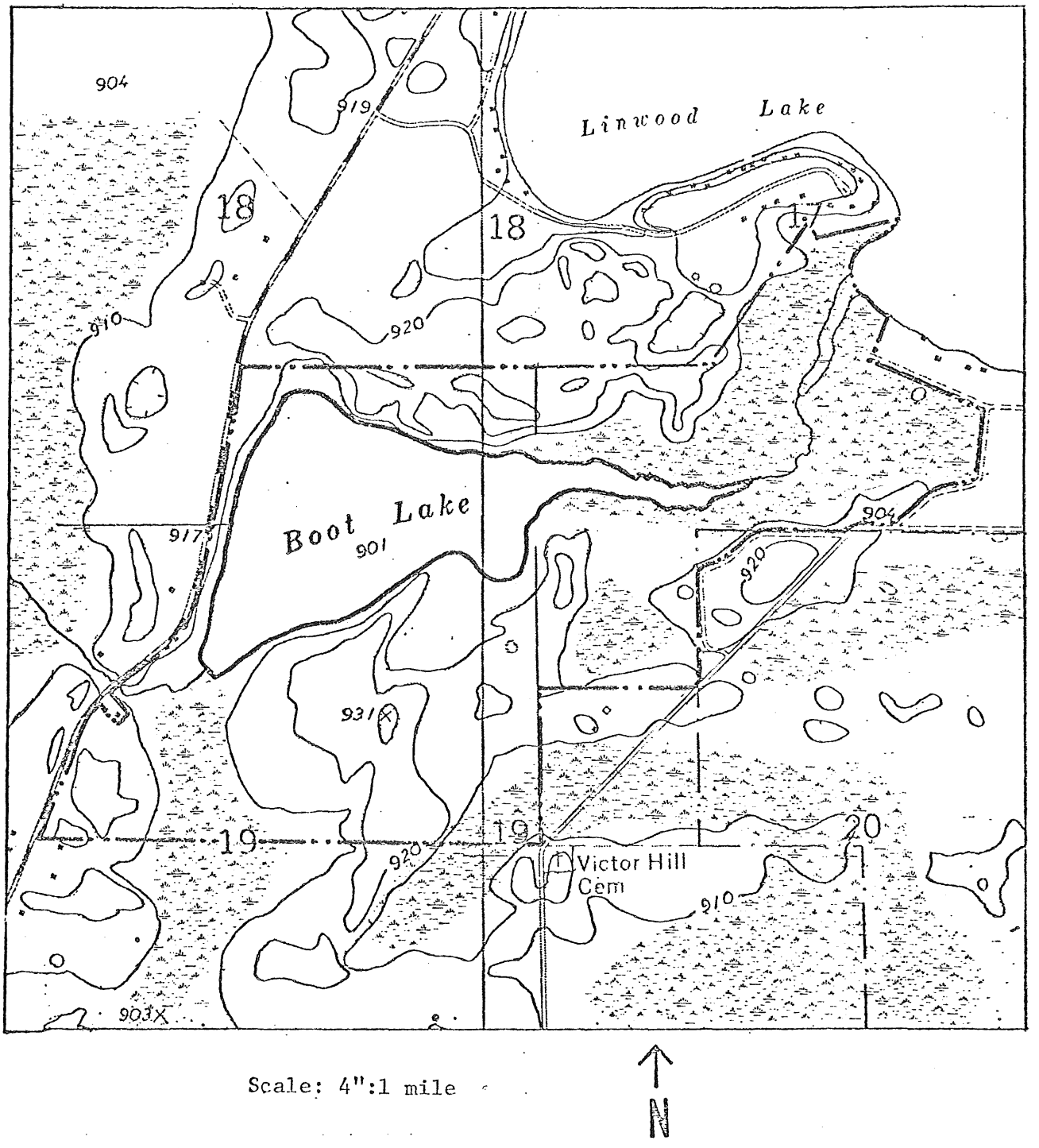

Figure 1. Topography of Boot Lake Natural Area. Adapted from U.S. Geological Survey, Coon Lake Beach and Linwood MN Quadrangles (1:24,000) 1955, 1974.

basin chain localized by a tunnel valley, which also includes Fawn, Martin, Linwood, Coon, and Ham Lakes in Anoka County (Zumberge, 1952).

Topography and Bedrock

Boot Lake natural area lies within the relatively flat, but smoothly undulating Anoka Sandplain. Maximum relief on the site is approximately 30 feet, with the surface of the lake mapped at 901 feet and the highest land elevation at about 930 feet above sea level (see Figure 1). About half of the tract consists of Boot Lake proper and associated depressional wet areas; the remainder is composed of drier uplands. The most prominent relief feature is fairly steep 20 - 25 foot high slope on the north edge of the lake.

East central Minnesota is underlain by various Paleozoic sedimentary rocks deposited from marine seas that covered southeastern Minnesota during Late Cambrian and Early and Middle Ordovician times (approximately 570 to 450 million years ago; Bray, 1977). These rocks, predominantly sandstones and shales about 700 feet thick, were laid down during a series of transgressions and regressions in a shallow branch of the Cambrian and Ordovician seas called the Hollendale Embayment (Sims & Morey, 1972). They are overlain by deposits of glacial drift approximately 150 feet thick near the natural area (USGS, 1974). Precambrian basalts, rhyolites, sandstones, and shales underlie the sedimentary rocks in east central Minnesota.

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SOILS

Methods

Soil information was obtained from literature sources and from the Anoka County Soil Survey manual. Soil series descriptions are based on single sheet soil interpretations provided by the Soil Conservation Service (SCS).[1]

Soils of Boot Lake Natural Area

Boot Lake natural area lies in an area of coarse to medium textured forest soils formed from glacial outwash and peat soils formed from organic matter (Arneman, 1963). The site's mineral soils formed in outwash sands associated with the Grantsburg glacial sublobe (see Geology section). One soil association and five soil series are present on the tract.

The Zimmerman-Isanti-Lino soil association (SCS, 1977) occupies about half of Anoka County. It is found in broad, undulating, sandy outwash plain area. Drainage patterns range from excessive in elevated sand dune areas to very poor in wet depressional sites. Soil development is poor in easily eroded sandy areas. Mineral soils occupy moderate to well drained sites, with mucky and peaty organic soils found in poorly drained areas. The water table is at or near the surface in most depressions.

Soils of the Rifle (typic borohemists) and Seeleyville (typic borosaprists) series are histosols, characterized as cool region soils with a

1 Bill Vidrine, District Conservationist, SCS, Anoka, provided valuable help for this section.

Key to Table 2.

TEXTURE: Relative proportions of various soil separates (silt, sand, clay) in a soil.

Topsoil: "surface soil", in uncultivated soils, a depth of 3 or 4 to 8 or 10 inches; in agriculture, refers to the layer of soil moved in cultivation.

Subsoil: soil below the top soil, from 8 or 10 to 10 to 60 inches.

DRAINAGE CLASS: Soil drainage refers to natural frequency and duration of saturation which exists during soil development. Soil drainage classes are those used in making detailed soil maps (Arneman and Rust, 1975; USDA-SCS and Minnesota Agricultural Experiment Station, 1977).

ED - Excessively Drained - water is removed very rapidly. Soils are without mottles.

SED - Somewhat Excessively Drained - water is removed rapidly and soils are without mottles.

WD - Well Drained - water is removed from soil readily but not rapidly. Soils are nearly free of mottling.

MWD - Moderately Well Drained - water table usually below 5 feet. Soils are wet for small but significant part of time. Mottling in lower B horizon.

SPD - Somewhat Poorly Drained - water table at depths of 36 to 60 inches. Soil is wet for significant periods, commonly with mottles below 6 to 16 inches.

PD - Poorly Drained - water table seasonally near surface for prolonged intervals. Water table from 18 to 36 inches. Soils wet for long periods, generally with mottles.

VPD - Very Poorly Drained - water table remains at or near surface (above 18 inches) greater part of time. Soils wet nearly all the time, with or without mottling.

COMPONENT IN STATE: Extent of acreage in state.

M - Major: 100,000 acres or more
I - Intermediate: 10,000 to 100,000 acres
m - Minor: 10,000 acres or less.

LOCATION IN STATE:

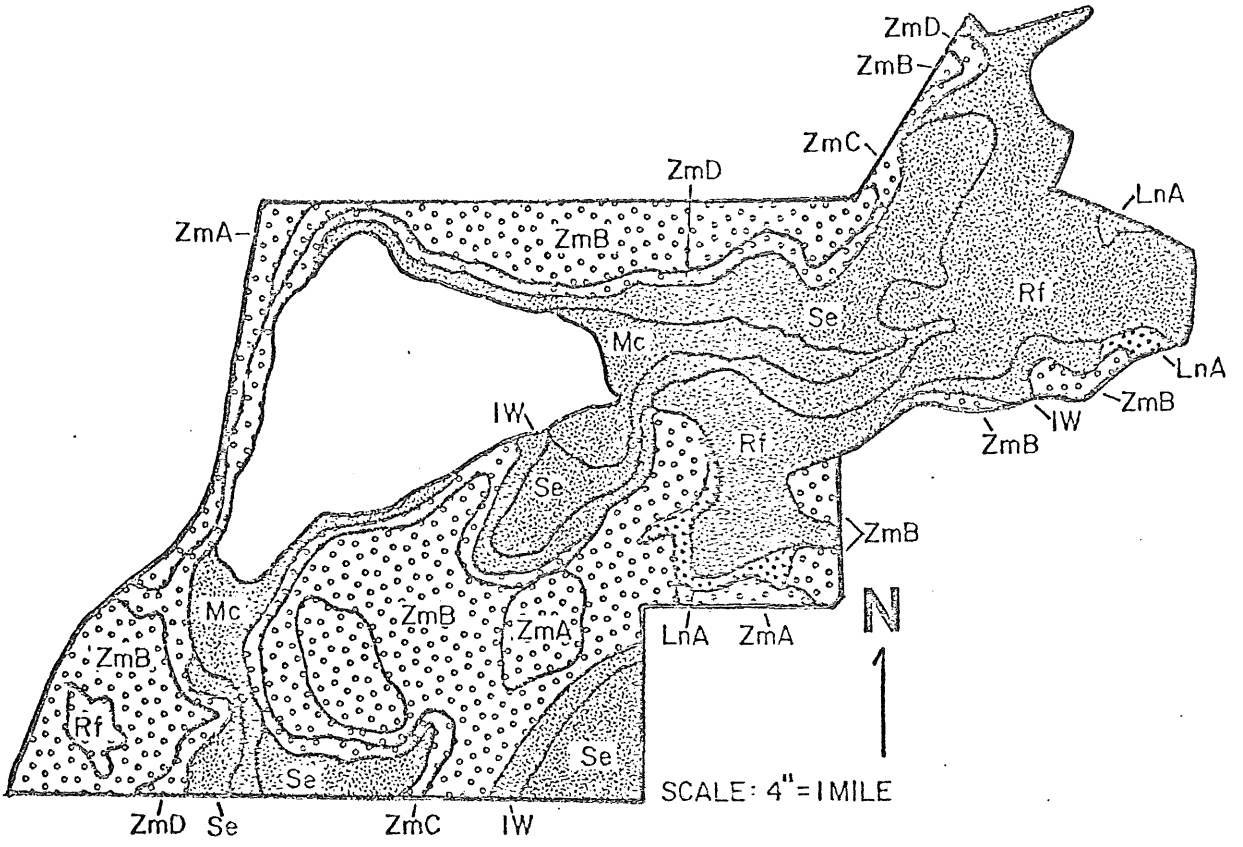
N - Northern
C - Central
NW - Northwestern

Table 2. Soil Characteristics of Boot Lake Natural Area.

SOIL SERIES # ACRES PERCENT	DRAINAGE CLASS	DEPTH TO WATER TABLE	PARENT MATERIAL	LANDSCAPE POSITION	TEXTURE		VEGETATION		COMPONENT IN STATE	LOCATION IN STATE
					TOPSOIL	SUBSOIL	ORIGINAL	PRESENT		
Zimmerman (Zm)	ED	76.0	outwash sands	broad outwash areas and drainageway escarpments 0-24% slopes	fine sand	fine sand	mixed oak forest		M	C
Lino (LnA)	SPD	2.0'-4.0'	outwash sands	small drainage-ways and low broad flats on outwash plains 0-4% slopes	loamy fine sand	fine sand	deciduous forest		M	C
Isanti (Iw)	VPD	0-2.0'	outwash sands	depressions, drainageways, and low flats on outwash plains 0-2% slopes	fine sandy loam	fine sand	grasses, sedges, and willows		M	C
Seeleyville (Se)	VPD	0-1.0'	organic material	bogs in outwash and till plains	muck	muck	sedges, grasses, and scattered trees		M	NW, N, & C

Table (continued). Soil Characteristics of Boot Lake Natural Area.

SOIL SERIES # ACRES PERCENT	DRAINAGE CLASS	DEPTH TO WATER TABLE	PARENT MATERIAL	LANDSCAPE POSITION	TEXTURE		VEGETATION		COMPONENT IN STATE	LOCATION IN STATE
					TOPSOIL	SUBSOIL	ORIGINAL	PRESENT		
Rifle (Rf)	VPD	0-1.0'	organic material	bogs in outwash plains and moraines 0-1% slopes	mucky peat	mucky peat	reeds, sedges, cattails, and scattered trees		M	NW, N, & C
Marsh (Mc)	VPD	0-5.0' above soil level	variable	depressional areas	unclassified	unclassified	cattails, reeds, and sedges		M	statewide



KEY

DRAINAGE SYMBOL	DRAINAGE CLASS	SOIL SERIES	MAP SYMBOL
	Excessively Drained	Zimmerman	ZmA ZmB ZmC ZmD
	Somewhat Poorly Drained	Lino	LnA
	Very Poorly Drained	Isanti	IW
		Seelyville	Se
		Rifle	Rf
		Marsh	Mc

Figure 2. Boot Lake Natural Area's soil and drainage classes.

surface horizon of greater than 30% organic matter to a depth of 16 inches. Both are very poorly drained soils occupying wet boggy areas at Boot Lake preserve. The organic matter of Rifle soils is only partially decomposed, with plant fiber material still easily visible. Seeleyville soils are more highly decomposed, and are slightly drier. Isanti series (typic haplaquolls) are very poorly drained, seasonally wet soils occupying small depressional areas. However, they are found in slightly better drained, relatively higher positions than Rifle and Seeleyville soils. Horizon formation is minimal and surface layers are strongly acidic in Isanti soils.

Lino (aquic udipsamments) and Zimmerman (alfic udipsamments) series soils are entisols, or recently formed soils displaying little horizon development. Both are characterized as sandy textured, easily weathered mineral soils. Lino soils are wetter and more poorly drained because they occupy topographically lower positions than Zimmerman soils. Boot Lakes' Zimmerman series soils vary greatly in slope, ranging from level to 24%. Steep areas of this series are subject to wind erosion.

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HYDROLOGY

Methods

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

Hydrology of Boot Lake Natural Area

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 Boot Lake natural area today. As part of a large glaciofluvial deposit called the Anoka Sandplain, the tract is in a region with a relatively high water table which commonly intersects the surface in depressional areas. The sandy nature of the Anoka Sandplain deposits and the soils formed in them dictate the flow patterns of both surface and subsurface waters at the site.

Boot Lake is fairly shallow 92 acre lake. It is mostly shallower than 5 feet, with a single small depression with a maximum depth of 19 feet (Moyle, 1976). Some areas of the lake are filled with emergent vegetation such as Wild Rice (Zizania aquatica). A small intermittent stream flows into Boot Lake from Rice Lake to the west. A larger stream drains the lake northeastward into a series of lakes and streams eventually emptying into the Sunrise and St. Croix rivers. About half of the natural area consists of Boot Lake and surrounding wetlands; the remainder is composed of better drained uplands.

The natural area's location in a negative relief feature called a tunnel valley (see Geology section) results in a water table at or very

near the surface. Peat deposits are common in poorly drained areas of the Anoka Sandplain such as these. Upland portions of the tract are excessively drained and generally quite dry because of the sandiness of the soils present. These soils are capable of absorbing large amounts of water quickly; thus, the potential for surface runoff is low (SCS, 1975).

Boot Lake natural area is located in the lower St. Croix River watershed. Ground water flows generally eastward towards the deeply entrenched St. Croix River valley (USGS, 1974).

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VEGETATIONAL COMPONENTS

Plants and plant communities are a major part of the ecosystems present on a natural area. Vegetation reflects the combined influence 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 homogenous 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

Boot Lake natural area is located on the eastern edge of the Mississippi River Sandplains (Fig. 3). Prior to European settlement, this area consisted of oak openings and barrens and conifer bogs and swamps, with areas of wet prairie, marshes and sloughs (Marschner, 1930; Fig. 4).

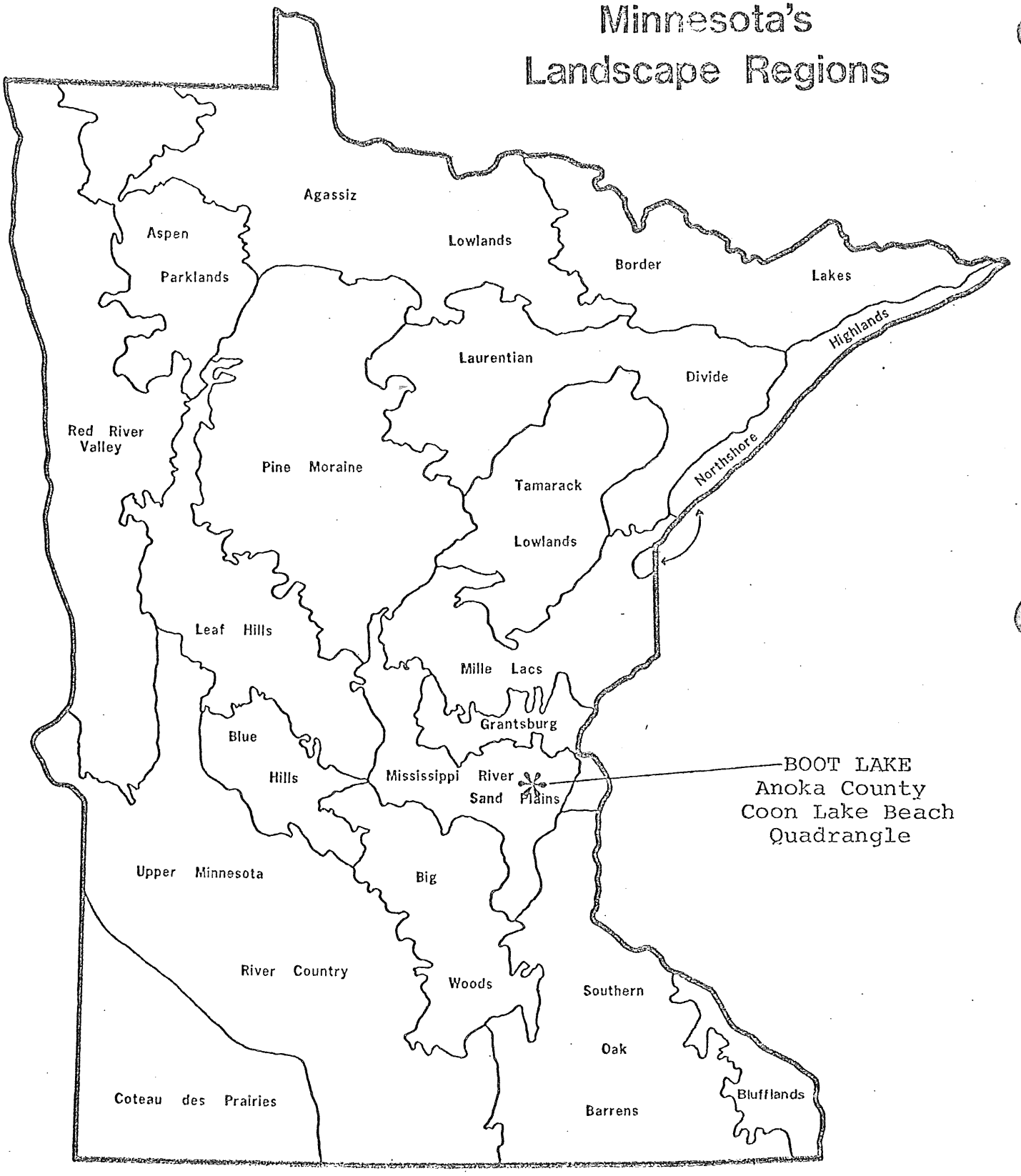


Figure 3. Boot Lake Natural Area in relation ot Minnesota's landscape regions. Adapted from T. Kratz and G.L. Jensen, an ecological geographic division of Minnesota (Unpublished, 1977).

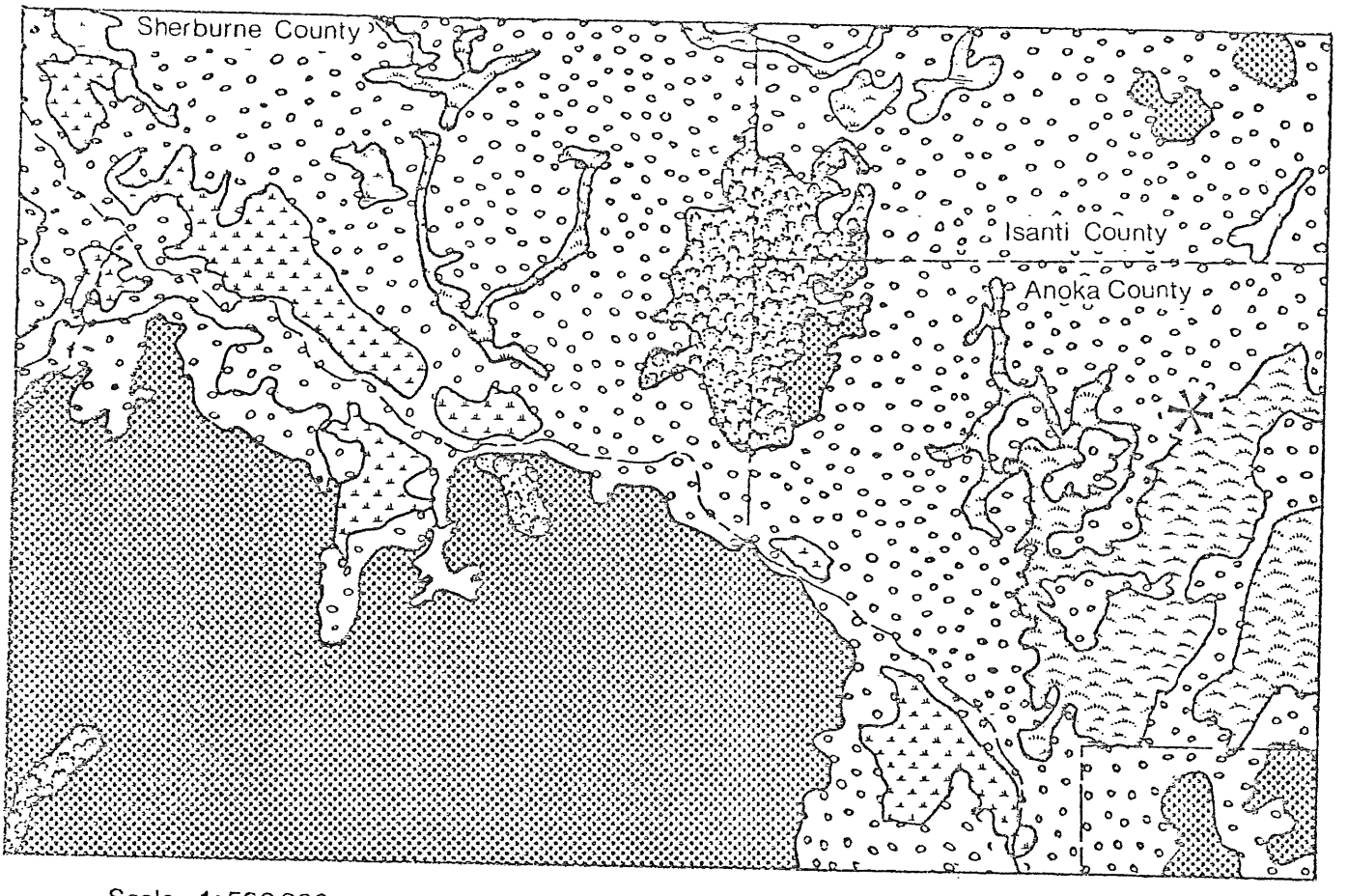
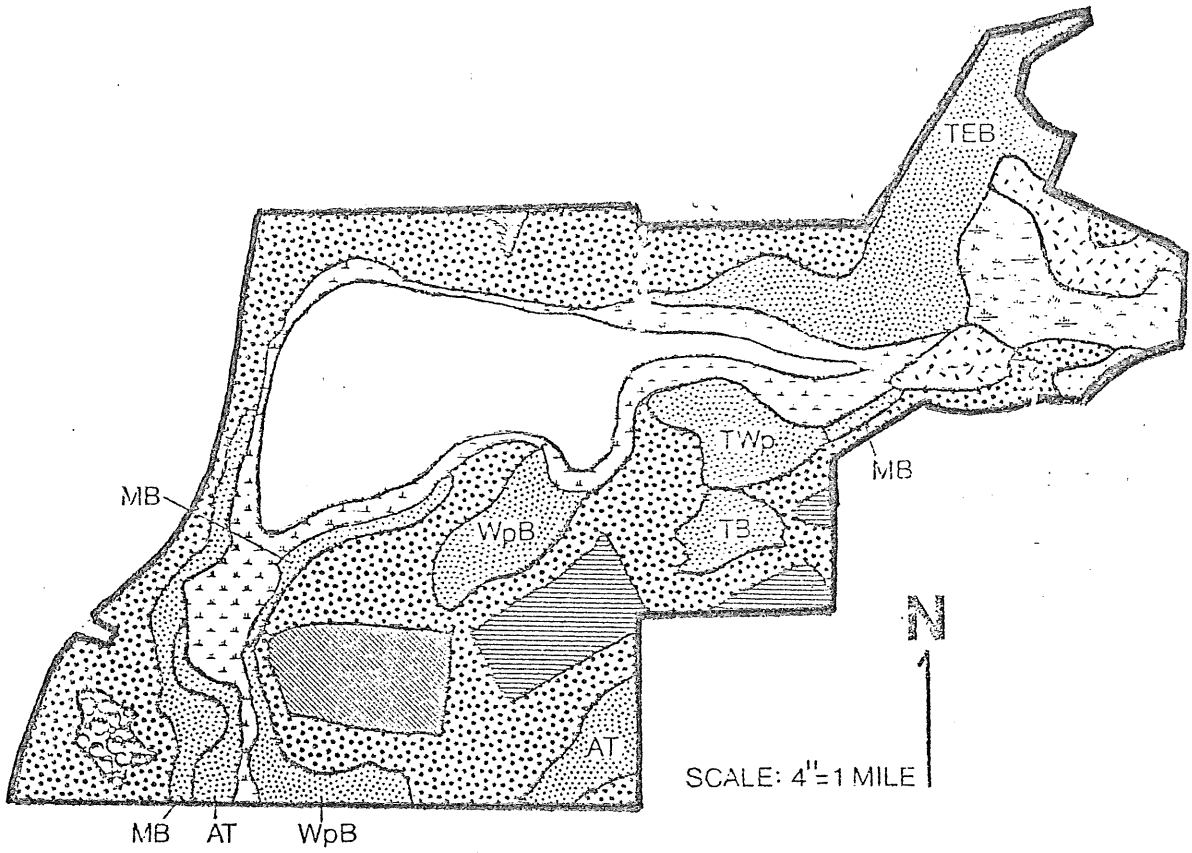


Figure 4. The original vegetation of east-central Minnesota, including Boot Lake. Adapted from F.J. Marschner, The Original Vegetation of Minnesota, 1:500,000.



KEY

	Oak Forest		Shrub Thicket
TEB	Tamarack-Elm-Birch Wet Forest		Old Field
TWp	Tamarack-White Pine Wet Forest		Cultivated Field
MB	Maple-Birch Wet Forest		Clearing
AT	Alder-Tamarack Wet Forest		Wet Meadow
WpB	White Pine-Birch Wet Forest		Floating Mat/Emergents
TB	Tamarack-Birch Wet Forest		Water (Open)
	Jack Pine Bog		

Figure 5. Vegetation communities identified on Boot Lake.

With European settlement fires were reduced and oak openings were replaced by oak forests on land not utilized for farming. However, examples of the original vegetation can still be found on the tract today.

Results

Boot Lake natural area's community types are illustrated in Figure 5. The area contains several different communities which are situated according to a moisture gradient. The communities range from drier oak forests and fields, to the mixed conifer-hardwood wet forests, conifer bogs, shrubs thickets, wet meadows, and emergent aquatic vegetation. The mixed conifer-hardwood wet forests can be further subdivided into six cover types by examining their dominant overstory trees species. A description of each community is given below.

OAK FOREST: 104 acres, 32% of preserve.

Dominant overstory species are Northern Pin Oak (Quercus ellipsoidalis) and White Oak (Quercus alba). Common shrubs are Smooth Juneberry (Amelanchier laevis), Black Cherry (Prunus serotina), and Red Maple (Acer rubrum). Dominant herbs are Large Leaf Aster (Aster macrophyllus), Pennsylvania Sedge (Carex pennsylvannia), and Bracken Fern (Pteridium aquilinum).

White Pine (Pinus strobus), and Paper Birch (Betula papyrifera) also occur in the overstory. Source of information: field inspection and releve BL-1 and 4.

TAMARACK-ELM-BIRCH WET FOREST: 37 acres, 12% of preserve.

Dominant trees are Tamarack (Larix laricina), American Elm (Ulmus americana), and Paper Birch (Betula papyrifera). Common shrubs include Red Osier Dogwood (Cornus stolonifera). Royal Fern (Osmunda regalis) and Sensitive Fern (Onoclea sensiblis) are common in the ground layer. Source of information: field inspection.

FLOATING MAT/EMERGENTS: 37 acres, 12% of preserve.

These communities occur along the shoreline of Boot Lake. Where the vegetation is thick enough, a floating mat is formed. Dominant species are cattails (Typha), Sphagnum Moss (Sphagnum sp.), Swamp Cinquefoil. (Potentilla palustris), Arrow-Leaved Tear-Thumb (Polygonum sagittatum). Speckled Alder (Alnus rugosa) occurs in small thickets on the floating mat.

Emergent vegetation includes the following species: Reed Canary Grass (Phalaris arundinacea), Wild Rice (Zizania aquatica), Bluejoint Grass (Calamagrostis canadensis), and Water Willow (Decodon verticillatus). Sweet-Scented White Water Lily (Nymphaea tuberosa) is also common. Source of information: field inspection.

CULTIVATED FIELD: 25 acres, 8% of preserve.

This area has been planted with alfalfa (Medicago sativa). Source of information: field inspection.

WET MEADOW: 18 acres, 6% of preserve.

The area is dominated by sedge species (Carex) and Reed Canary Grass (Phalaris arundinacea). The sedges often grow in tussocks. Source of information: field inspection.

OLD FIELD: 18 acres, 6% of preserve.

Dominant grasses are Quack Grass (Agropyron repens) and Rough Bent Grass (Agrostis scabra). Dominant forbs are Field Sorrel (Rumex acetosella) and Hairy Vetch (Vicia villosa).

Numerous Pocket Gopher holes occur in the old fields. Source of information: field inspection and releve BL-2.

TAMARACK-WHITE PINE WET FOREST: 18 acres, 6% of preserve.

Dominate trees are Tamarack (Larix laricina) and White Pine (Pinus strobus). Other common woody plants are Black Alder (Ilex verticillata) and

Mountain Holly (Nemopanthus mucronatus). Sphagnum Moss (Sphagnum sp.), Three Way Sedge (Dulichium arundinaceum), and Cinnamon Fern (Osmunda cinnamomea) dominate the ground cover, especially in areas close to the lake. Source of information: field inspection and releve BL-7.

MAPLE-BIRCH WET FOREST: 17 acres, 5% of preserve.

Red Maple (Acer rubrum), Paper Birch (Betula papyrifera), and White Pine (Pinus strobus) are the dominant overstory trees. Shrubs such as Pagoda Dogwood (Cornus alternifolia), Poison Sumac (Rhus vernix), and Speckled Alder (Alnus rugosa) are common in the understory layer. Cinnamon Fern (Osmunda cinnamonea) dominates the ground cover. Source of information: field inspection and releve BL-10.

SHRUB THICKET: 15 acres, 5% of preserve.

Dominant shrubs are Red Osier Dogwood (Cornus stolonifera) and several willow species (Salix sp.). The ground cover is composed of a variety of herbs, including Reed Canary Grass (Phalaris arundinacea), Fowl Manna Grass (Glyceria striata), and Royal Fern (Osmunda regalis). Source of information: field inspection and releve BL-6.

ALDER-TAMARACK WET FOREST: 14 acres, 4% of preserve.

This area is dominated by Speckled Alder (Alnus rugosa). Tamarack (Larix laricina) and Paper Birch (Betula papyrifera) are common woody species. Dominant ground cover species are Sedge (Carex lacustris) and Sphagnum Moss (Sphagnum sp.). Source of information: field inspection and releve BL-3.

WHITE PINE-BIRCH WET FOREST: 13 acres, 4% of preserve.

White Pine (Pinus strobus) and Paper Birch (Betula papyrifera) are the dominant overstory species. Red Maple (Acer rubrum) is also common.

Speckled Alder (Alnus rugosa) is common in the shrub layer. Common herbacious plants include Cinnamon Fern (Osmunda cinnamonea), Royal Fern (Osmunda regalis), and Sensitive Fern (Onoclea sensiblis). Source of information: field inspection.

TAMARACK-BIRCH WET FOREST: 9 acres, 3% of preserve.

Tamarack (Larix laricina) and Paper Birch (Betula papyrifera) dominate the overstory. Black Alder (Ilex verticillatas) and Narrow-Leaved Blueberry (Vaccinium angustifolium) are common shrubs. Sphagnum Moss (Sphagnum sp.) dominates the ground cover.

The Tamarck-Birch community intergrades into a small area dominated by Sphagnum Moss and ericaceous shrubs such as Leather-Leaf (Chamaedaphne calyculata) and Labrador Tea (Ledum groenlandicum). A majority of the Paper Birch trees appeared to be diseased or dying in late August. Source of information: field inspection and releve BL-8.

JACK PINE BOG: 5 acres, 1% of preserve.

Jack Pine (Pinus banksiana) dominates the overstory with Speckled Alder (Alnus rugosa) in the lower height classes. Common shrubs include Leather-Leaf (Chamaedaphne calyculata) and Bog Rosemary (Andromeda glaucophylla). Sphagnum Moss (Sphagnum sp.) and Tall Cotton Grass (Eriophorum angustifolium) dominate the ground layer.

The Jack Pine bog is surrounded by a "moat" dominated by Fowl Manna Grass (Glyceria striata) and Blue-Joint Grass (Calamagrostis canadensis). Source of information: field inspection and releve BL-9.

CLEARINGS: 2 acres, 1% of preserve.

Dominant grasses are Kentucky Blue Grass (Poa pratensis), Little Bluestem (Andropogon scoparius), Big Bluestem (Andropogon gerardi), and Field Sorrel (Rumex acetosella). Source of information: field inspection and releve BL-5.

Sources of Information

Curtis, John T. 1959. Vegetation of Wisconsin. University of Wisconsin Press.

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, Minnesota.

FLORA

Methods

Boot Lake natural area was visited on a weekly basis, when weather conditions permitted, from 27 April to 14 September, 1979. Flowering or fruiting plants 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 37 specimens. Gerald Wheeler, identified all species of the genus Carex. Dr. Gerald Ownbey, Curator of the Herbarium Univeristy of Minnesota, verified the remaining specimens. Any specimens identified in the field but not collected, are indicated in the list. Specimens identified by other individuals but not collected are filed with the SNA section.

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, Minnesota.

Table 3. Annotated List of Plants for Boot Lake Natural Area.

Format: Scientific name. Common name. Collection number of voucher specimen. Community in Boot Lake. 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 Owenby.

PTERIDOPHYTA - Spore-Bearing Plants

EQUISETACEAE - Horsetail Family
Equisetum fluviatile L. - Water Horsetail. #934. Lakeshore.

LYCOPODIACEAE - Clubmoss Family
Lycopodium clavatum L. - Running Clubmoss. #941. Old Road.
Lycopodium obscurum L. (L. dendroideum Michx. Britton and Brown, 1970) - Ground Pine. #940. Old Road.
Lycopodium tristachyum Pursh. - Ground Cedar. #1002. White Pine Red Maple Woods.

OPHIOGLOSSACEAE - Adder's-Tongue Family
Botrychium virginianum (L.) Sw. - Virginia Grape Fern. Wet Forest. +

OSMUNDACEAE - Royal Fern Family
Osmunda cinnamonea L. - Cinnamon Fern. #644. Wet Forest.
Osmunda claytoniana L. - Interrupted Fern. #616. Oak Forest.
Osmunda regalis L. - Royal Fern. #613. Edge of Forest.

POLYPODIACEAE - Polypody Family
Athyrium felix-femina Roth. - Lady Fern. #632. Edge of Wet Forest.
Dryopteris austriaca (Jacq.) Woynar. var. spinulosa (Muell.) Fiori. (D. spinulosa (O.F. Muell.) Watt. in Fernald, 1950) - Shield Fern. #631. Edge of Wet Forest.
Dryopteris cristata Gray. - Crested Wood Fern. #749. Edge of Wet Forest.
Gymnocarpium dryopteris (L.) Newm. - Oak Fern. #503. Wet Forest.
Onoclea sensiblis L. - Sensitive Fern. #937. Near Lakeshore.
Pteridium aquilinum (L.) Kuhn. - Bracken Fern. #887. Oak Forest.

SPERMATOPHYTA - Seed Plants

GYMNOSPERMAE - Gymnosperms

CUPRESSACEAE - Cypress Family
Juniperus communis L. var. depressa Pursh. - Prostrate Juniper. #1012. Oak Forest.
Juniperus virginiana L. - Red Cedar. #1062. Clearing.

PINACEAE - Pine Family
Larix laricina (DuRoi) K. Koch. - Tamarack. #496. Edge of Floating Mat.
Picea abies (L.) Karst. (in Fernald, 1950) - Norway Spruce. #897. Roadside. Alien.

Pinus banksiana Lamb. - Jack Pine. #1022. Edge of Oak Forest.
Pinus strobus L. - White Pine. #766. Edge of Wet Forest.
Pinus sylvestris L. - Scotch Pine. #943. Edge of Old Field.

ANGIOSPERMAE - Angiosperms

MONOCOTYLEDONEAE - Monocots

ALISMATACEAE - Water Plantain Family
Sagittaria latifolia Willd. - Hastate-Leaved Arrow-Head. #998. Wet Forest.

ARACEAE - Arum Family
Arisaema triphyllum (L.) Schott. - Jack In The Pulpit. #290. Oak Forest.
Calla palustris L. - Water Arum. #396. Wet Forest.

COMMELINACEAE - Spiderwort Family
Tradescantia occidentalis (Britt.) Smyth. - Western Spiderwort. #617. Roadside.

CYPERACEAE - Sedge Family
Carex brunnescens (Pers.) Poir. (C. brunnescens (Pers.) Poir. var. sphaerostachya (Tuckerm.) Kukenth. in Fernald, 1950). #606. Jack Pine Bog.
Carex canescens L. - Silvery Sedge. #292. Floating Mat.
Carex comosa Boott. - Bristly Sedge. #756. Edge of Lake.
Carex disperma Dewey. - Soft-Leaved Sedge. #375. Wet Forest.
Carex hystericina Muhl.- Porcupine Sedge. #609. Wet Forest.
Carex lacustris Willd. - #285. Edge of Wet Meadow.
Carex oligosperma Michx. - Few-Seeded Sedge. #408. Wet Forest.
Carex paupercula Michx. - Bog Sedge. #374. Wet Forest.
Carex pensylvanica Lam. - Pennsylvania Sedge. #235. Oak Forest.
Carex pseudo-cyperus L. - Cyperus-Like Sedge. #504. Wet Forest.
Carex scoparia Schk. - Pointed Broom Sedge. #628. Near Road.
Carex siccata Dewey. - (C. foenea Willd. in Fernald, 1950) - Dry-Spiked Sedge. #373. Old Road.
Carex stipata Muhl. - Saw-Beak Sedge. #412. Shrub Thicket.
Cyperus filiculmis Vahl. (C. filiculmis (Vahl. var. macilentus in Fernald, 1950) - Few-Flowered Slender Cyperus. #1128. Old Field. *
Cyperus strigosus L. - Straw-Colored Cyperus. #1132. Near Road. *
Dulichium arundinaceum (L.) Britt. - Three Way Sedge. #757. Lake Shore.
Eleocharis erythropoda Steud. (E. calva Torr. in Fernald, 1950). Marsh Spike Rush. #649. Edge of Old Road. *
Eleocharis palustris (L.) R. & S. (E. smallii in Fernald, 1950) - Small's Spike Rush. #928. Edge of Floating Mat. *
Eriophorum angustifolium Honckeny. - Tall Cottongrass. #261. Wet Forest. *
Eriophorum virginicum L. - Virginia Cottongrass. #750. Wet Forest. *
Scirpus americanus Pers. - Three-Square. #647. Edge of Wet Meadow. *
Scirpus atrovirens Willd. - Bulrush. #650. Edge of Shrub Thicket. *
Scirpus cyperinus (L.) Kunth. - Dark Bracted Wool Grass. #1004. Wet Forest.

IRIDACEAE - Iris Family
Iris versicolor L. - Blue Flag. #634. Swampy Area.

LEMNACEAE - Duckweed Family
Lemna minor L. - Lesser Duckweed. Shrub Thicket. +
Lemna trisulca L. - Ivy-Leaved Duckweed. #1085. Lake Shore.

LILIACEAE - Lily Family
Asparagus officinalis L. - Asparagus. #578. Oak Forest.
Clintonia borealis (Ait.) Raf. - Yellow Clintonia. #382. Oak Forest.
Maianthemum canadense Desf. - Wild Lily of the Valley. #386. Wet Forest.
Polygonatum biflorum (Walt.) Ell. - Solomon's Seal. #583. Oak Forest.
Smilacina racemosa (L.) Desf. - False Solomon's Seal. Oak Forest. +
Smilacina stellata (L.) Desf. - Star-Flowered False Solomon's Seal. #303. Prairie.
Trillium cernuum L. - Nodding Wake-Robin. #301. Wet Forest.
Uvularia sessilifolia L. - Pale Bellwort. #266. Oak Forest.

ORCHIDACEAE - Orchid Family
Cypripedium acaule Ait. - Stemless Lady-Slipper. #395. Wet Forest.

POACEAE - Grass Family
Agropyron repens (L.) Beauv. - Quack Grass. #619. Roadside. Alien.
Agrostis hyemalis (Walt.) BSP var. tenuis (Tuckerm) Gl. (A. scabra Willd. in Fernald, 1950) - Rough Bent Grass. #591. Edge of Old Field. *
Andropogon gerardi Vitm. - Big Bluestem. #905. Roadside.
Andropogon scoparius Michx. - Little Bluestem. #1061. Prairie-Like Area.
Bromus inermis Leyss. - Smooth Brome. #587. Edge of Agricultural Field and Oak. Alien. *
Calamagrostis canadensis (Michx.) Beauv. - Blue Joint. #571. Edge of Floating Mat.
Cenchrus longispinus (Hack.) Fern. - Sandbur. #898. Roadside. Possible Alien.
Echinochloa muricata (Beauv.) Fern. (E. pungens (Poir.) Rydb. in Fernald, 1950) - Bristley Barnyard Grass. #1072. Roadside. *
Eragrostis spectabilis (Pursh.) Steud. - Purple Love Grass. #1074. Old Field.
Glyceria canadensis (Michx.) Trin. - Rattlesnake Grass. #605. Moat Surrounding Jack Pine Bog. *
Glyceria striata (Lam.) Hitch. - Fowl Manna Grass. #400. Shrub Thicket.
Leersia oryzoides (L.) Sw. - Rice Cut Grass. #1070. Shrub Thicket. *
Muhlenbergia mexicana (L.) Trin. - Mexican Satin Grass. #920. Lakeshore. *
Panicum oligosanthes Schult. (P. oligosanthes Schutt. var. scribnerianum (Nash) Fern. in Fernald, 1950) - Scribner's Panic Grass. Edge of Field. *
Panicum villosissimum Nash var. pseudopubescens (Nash) Fern. - Appressed White-Haired Panic Grass. #633. Edge of Oak Forest. *
Phalaris arundinacea L. - Reed Canary Grass. #573. Lake Shore. Possible Alien.
Phleum pratense L. - Timothy Grass. #618. Roadside. Alien.
Poa palustris L. - Fowl Meadow Grass. #502. Old Field.
Poa pratensis L. - Kentucky Blue Grass. #279. Near Sandpit. Possible Alien.
Setaria glauca (L.) Beauv. - Foxtail Grass. #1129. Edge of Old Field.

Sorghastrum nutans (L.) Nash. - Indian Grass. #932. Prairie-Like Area.
Sporobolus cryptandrus (Torr.) Gray. Sand Dropseed. #933. Sand Pit.
Stipa spartea Trin. - Porcupine Grass. #620. Roadside.
Zizania aquatica L. - Wild Rice. #929. Lake Shore.

POTAMOGETONACEAE - Pondweed Family
Potamogeton zosteriformis Fern. - American Eel-Grass Pondweed. #927. In Lake.

TYPHACEAE - Cat-Tail Family
Typha latifolia L. - Broad-Leaved Cat-Tail. #743. Floating Mat.

DICOTYLEDONEAE - Dicots

ACERACEAE - Maple Family
Acer rubrum L. - Red Maple. #237. Wet Forest.

ANACHARDIACEAE - Cashew Family
Rhus radicans L. - Poison Ivy. Oak Forest.+
Rhus vernix L. - Poison-Sumac. #570. Floating Mat.
Rhus typina L. - Staghorn Sumac. #1015. Edge of Old Field.

APIACEAE - Parsley Family
Cicuta bulbifera L. - Bulb-Bearing Water Hemlock. #1069. Shrub Thicket.
Osmorhiza claytoni (Michx.) Clarke. - Sweet Cicely. #585. Oak Forest.

APOCYNACEAE - Dogbane Family
Apocynum androsaemifolium L. - Spreading Dogbane. Oak Forest. +

AQUIFOLIACEAE - Holly Family
Ilex verticillata (L.) Gray. - Black Alder. #372. Wet Forest.
Nemopanthus mucronatus (L.) Trel. - Mountain Holly. #295. Wet Forest.

ARALIACEAE - Ginseng Family
Aralia nudicaulis L. - Wild Sarsaparilla. #378. Edge of Oak Forest.
Aralia racemosa L. - Spikenard. Forest. +

ASCLEPIACLACEAE - Milkweed Family
Asclepias incarnata L. - Swamp Milkweed. #742. Floating Mat.
Asclepias syriaca L. - Common Milkweed. #748. Edge of Old Field and Oak Forest.
Asclepias tuberosa L. - Butterfly Weed. #638. Opening in Oak Forest.

ASTERACEAE - Composite Family
Achillea millefolium L. - Yarrow. #481. Edge of Prairie-Like Area.
Ambrosia artemisiifolia L. - Common Ragweed. #900. Roadside.
Antennaria neglecta Greene. - Pussy Toes. #265. Old Field.
Aster hesperius Gray. - White Aster. #916. Near Lake Shore. *
Aster junciformis Rydb. - Rush Aster. #921. Floating Mat.
Aster lateriflorus (L.) Britt. - Calico Aster. #923. Floating Mat.
Aster macrophyllus L. - Large-Leaved Aster. #1009. Oak Forest.
Aster puniceus L. - Red-Stalked Aster. #1080. Edge Shrub Thicket and Lake.

Aster umbellatus Mill. - Flat-Topped White Aster. #1082. Edge of Shrub Thicket and Lake.
Bidens coronata (L.) Britt. (B. coronata (L.) Britt. var tenniloba (Gray) Sherff. in Fernald, 1950) - Narrow-Lobed Showy Beggar-Ticks. #948. Shrub Thicket. *
Bidens frondosa L. - Leafy Beggar-Ticks. #995. Wet Forest. *
Cirsium discolor (Muhl.) Spreng. - Field Thistle. #1084. Edge of Shrub Thicket.
Cirsium vulgare (Savi) Tenore. - Bull Thistle. #1127. Oak Forest.
Conyza canadensis (L.) Croq. - Horseweed. #904. Roadside.
Crepis tectorum L. - Narrow-Leaved Hawk's-Beard. #589. Edge of Agricultural Field.
Erechtites hieracifolia (L.) Raf. - Fireweed. #994. Wet Forest.
Erigeron annuus (L.) Pers. - Daisy Fleabane. #593. Edge of Old Field.
Eupatorium maculatum L. - Joe Pye Weed. #1063. Edge of Shrub Thicket.
Eupatorium perfoliatum L. - Boneset. +
Gnaphalium obtusifolium L. - Sweet Everlasting. #931. Prairie-Like Area.
Helianthus hirsutus Raf. - Stiff-Haired Sunflower. #895. Roadside. *
Helianthus laetiflorus Pers. - Stiff-Leaved Sunflower. #891. Roadside.
Helianthus petiolaris Nutt. - Prairie Sunflower. #594. Roadside. Possible Alien.
Hieracium aurantiacum L. - King-Devil. Alien. +
Hieracium canadense Michx. - Hawkweed. #909. Roadside.
Hieracium longipilum Torr. - Long Bearded Hawkweed. #949. Prairie-Like Area. Potential Heritage Element.
Krigia biflora (Walt.) Blake. - Dwarf Dandelion. #626. Roadside.
Rudbeckia hirta L. - Black-Eyed Susan. #595. Roadside. Alien.
Senecio pauperculus Michx. - Dwarf Ragwort. #478. Edge of Wet Meadow.
Solidago gigantea Ait. - Late Goldenrod. #1135. Roadside. *
Solidago graminifolia (L.) Salisb. - Bushy Goldenrod. #1014. Old Road.
Solidago nemoralis Ait. - Gray Goldenrod. #1071. Edge of Prairie-Like Area.
Solidago speciosa Nutt.- Showy Goldenrod. #896. Roadside. *
Taraxacum officinale Weber. - Common Dandelion. #392. Old Road. Alien.
Tragopogon dubius Scop. - Goat's Beard. #405. Prairie-Like Area. Alien.

BALSAMINACEAE - Touch-Me-Not Family
Impatiens biflora Walt. - Spotted Touch-Me-Not. #894. Near Lake.

BETULACEAE - Birch Family
Alnus rugosa (DuRoi) Spreng. - Glaucous-Leaved Speckled Alder. #1117. Shrub Thicket.
Betula papyrifera Marsh. - Paper Birch. #286. Edge of Wet Meadow.
Betula pumila L. Bog Birch. #269. Wet Forest.
Corylus americana Walt. - American Hazelnut. #1021. Oak Forest.

BORAGINACEAE - Borage Family
Lithospermum canescens (Michx.) Lehm. - Hoary Puccoon. #418. Edge of Oak Forest.
Lithospermum caroliniense (Walt.) MacMill. - Carolina Puccoon. #588. Oak Forest.

BRASSICACEAE - Mustard Family
Arabis lyrata L. - Lyre-Leaved Rock Cress. #272. Roadside.
Berteroa incana (L.) D.C. - Hoary Allysum. #485. Edge of Wet Meadow.
Lepidium densiflorum Schrader. - Pepper-Grass. #394. Old Field.

CAMPANULACEAE - Harebell Family
Campanula aparinoides Pursh. - Marsh Bellflower. Floating Mat. +
Campanula rotundifolia L. - Harebell. #577. Oak Forest.

CAPRIFOLIACEAE - Honeysuckle Family
Diervilla lonicera Mill. - Bush Honeysuckle. #584. Oak Forest.
Lonicera dioica L. Wild Honeysuckle. Wet Forest. +
Lonicera villosa (Michx.) R. & S. - Fly Honeysuckle. #377. Wet Forest.
Sambucus pubens Michx. - Red-Berried Elder. #271. Oak Forest.
Viburnum opulus L. - High-Bush Cranberrry. +

CARYOPHYLLACEAE - Pink Family
Arenaria lateriflora L. Blunt-Leaved Sandwort. #388. Oak Forest.
Lychnis alba Mill - White Campion. #380. Old Field. Alien.
Silene antirrhina L. - Sleepy Catchfly. #492A. Old Field. Alien.
Stellaria longifolia Muhl. - Long-Leaved Stitchwort. #410. Shrub Thicket. *

CERATOPHYLLACEAE - Hornwort Family
Ceratophyllum demersum L. - Coontail. #926. In Lake.

CHENOPODIACEAE - Goosefoot Family
Chenopodium leptophyllum Nutt. - Narrow-Leaved Goosefoot. #901. Roadside.
Salsola kali L. - Russian Thistle. #899. Roadside. Alien.

CISTACEAE - Rockrose Family
Helianthemum bicknellii Fern. - Hoary Frostweed. #637. Edge of Old Field. *
Lechea intermedia Leggett. - Intermediate Pinweed. #902. Roadside. *

CONVOLVULACEAE - Morning Glory Family
Cuscuta umbrosa Hook. - Dodder. #991. Oak Forest. *

CORNACEAE - Dogwood Family
Cornus alternifolia L.f. - Pagoda Dogwood. #491. Edge of Oak Woods.
Cornus canadensis L. - Bunchberry. #393. Wet Forest.
Cornus racemosa Lam. - Gray Dogwood. #608. Forest.
Cornus stolonifera Michx. - Red Osier Dogwood. #488. Edge of Wet Meadow.

CUCURBITACEAE - Gourd Family
Echinocystis lobata (Michx.) T. & G. - Wild Cucumber. #893. Roadside.

ERICACEAE - Heath Family
Andromeda glaucophylla Link. - Bog Rosemary. #299. Sphagnum-Heath Bog.
Chamaedaphne calyculata (L.) Moench. - Leather-Leaf. #259. Sphagnum-Heath Bog.
Chimaphila umbellata (L.) Bart.- Prince's Pine. #942. Edge of Forest.

Gaultheria procumbens L. - Checkerberry. #950. Forest.
Gaylussacia baccata (Wang.) K. Koch. - Huckleberry. #889. Oak Forest.
Ledum groenlandicum Oeder. - Labrador-Tea. #391. Wet Forest.
Monotropa uniflora L. - Indian Pipe. #765. Wet Forest.
Pyrola elliptica Nutt. - Common Pyrola. #636. Near Lake.
Pyrola secunda L. - One-Sided Pyrola. #614. Edge of Wet Forest.
Vaccinium angustifolium Ait. - Narrow-Leaved Blueberry. #296. Oak Forest.
Vaccinium myrtilloides Michx. - Velvet Leaf Blueberry. #399. Wet Forest.
Vaccinium oxycoccos L. - Small Cranberry. #1168. Jack Pine Bog.

EUPHORBIACEAE - Spurge Family
Euphorbia glyptosperma Engelm. - Ridge-Seeded Spurge. #907. Roadside. *

FABACEAE - Bean Family
Amorpha canescens Pursh. - Lead Plant. #924. Oak Forest.
Amphicarpa bracteata (L.) Fern. - Hog Peanut. #992. Oak Forest.
Apios americana Medic. - Wild Bean. #1083. Edge of Shrub Thicket.
Desmodium canadense (L.) DC. - Canada Tick-Trefoil. #1130. Near Roadside.
Desmodium glutinosum (Muhl.) Wood. - Pointed-Leaved Tick-Trefoil. #751. Oak Forest.
Lathyrus ochroleucus Hook. - Pale Vetchling. #381. Oak Forest.
Lathyrus venosus Muhl var. intonsus Butters and St. John.- Veiny Pea. #635. Near Lake. *
Lespedeza capitata Michx. - Bush-Clover. +
Medicago lupulina L. - Black Medick. #652. Shrub Swamp. Alien.
Medicago sativa L. - Alfalfa. #586. Agricultural Field. Alien.
Melilotus alba Desr. - White Sweet Clover. Alien. +
Melilotus officinalis (L.) Desr. - Yellow Sweet Clover. Alien. +
Robinia pseudoacacia L. - Common Locust. #908. Roadside.
Trifolium arvense L. - Rabbit Foot Clover. #625. Sand Pit. Alien.
Trifolium hybridum L. - Alsike Clover. #629. Roadside. Alien.
Trifolium pratense L. - Red Clover. #486. Edge of Wet Meadow. Alien.
Trifolium repens L. - White Clover. #487. Edge of Wet Meadow. Alien.
Vicia villosa Roth. - Hairy Vetch. #490. Edge of Wet Meadow.

FAGACEAE - Beech Family
Quercus alba L. - White Oak. #1013. Oak Forest.
Quercus ellipsoidalis E.J. Hill. - Northern Pin Oak. #276. Edge of Oak Forest.

GENTIANACEAE - Gentian Family
Gentiana andrewsii Griseb. - Closed Gentian. #1081. Edge of Shrub Thicket.
Menyanthes trifoliata L. Buckbean. #293. Floating Mat.

GERANIACEAE - Geranium Family
Geranium maculatum L. - Wild Geranium. #383. Edge of Old Field.

HYPERICACEAE - St. John's-Wort Family
Hypericum majus (Gray) Britt. - Small-Flowered St. John's-Wort. #990. Edge of Old Field.

Triadenum virginicum (L.) Raf. (Hypericum v. L. in Fernald, 1950) - Marsh St. John's-Wort. #990. Edge of Old Field.

JUGLANDACEAE - Walnut Family
Juglans cinerea L. - Butternut. #291. Edge of Oak Forest.

JUNCACEAE - Rush Family
Juncus nodosus L. - Knotted Rush. #648. Edge of Shrub Thicket. *
Juncus pelocarpus E. Meyer. - Brown Fruited Rush. #630. Roadside.
Juncus tenuis Willd. - Slender Rush. #592. Old Road. *

LAMIACEAE - Mint Family
Agastache foeniculum (Pursh) Kuntze. - Fragrant Giant Hyssop. #910. Roadside.
Lycopus americanus Muhl.- Water Horehound. #1126. Old Road.
Lycopus uniflorus Michx. - Northern Bugleweed. #938. Old Road.
Mentha arvensis L. - Wild Mint. #917. Near Lake Shore.
Monarda fistulosa L. - Wild Bergamot. #886. Oak Forest.
Prunella vulgaris L. - Self-Heal. #1131. Near Roadside.
Pycnanthemum virginianum (L.) Durand & Jackson. - Mountain Mint. #1131A. Near Roadside.
Scutellaria galericulata L. - Marsh Skullcap. #642. Wet Forest.
Stachys palustris L. - Woundwort. #654. Edge of Old Road.

LENTIBULARIACEAE - Bladderwort Family
Utricularia vulgaris L. - Greater Bladderwort. #1077. Lake Shore.

LOBELIACEAE - Lobelia Family
Lobelia inflata L. - Indian Tobacco. #988. Edge of Old Field.
Lobelia siphilitica L. - Louisiana Lobelia. #922. Lakeshore.

LYTHRACEAE - Loosestrife Family
Decodon verticillatus (L.) Ell. - Water-Willow. #915. Edge Lakeshore and Floating Mat.

NYMPHAEACEAE - Water Lily Family
Nymphaea tuberosa Paine. - Sweet-Scented White Water Lily. #925. In Lake.
Nuphar variegatum Engelm. - Bullhead Water Lily. #1118. Creek.

OLEACEAE - Olive Family
Fraxinus pennsylvanica Marsh. - Green Ash. #401. Shrub Thicket.

ONAGRACEAE - Evening-Primrose Family
Circaea alpina L. - Enchanter's Nightshade. #582. Wet Forest.
Circaea quadrisulcata (Maxim.) Franch. & Sav. - Enchanter's Nightshade. #641. Oak Forest.
Epilobium glandulosum Lehm. - Northern Willow-Herb. #760. Wet Forest.
Epilobium strictum Muhl. - Downy-Willow Herb. #912. Floating Mat.
Oenothera parviflora L. - Northern Evening-Primrose. #1073. Edge of Old Field.

OXALIDACEAE - Wood-Sorrel Family
Oxalis stricta L. - Upright Wood-Sorrel. #379. Old Field. Possible Alien.

PHRYMACEAE - Lopseed Family
Phryma leptostachya L. - Lopseed. #752. Oak Forest.

PLANTAGINACEAE - Plantain Family
Plantago rugelii Decne. - Rugel's Plantain. #762. Old Road.

POLEMONIACEAE - Phlox Family
Phlox pilosa L. - Shining Prairie Phlox. #627. Roadside.

POLYGALACEAE - Milkwort Family
Polygala polygama Walt. - Racemose Milkwort. #1134. Roadside.

POLYGONACEAE - Smartweed Family
Polygonum coccineum Muhl. - Swamp Smartweed. Shrub Thicket. +
Polygonum covolvulus L. - Black Bindweed. #767. Old Field. Alien.
Polygonum lapathifolium L. - Dock-Leaved Smartweed. #624. Edge of Prairie-Like Area. *
Polygonum aviculare L. - Knot-Grass. #906. Roadside. *
Polygonum pensylvanicum L. - Pennsylvania Smartweed. #1019. Old Field.
Polygonum punctatum Ell. - Dotted Smartweed. #911. Floating Mat. *
Polygonum sagittatum L. - Arrow-Leaved Tear-Thumb. #1120. Floating Mat.
Rumex acetosella L. - Field Sorrel. #273. Old Field.
Rumex orbiculatus Gray. - Great Water Dock. #913. Floating Mat.

PRIMULACEAE - Primrose Family
Lysimachia thyrsiflora L. - Tufted Loosestrife. #413. Shrub Thicket.
Trientalis borealis Raf. - Northern Star Flower. #304. Wet Forest.

RANUNCULACEAE - Crowfoot Family
Actaea rubra (Ait.) Willd. - Red Baneberry. #745. Oak Forest.
Anemone cylindrica Gray. - Thimbleweed. #640. Opening in Oak Woods.
Anemone quinquefolia L. - Wood anemone. #264. Oak Forest.
Aquilegia canadensis L. - Wild Columbine. #384. Oak Forest.
Caltha palustris L. - Marsh Marigold. #268. Wet Forest.
Delphinium virescens Nutt. - Prairie Larkspur. #639. Oak Forest.
Ranunculus abortivus L. - Small-Flowered Crowfoot. #390. Old Road.
Ranunculus pensylvanicus L.f. - Bristly Buttercup. #761. Wet Forest.
Ranunculus recurvatus Poir. - Hooked Buttercup. #576. Oak Forest.
Thalictrum dasycarpum Fisch & Ave-Lall. - Tall Meadow Rue. #651. Edge of Shrub Thicket.

RHAMNACEAE - Buckthorn Family
Coptis trifolia (L.) Salisb. (C. groenlandica (Oeder) Fern. in Fernald, 1950) - Goldthread. #267. Wet Forest.
Rhamnus frangula L. - Alder Buckthorn. #996. Wet Forest.

ROSACEAE - Rose Family
Amelanchier laevis Wieg. - Smooth Juneberry. #270. Edge of Oak Forest.
Aronia melanocarpa (Michx.) Ell. - Black Chokeberry. #397. Wet Forest.
Fragaria vesca L. - Wood Strawberry. #1011. Oak Forest.
Fragaria virginiana Duchesne. - Wild Strawberry. #258. Edge of Old Field.
Geum aleppicum Jacq. - Yellow Avens. #575. Oak Forest.
Potentilla arguta Pursh. - Tall Cinquefoil. #930. Prairie-Like Area.
Potentilla norvegica L. - Rough Cinquefoil. #746. Old Field.
Potentilla palustris (L.) Scop. - Marsh Cinquefoil #569. Floating Mat.
Potentilla recta L. - Sulfur Cinquefoil. #596. Roadside.
Potentilla simplex Michx. - Old Field Cinquefoil. #489. Edge of Wet Meadow.
Prunus pensylvanica L.f. - Pin Cherry. #759. Edge of Old Field.
Prunus serotina Ehrh. - Black Cherry. #499. Oak Forest.
Prunus triloba Lindel. (in Morley, 1966) - Flowering Almond. #298. Oak Forest. *
Prunus virginiana L. - Choke Cherry. #302. Oak Forest.
Rosa suffulta Greene. - Wild Prairie Rose. #655. Edge of Agricultural Field.
Rubus allegheniensis Porter. - Common Blackberry. #1024. Edge of Old Field.
Rubus flagellaris L. - Northern Dewberry. #500. Edge of Oak Forest. *
Rubus pubescens Raf. - Dwarf Blackberry. #389. Wet Forest.
Rubus strigosus Michx. - Red Raspberry. #1114. Wet Forest.
Spiraea alba DuRoi - Meadow Sweet. #946. Shrub Thicket.
Spiraea tomentosa L. - Steeplebush. #409. Wet Forest.

RUBIACEAE - Madder Family
Galium boreale L. - Northern Bedstraw. #579. Edge of Oak Forest.
Galium labradoricum (Wieg.) Wieg. - Labrador Marsh Bedstraw. #612. Wet Forest. *
Galium obtusum Bigel. - Clayton's Bedstraw. #568. Wet Forest.
Galium trifidum L. - Small Bedstraw. #1001. Wet Forest. *
Galium triflorum Michx. - Sweet-Scented Bedstraw. #566. Oak Forest.
Mitchella repens L. - Partridge Berry. #656. Edge of Wet Forest.

RUTACEAE - Rue Family
Zanthoxylum americanum Mill. - Prickly Ash. #297. Edge of Oak Forest.

SALICACEAE - Willow Family
Populus grandidentata Michx. - Bigtooth Aspen. #890. Oak Forest.
Populus tremuloides Michx. - Quaking Aspen. #1075. Edge of Old Field and Wet Area.
Salix bebbiana Sarg. - Beaked Willow. #280A. Edge of Wet Meadow.
Salix discolor Muhl. - Pussy-Willow. #238. Shrub Thicket.
Salix petiolaris Sm. - Slender Willow. #239. Shrub Thicket.
Salix pedicellaris Pursh. - Bog-Willow. #498. Floating Mat.
Salix pyrifolia Anderss. - Balsam Willow. #1167. Moat around Jack Pine Bog.
Salix serissima (Bailey) Fern. - Autumn-Willow. #402. Shrub Thicket.

SAXIFRAGACEAE - Saxifrage Family
Parnassia palustris L. - Grass of Parnassus. #1079. Edge of Shrub Thicket.
Ribes americanum Mill. - Wild Black Currant. #281. Edge of Wet Meadow.
Ribes cynosbati L. - Dogberry. #288. Oak Forest.
Ribes hirtellum Michx. - Swamp Gooseberry. #411. Shrub Thicket.
Saxifraga pensylvanica L. - Swamp Saxifrage. #493. Edge of Wet Meadow.

SCROPHULARIACEAE - Figwort Family
Castilleja coccinea (L.) Spreng. - Painted Cup. #482. Edge of Prairie-Like Area.
Gerardia tenuifolia Vahl. - Slender-Leaved Gerardia. #944. Roadside.
Lindernia dubia (L.) Pennell. - False Pimpernel. #753. Lake Shore.
Pedicularis lanceolata Michx. - Swamp Lousewort. #1060. Edge of Wet Meadow.
Verbascum thapsus L. - Great Mullein. #747. Old Field. Alien.

SOLANACEAE - Night Shade Family
Physalis heterophylla Nees. - Clammy Ground Cherry. #1020. Edge of Old Field.

TILIACEAE - Linden Family
Tilia americana L. - Basswood. #918. Near Lakeshore.

ULMACEAE - Elm Family
Ulmus americana L. - American Elm. #610. Forest.

URTICACEAE - Nettle Family
Boehmeria cylindrica (L.) Sw. False Nettle. +
Pilea fontana (Lunell) Rydb. - Black-Fruited Clearweed. Floating Mat. +
Urtica dioica L. - Stinging Nettle. +

VERBENACEAE - Verbena Family
Verbena hastata L. - Blue Vervain. #744. Old Field.

VIOLACEAE - Violet Family
Viola conspersa Reichenb. - American Dog Violet. #263. Oak Forest.
Viola pallens (Banks) Brainerd. - Wild White Violet. #262. Oak Forest.
Viola pedatifida G. Don. - Prairie Violet. #277. Prairie-Like Area.
Viola sagittata Ait. - Arrow-Leaved Violet. #480. Edge of Wet Meadow.
Viola sororia Willd. - Common Blue Violet. #257. Edge of Old Field.

VITACEAE - Grape Family
Parthenocissus vitacea (Knerr) Hitchc. (P. inserta (Kerner) Fritsch., misapplied) - Virginia Creeper. #1008. Oak Forest.
Vitis riparia Michx. - Riverbank Grape. #1010. Oak Forest.

The following additional plant species were identified in releve plots. Voucher specimens were not collected.

FAGACEAE
Quercus cf. borealis

POACEAE
Glyceria striata var. stricta

POLYPODIACEAE
Thelypteris palustris

ROSACEAE
Rubus occidentalis

VERBENACEAE
Verbena stricta

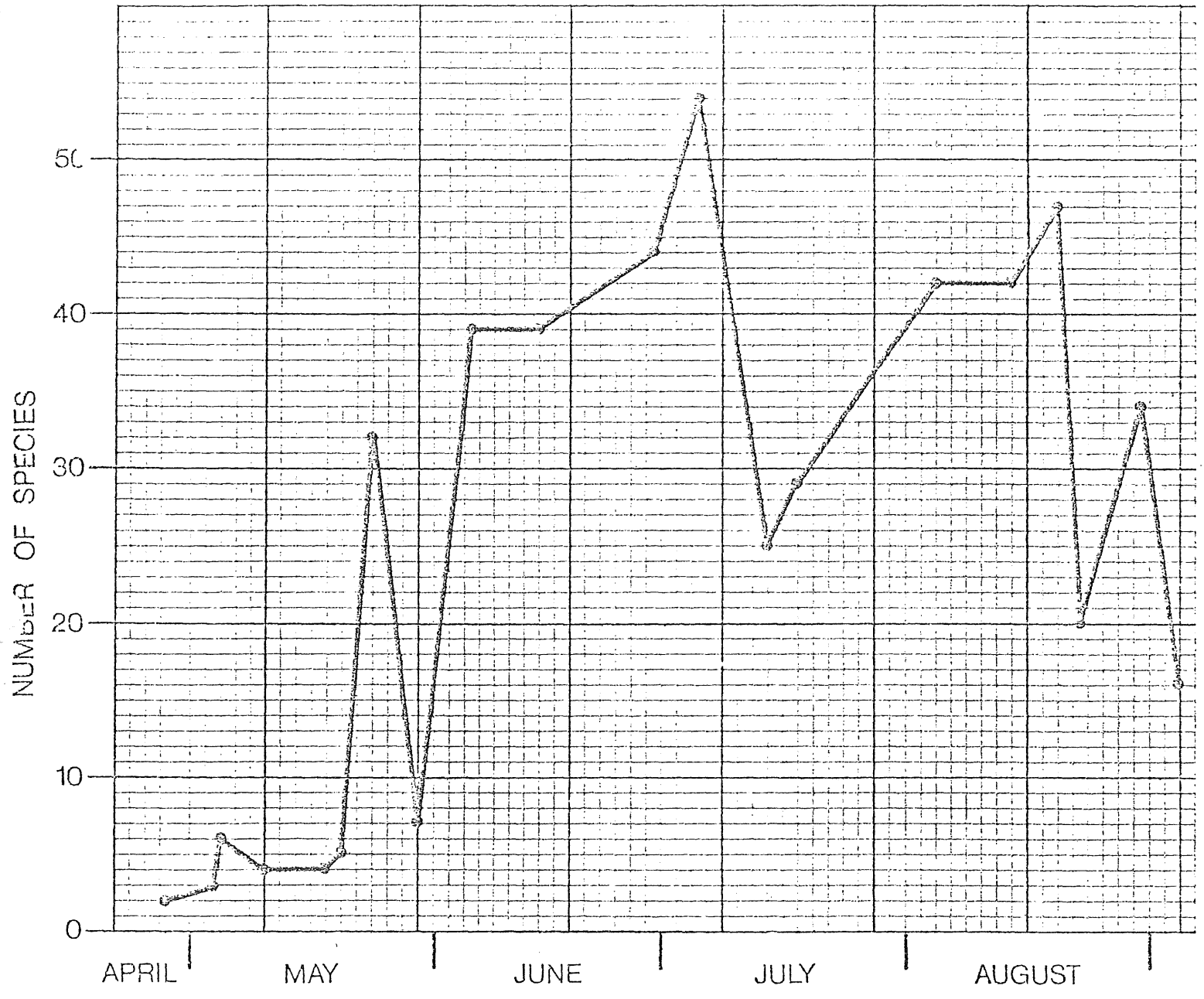


Figure 6. The 1979 blooming phenology on Boot Lake. Graph illustrates the number of plant species blooming on each visit to the preserve.

Results

Table 3 is an annotated list of the plants identified on the tract.[1] A total of 319 vascular plant species[2], representing 77 families, were recorded on the unit in 1979. Twenty-seven of these species are alien. The families with the largest number of species were: Asteraceae with 35 species (10.97% of total), Poaceae with 24 species (7.52% of total). and Cyperaceae with 23 species (7.21% of total).

Figure 6 illustrates the number of species in flower on each visit to the preserve. A total of 234 species were included. The peak of blooming occurred in early July.

Sources of Information

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1 Nomenclature is according to Gleason and Cronquist (1963).
2 This total does not include additional plant species identified in releve plots.

ZOOLOGICAL COMPONENTS

Animals are found on 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 animals 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

The 1979 bird inventory used a variation of the IPA (Indices Ponctuels d'Abondance) or Point Count Method (Robbins, 1978) to inventory breeding birds. This method infers a breeding territory based on repetition of a singing male in the same area during the breeding season (May-June). Fourteen circular stations (50 m radius) were established to include each of the major habitat types. A researcher visited the tract once a week, remaining 10 minutes at each station. The time of day and order in which the stations were visited was varied. All birds seen or heard from each station were recorded. A minimum of three non contemporaneous occurrences of a particular species on a given station was used as a guideline for inferred breeding of that species. Additional species observed outside of the established stations were also recorded.

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 4. Seventy-two species of birds, representing 26 families, were observed on or above Boot Lake natural area. Four species were found nesting on the area with 13 others recorded as inferred breeders. Great Blue Herons were seen regularly on the area, possibly using Boot Lake as a feeding ground.[1]

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 4

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.

OWo - Oak Woods
Pr - Prairie
FlM - Floating Mat
TBB - Tamarack Birch Bog
EgL - Edge of Lake
WM - Wet Meadow
PBWo - Pine-Birch Woods
EgF - Edge of Field
CB - Conifer Bog
TWF - Tamarack Wet Forest
MBWo - Maple-Birch Woods
PBWo - Pine-Birch Woods
Mh - Marsh
ToP - Throughout Preserve

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

P - Permanent Resident
S - Summer Resident
W - 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 4. ANNOTATED LIST OF BIRDS OBSERVED AT BOOT LAKE

FAMILY/SCIENTIFIC NAME	COMMON NAME	DATE	HABITAT	RESI-DENCY	BREEDING STATUS	REMARKS
GAVIIDAE						
Gavia immer	Common Loon	20 May	L	S		
ARDEIDA						
Ardea herodis	Great Blue Heron	26 April	Pr F/M Tbb OWo	S		
ARDEIDAE						
Butorides virescens	Green Heron	5 June	F/M	S		
ANATIADAE						
Branta canadensis	Canada Goose	20 May	EgL	S		
Anas platyrhynchos	Mallard	17 May	EgL WM	S	●	1 nest 11 eggs 5/17/79
Anas discors	Blue-Winged Teal	20 May	EgL	S	●	1 nest 11 eggs 5/20/79
Aix sponsa	Wood Duck	20 May	F/M OWo	S		
ACCIDITRIDAE						
Buteo jamaicensis	Red-Tailed Hawk	10 May	F/M OWo	S		
Buteo platypterus	Broad-Winged Hawk	5 July		S		Observed Flying
Circus cyaneus	Marsh Hawk	26 April	F/M EgF	S		
TETRAONIDAE						
Banasa umbellus	Ruffed Grouse	26 April	OWo	P	●	Parent with young 6/29/79
PHASINAIDAE						
Phasianus colchirus	Ring-Necked Pheasant	10 May	Pr OWo	P		
RALIIDAE						
Porzona carolina	Sora	10 May	Pr	S		
SCOLOPACIDAE						
Actitis macularia	Spotted Sandpiper	10 May	EgF	S	●	1 nest 3 eggs 5/10/79
COLUMBIDAE						
Zenaida macroura	Mourning Dove	29 May	F/M OWo	S		
COCULIDAE						
Coccyzus erythropthalmus	Black-Billed Cuckoo	5 July	EgF	S		

TABLE 4 (Continued) ANNOTATED LIST OF BIRDS OBSERVED AT BOOT LAKE

FAMILY/SCIENTIFIC NAME	COMMON NAME	DATE	HABITAT	RESI-DENCY	BREEDING STATUS	REMARKS
STRIGIDAE						
Strix varia	Barred Owl	26 April	EgF	P		
PICIDAE						
Colaptes auratus	Common Flicker	4 May	EgF OWo CB TWF	S		
Dendrocopus villosus	Hariy Woodpecker	26 April	MBW OWo BBWo	P		
Dendrocopus pubescens	Downy Woodpecker	10 May	EgF OWo	P		
TYRANNIDAE						
Myiarchus crinitus	Great Crested Flycatcher	17 May	WM FLM	S	Ø	
Sayornis phoebe	Eastern Phoebe	4 May	CB WM	S	Ø	
Contopus virens	Eastern Wood Pewee	17 May	EgF OWo	S	Ø	
HIRUNDINIDAE						
Iridoprocne bicolor	Tree Swallow	3 May	OWw	S		
Hirundo rustica	Barn Swallow	5 June	EgF	S		
CORVIDAE						
Cyanocitta cristata	Blue Jay	4 May	EgF Pr	P	Ø	
Corvus brachyrynchus	Common Crow	26 April	EgF OWo PBWo	P	Ø	
PARIDAE						
Parus atricapillus	Black-Capped Chickadee	26 April	MBW OWo EgG	P	Ø	
SITTIDAE						
Sitta carolinensis	White-Breasted Nuthatch	26 April	CB OWo	P	Ø	
MIMIDAE						
Dumetella carolinensis	Gray Catbird	10 May	WM PBWo TBW Pr	S		

TABLE 4. (Continued) ANNOTATED LIST OF BIRDS OBSERVED AT BOOT LAKE

FAMILY/SCIENTIFIC NAME	COMMON NAME	DATE	HABITAT	RESI-DANCY	BREEDING STATUS	REMARKS
TURDIDAE						
Turdus migratorius	American Robin	4 May	OWo MB F/M	S	⊕	
Catharus guttatus	Hermit Thrush	17 May	OWo	S		
Catharus fuscescens	Veery	20 May	F/M TWF	S	⊕	
SYLVIIDAE						
Regulus calendula	Ruby-Crowned Kinglet	29 May	Mh	S		
STURNIDAE						
Sturnus vulgaris	Starling	3 May	TBB	P		
VIREONIDAE						
Vireo flavifrons	Yellow-Throated Vireo	20 May	OWo	S		
Vireo olivaceus	Red-Eyed Vireo	10 May	OWo WM Pr	S	⊕	
PARULIDAE						
Mniotilta varia	Black-And-White Warbler	10 May	EgF	S		
Vermivora chrysoptera	Golden-Winged Warbler	29 May	TBB F/M WM	S		
Vermivora peregrina	Tennessee Warbler	10 May	OWo BBWo	S		
Vermivora ruficapilla	Nashville Warbler	10 May	OWo PBWo	S		
Dendroica petechia	Yellow Warbler	26 April	MBW	S		
Dndroica magnolia	Magnolia Warbler	10 May	OWo	S		
Dendroica tigrina	Cap May Warbler	10 May	PBWo	S		
Dendroica coronata	Yellow-Rumped Warbler	3 May	OWo CB EgF	S		
Dendroica virens	Black-Throated Green Warbler	10 May	PBWo	S		
Dendroica fusca	Blackburnian Warbler	10 May	OWo PBWo	S		
Dendroica pensylvanica	Chestnut-Sided Warbler	10 May	EgF OWo	S		
Dendroica striata	Blackpoll Warbler	20 May	PBWo	M		
Dendroica pinus	Pine Warbler	10 May	PBWo	S		
Dendroica palmarum	Palm Warbler	10 May	CB	S		

TABLE 4. (Continued) ANNOTATED LIST OF BIRDS OBSERVED AT BOOT LAKE

FAMILY/SCIENTIFIC NAME	COMMON NAME	DATE	HABITAT	RESI-DENCY	BREEDING STATUS	REMARKS
PARULIDAE						
Seiurus aurocapillus	Ovenbird	10 May	OWo	S		
Geothlypis trichas	Common Yellowthroat	10 May	CB EgF PBWo F/B TBB	S		
Setophaga niticilla	American Redstart	10 May	F/M OWo	S		
ICENDAE						
Xanthocephalus xanthocephalus	Yellow-Headed Blackbird	5 June	F/M	S		
Agelaius phoeniceus	Red-Winged Blackbird	4 May	EgF Pr F/M MBW	S	⓪	
Icterus galbula	Northern Oriole		PBWo OWO	S		
Euphagus cyanocephalus	Brewer's Blackbird	4 May	TWF	S		
Quiscalus quiscula	Common Grackle	5 June	EgF	S		
Molothrus ater	Brown-Leaded Cowbird	4 May	TOP	S		
THRAUPIDAE						
Piranga olivaces	Scarlet Tanager	20 May	W/B OWo CB	S		
FRINGILLIADE						
Cardinalis cardinalis	Cardinal	10 May	TWF	P		
Pheusticus ludovicianus	Rose-Breasted Grosbeak	10 May				
Passerina cyanea	Indigo Bunting	20 May	OWO	S		
Carpodacus purpureus	Purple Finch	20 May	OWO	S		
Spinus tristis	American Goldfinch	29 June	EgF	S		
Ammodramus savannarum	Grasshopper Sparrow	14 June	WM	S		
Pooecetes gramineus	Vesper Sparrow	26 April	OBWo EgF	S		
Spizella passerina	Chipping Sparrow	26 April	TWF CB OWo	S		
Zonotrichia albicollis	White-Throated Sparrow	10 May	OWO CB	S		
Melospiza guorginan	Swamp Sparrow	3 May	WM MBW PBWo F/M OWo	S	⊕	
Melospiza melodia	Song Sparrow	3 May	TBB EgF	S	⊕	

Sources of Information

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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 Agriculture 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. 1971. Houghton Mifflin Company, Boston.

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

MAMMALS

Methods

Mammals were identified by sight, track, sound, and collections. 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 16 Museum Special snap traps, two Shermans, one Havahart and one wooden live trap 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 re-opened. 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 a female of each species collected were deposited in the Bell Museum of Natural History, University of Minnesota, Department of Ecology and Behavior Biology, as voucher specimens.

Table 5. Mammals Identified on Boot Lake Natural Area.

Family Name/ Scientific Name	Common Name	Habitat
SORICIDAE		
Sorex cinereus	Masked Shrew	Pines, Pine Tamarack, Wet Forest, Jack Pine Bog, Maple-Birch Wet Forest
Blarina brevicauda	Short-tailed Shrew	Pine, Jack Pine Bog, Tamarack, Wet Forest
SCIURIDAE		
Tamiasciurus hudsonicus	Red Squirrel	
Tamias striatus	Eastern Chipmunk	
Sciurus carolinensis	Eastern Gray Squirrel	
GEOMYIDAE		
Geomys bursarius	Plains Pocket Gopher	
CRICETIDAE		
Peromyscus leucopus	White-footed Mouse	Oak Woods, Tamarack Wet Forest, Maple-Birch Wet Forest, Jack Pine Bog
Clethrionomys gapperi	Gapper's Red-backed Vole	Pine, Oak Woods, Maple-Birch, Wet Forest, Tamarack Wet Forest
Microtus pennsylvanicus	Meadow Vole	Pine, Pine-Tamarack Wet Forest, Shrub Swamp/Wet Meadow, Tamarack-Birch Wet Forest
ZAPODIDAE		
Zapus hudsonius	Meadow Jumping Mouse	Pine, Tamarack-Birch Wet Forest, Jack Pine Bog, Shrub Swamp, Wet Forest
CERVIDAE		
Odocoileus virginianus	White-tailed Deer	

Results

The results of the 1979 mammal inventory is presented in the form of an annotated list, Table 5. Eleven species, representing six families were observed or captured on Boot Lake.[1]

Sources of Information

Banfield, S.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 K. Bur. 1953. The Mammals of Minnesota. University of Minnesota Press, Minneapolis.

1 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 identified by vocalizations, sight and collection of specimens.[1] Collection techniques used were drift fences and hand collection. Incidental observations were made throughout the summer.

Collection of amphibians was accomplished by hand capture and with drift fences. In the spring frogs, toads and salamanders congregate for breeding, often in the same areas. Frogs and toads can be identified using their breeding vocalizations, located and hand captured. Salamanders were collected by searching the breeding area. Collecting was done at night with head lamps and waders. Later in the spring and throughout the summer drift fences, ranging from 50 to 100 feet long, were constructed of 18 inch high galvanized flashing sunk 3 to 4 inches into the ground. One bucket was placed at each end of the fence with a pair of buckets along the fence at 15 foot intervals. These served as drop receptacles for amphibians moving along the fence. The fences were placed in low areas and along the shores of water areas. Any animal moving toward or away from the water was diverted by the obstructing fence into one of the drop buckets.

Voucher specimens were deposited at the Bell Museum of Natural History, University of Minnesota, Department of Ecology and Behavior Biology.

Results

The results of the 1979 amphibian and reptile inventory are presented in the form of an annotated list, Table 6. Seven amphibians and 6 reptiles were identified in Boot Lake.

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

Table 6. Amphibians and Reptiles Observed on Boot Lake Natural Area.

AMPHIBIA

AMBYSTOMATIDAE
Ambystoma laterale (Blue-spotted Salamander)
Ambystoma tigrinum tigrinum (Eastern Tiger Salamander)

BUFONIDAE
Bufo americanus american (American Toad)

HYLIDAE
Hyla crucifer (Spring Peeper)
Hyla versicolor (Gray Tree Frog)
Pseudacris triseriata triseriata (Western Chorus Frog)

RANIDAE
Rana pipiens pipiens (Leopard Frog)
Rana sylvatica (Wood Frog)

REPTIDIA

COLUBRIDAE
Storeria occipitomaculata occipitomaculata (Northern Red-bellied Snake)
Thamnophis sirtalis sirtalis (Eastern Garter Snake)
Thamnophis sirtalis parietalis (Red-sided Garter Snake)
Pituophis melanoleucus sayi (Bullsnake)

EMYDIDAE
Chrysemys picta belli (Western Painted Turtle)
Emydoidea blandingii (Blanding's Turtle)

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.

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.

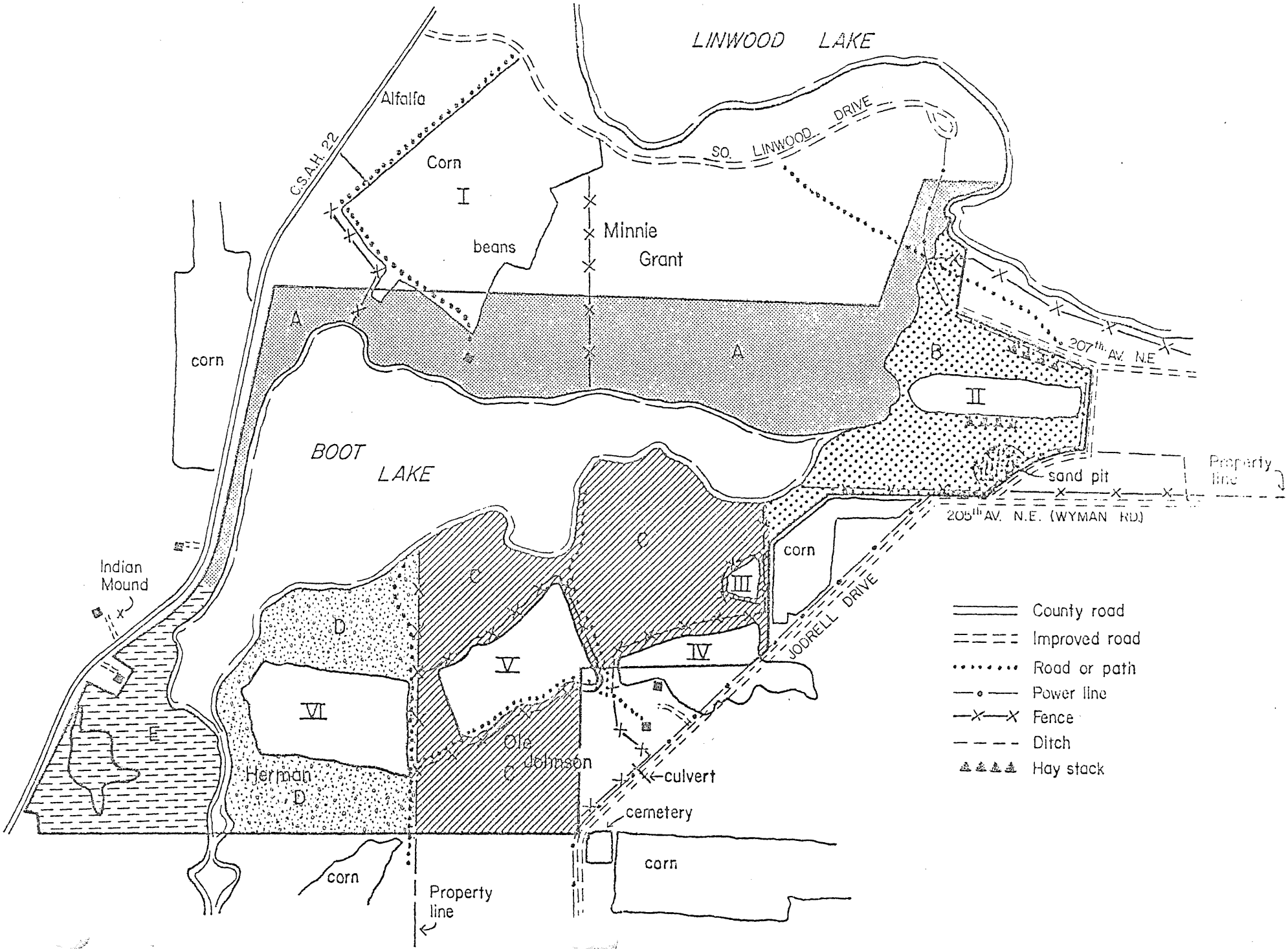
Methods

The land use information presented here is based on historical records, aerial photographs, inspections of the site, and interviews with owners of adjacent land and other individuals knowledgeable about Boot Lake natural area.

Land Use History of Boot Lake Natural Area

People have lived in the vicinity of Boot Lake for centuries. The Mound Builders were the first people recorded living in the area. The Mound Builders' name derives from the symetrical burial mounds they typically built beside a river or lake. One such mound was discovered near the southwest corner of Boot Lake (see Figure 7). A bone of a ten year old child was discovered when a tree was uprooted from the mound, and a full skeleton in sitting position was found immediately south of the mound in the earlier part of this century. Later on, other Indians, probably the Chippewa or Sioux, frequently traversed the land surrounding Boot Lake. A number of arrowheads and hatchets have been found on the land throughout the years, especially on those areas which were plowed.

Europeans first came to the Boot Lake area in the later part of the 1800's. Linwood Township, where Boot Lake is located, was settled in


LINWOOD LAKE
Alfalfa
C.S.A.H. 22
Corn
I
beans
Minnie
Grant
SO. LINWOOD DRIVE
corn
A
A
B
II
207th AV. N.E
BOOT
LAKE
sand pit
Property
line
205th AV. N.E. (WYMAN RD)
Indian
Mound
C
D
III
corn
JODRELL DRIVE
V
IV
VI
E
Herman
D
Ole
Johnson
culvert
cemetery
corn
corn
Property
line
County road
Improved road
Road or path
Power line
Fence
Ditch
Hay stack

1855 and organized in 1871. In 1872, 1878, and 1886 three families homesteaded around Boot Lake. These families still own most of the land surrounding the lake (see Figure 7).[1]

With time, parcels of land in the vicinity of Boot Lake were cleared and used for crop production, grazing, or residential housing. Other parcels were utilized for timber and wildlife production. Today woods still stand around much of the tract's border with an occasional cultivated field and house. Corn and soybeans are the most common crops grown in the area. Carlos Avery Wildlife Management Area borders the northeastern, eastern, and southeastern edge of the tract. However, Boot Lake lies in the urban fringe of the Twin Cities Metropolitan Area, and the area around Boot Lake is being rapidly developed. The land just north of the tract, on the south shore of Linwood Lake, is being subdivided and now has residential homes. Houses have also been recently built on Highway 17, south of the tract.

The land immediately adjacent to Boot Lake natural area has been affected in many ways by the activities of people. Figure 7 summarizes the recent land use history of the area. Logging, grazing, haying, and row cropping have all occurred in the area. Several roads and other structures, including a log cabin, were also built near or immediately adjacent to the lake.

Livestock grazing has occurred all around the lake. Letters A-D represent areas which have been grazed. Area "A" was grazed from the 1880's until 1957 by 140 head of Holstein cattle and thirty-five sheep.

1 A description of the changes which have occurred in the Boot Lake ownership is on file, Scientific and Natural Areas Section, St. Paul.

Area "B" was grazed from 1880 to 1957 by twenty-five horses in the fall, after the crops were harvested and the hay stacked. Twenty-six dairy cattle and four horses grazed over Area "C" between 1886 and 1942; eight sheep also grazed in the area, but closer to the southwest corner of Field IV. Area "D" was grazed in the fall by forty head of Holstein cattle from 1878 until about 1930. Area "E" was grazed by an unknown number of dairy cattle and horses between 1880 and 1940.

Two areas were hayed for over fifty years. Swamp grass in Area "B" was mowed every year from 1900 to 1957 with a hand scythe and the aid of horses. Haystacks were kept on the higher ground through the winter and hauled off in the spring. Field VI was alternately used for hay and crop production from 1879 until 1977 when it was planted with alfalfa and red clover and fertilized with potash. Alfalfa and red clover have subsequently been cut twice every year, baled, and hauled off the field.

Six fields have been cultivated near Boot Lake. Field I was farmed from 1872 to 1955. Corn, sugar cane, oats, barley, soy beans, potatoes, clover and alfalfa were all planted on the field at various times. Then for twenty years the field lay fallow. In 1975 corn and soybeans were again planted and have continued to be cultivated up to the present. Lime was used on the field after 1945, but only manure has been used as fertilizer. Field II was planted from 1872 to 1930 with oats. Fields III and IV were planted with a rotation of corn, potatoes, melons, oats and red clover from 1886 to 1961. Field V had a rotation of potatoes, corn and oats also from 1886 to 1961. Corn, hay, soybeans and potatoes were harvested on a rotating basis on Field VI from 1879 to 1977.

In addition to the above crops blueberries were regularly gathered in Areas "A" and "E". From 1879 to 1920 the blueberries, and about 500 bushels of cranberries collected from the bog in "E", were sold by the owners. Spring controlled burns were set in the two areas every two years during this time to maintain the blueberry patches and eliminate competitors.

Parts of areas A-E have also been logged at various times, beginning in the early 1900's. Area "A" apparently experienced the most intensive logging: 350,000 board feet of Poplar, Oak, Jack Pine and some Birch were handcut and hauled off to a nearby lumber mill. A small patch of Maple, Birch and Oak was cut in Area "B". In 1979 dead and dying oaks were also removed from this area: other oaks which arch over Jordell Drive are presently being removed. Timber thieves cut many large White Pines in Area "C" before 1880. In 1886 a few 30 inch diameter at breast height (d.b.h.) White Pines and some Tamarack trees were logged above Field IV. Then in 1961 about fifteen 18-20 inch d.b.h. Jack Pine were removed south of Field V. Area "D" was first logged during homesteading in 1878. Then the entire section above Field VI was logged around 1939; some 12-13 inch diameter White Pine and Jack Pine were cut here. Another timber harvest occurred in Area "D", and in the bog in the northeast section of the bog in Area "E" around 1943: 2000 board feet of white pine were cut. These trees were about forty feet high and 100 years old. One hundred tamarack trees immediately southeast of the bog in Area "E" were also logged in 1943.

Fences were built on all of the areas which were grazed near the lake. The fences in and around Areas "A" and "B" were erected before

1900, probably at the same time the homestead was built in 1872. They were made of small oak and cedar trees with eight strands of barbed wire. Some metal stakes were used to replace rotten wooden posts from about 1925 to 1955. Today, posts may still be found in the two areas. The fences in and around Area "C" were installed in 1886 and kept in repair through 1934. These fences consisted of Yellow Tamarack posts and barbed wire. Parts of the fences are still standing. The barbed wire fence which presently separtes Areas "C" and "D" was erected in 1878. Area "E" was also fenced, but the fence location was not determined.

Several structures were built in the Boot Lake area, some of which remain today. A 12'x16' log cabin was built on the north shore of the lake in 1872, but was moved to the farmstead on the south shore of Linwood Lake in 1910. A path probably led to the house and sedum was planted around it. A root cellar in the southeast corner of Field V was used when the field was being farmed. The cellar has since been filled in with garbage and dirt. Today only a large ten foot pit marks the cellar's location. On the south shore of Boot Lake there are a couple wood planks presently used as a boat dock. A sunken duck blind is located a short distance to the east of the dock. Another duck blind is south of the old homestead site on the north shore. More recently, the Anoka Electric Cooperative erected powerlines which cross the creek on the lakes east side, and border Jordell Drive, Saturn Street and 207th Avenue.

At least five roads have been built in or adjacent to the Boot Lake area. County State Aid Highway 22 (CSAH 22) began as a wagon trail when the homesteads were built. It was a dirt road until 1965 when the county leveled the road, using adjacent earth, and paved it. A section of the old road bordering Field I was abandoned and returned to the landowner.

CSAH 22 has 50 feet right-of-way on each side of the center line. Blue grass, red clover, white clover, birdsfoot trefoil, hairy vetch, timothy, brome grass and perennial rye grass were all planted along the road's sides. The Boy Scouts may also have planted a few conifers on the west side of Boot Lake bordering the road.

Jordell Drive N.E. is a township sand road first used around 1910 as a mail route to Wyoming, Minnesota.

In 1969, 207th Avenue N.E. was built. The sand for this road and parts of the nearby roads, came from the sand pit on the lake's east side. It is not known when this sand pit began operating, but it is still being used today.

A 16 foot wide cartway going from Areas "A" to "B" was built and used in the late 1800's. To cross the stream a bridge 10-12 feet in width was also constructed. The cartway then continued along the south shore of the lake, taking a turn south on what is now Saturn Drive N.E. Corduroy, consisting of pine and tamarack, was placed in two sections of the path. The bridge was used by both livestock and cars until 1942 when the bridge rotted out. Although low standing vegetation covers much of the cartway today, the path can still be recognized.

The sand road between Areas "C" and "D" was built in 1878 and used to connect with Highway 17 to the south. This road is still used as an access to the field and boat dock. An additional segment was added on to the road in 1886, running along the south edge of Field V to a landowner's house. This road is now covered with vegetation and is undistinguishable in the woods, but the ruts in the field can still be seen.

In addition to the above roads many foot paths run through the woods. One path was built in the 1900's to connect Areas "D" and "E". Presently this path is in extremely poor condition because the logs used in the path have rotted.

Several other activities have affected the Boot Lake area. A ditch was built by hand east of Area "B" in 1890 to drain the crop area. The ditch was 2-4 feet wide and several feet deep. However, in 1960 the ditch was plugged up and filled in with earth and grasses; today it is barely recognizable. A beaver dam which blocks the flow of wastes from Boot to Linwood Lake has been blown out several times, most recently in the spring of 1979. This action, in turn, has affected Boot Lake's water level. Finally, all of the Boot Lake area has been used by hunters and snowmobilers. Areas "A" and "B" were leased to the Linwood Gun Club from 1892 to 1978. Blinds were sunk along the north border of Boot Lake in the fall, one of which still remains near the old homestead.

Addendum # 1
Feb 1, 1982

LOCAL PERSPECTIVE

LOCAL PERSPECTIVE

Linwood Township (The following discussion is summarized from the Linwood Township Comprehensive Plan, 1979)

Boot Lake SNA is located in Linwood Township in the extreme northern fringe of the Metropolitan Area, approximately 40 miles from the Twin Cities. The township is served by Interstate 35 which parallels the eastern boundary. CSAH 22 provides east-west access through Linwood. Within the context of the Twin Cities Metropolitan Area, Linwood Township serves the primary function of providing housing in a rural, open space environment. The general community objectives for Linwood are:

1. Protect, preserve and enhance the community's natural/rural environment avoiding the creation of an 'urban' environment and sustaining the existing low density 'rural' suburban growth pattern.

2. To avoid the creation of an urban environment, growth shall be regulated so that the need for a premature extension of sewer service can be avoided.

Linwood has been experiencing unprecedented growth pressures in recent years. Single family homes are the predominant housing type. Map # shows the land-use development plan for Linwood Township. Map# shows how Linwood plans to direct anticipated growth. The west side of Boot Lake SNA is a primary growth staging area. Residential development and expansion of community services will be focused in this type of area. Minimum lot size is 2 1/2 acres.

The rest of the private land surrounding the SNA is planned a residential/agricultural district. Minimum lot size is 5 acres. This can be appealed to 2.5 acres with proof of adequate soil service capability and evidence that such a development will not result in rapid urbanization.

Local road development could affect the SNA. The new road proposed south of the SNA (see map) crosses a lowland area contiguous with the SNA, and also could have an impact on the type of development that would occur adjacent the southern boundary of the SNA (See adjacent resources, Area 5, pg).

Carlos Avery Wildlife Management Area (WMA)

Adjoining the eastern boundary of Boot Lake SNA is the Carlos Avery WMA (21,713 acres). The WMA includes upland woods, lowland forests, old fields, cropland and large wetlands. It was established to provide public hunting for sportsmen in the Twin Cities. It is administered by the DNR, Section of Wildlife. In the past it has been managed principally for waterfowl with secondary emphasis on white tailed deer, squirrels and ruffed grouse and fur-bearers. Hunting and trapping are the dominant recreational uses (DNR, 1977). The management area also provides a variety of other wildlife-oriented outdoor recreation. A large sanctuary area within the WMA occurs just southeast of Boot Lake (see map #).

The WMA headquarters is located about 1 1/2 miles SE of the SNA. Heavy equipment used on the WMA and in the region is stored here. This includes farm equipment, equipment used to construct and maintain roads and firebreaks, manipulate wildlife habitat, build dikes and water control structures.

Prescribed burning has been used extensively on the WMA. It has been applied to the management of wetlands and upland grasslands. Prescribed burning is also planned for savanna areas within the WMA.

The DNR, Division of Forestry maintains its Metro Region headquarters, Carlos Avery District Headquarters and a nursery in the WMA. (See map#)

Martin-Island-Linwood Regional Park

The Metropolitan Council expects this to be a heavily used park when development is completed. It will offer family camping (100 sites) swimming and boating. (see map). A swimming beach, picnic area, nature study area and trails are proposed to be developed in the south end of the park nearest the SNA. Development is scheduled for 1985.

VISITORS AND USE

Past Use

Before SNA designation, public recreational use was confined to Boot Lake itself. The lake was used for both summer and winter fishing, harvesting of wild rice, and snowmobiling. The upland areas were in private ownership. The land on the north and east sides of the lake were leased to a gun club.

Present Use

Since SNA designation, no effort has been made to gather information on user numbers or characteristics.

Use and Activity Problems

Borrow pit area. The lower part of this area was heavily disturbed by sand removal. The upper portions are dominated by prairie species. The entire area was once a cultivated field. Hieracium longipilum occurs on the upland part.

The area next to the road is commonly used as a vehicle turn-around. Tracks indicate vehicles drive all over the lower pit area. Some also drive up onto the upper prairie. The area is also used for target practice and trash dumping.

Wild rice. Wild rice has been traditionally harvested off Boot Lake in the past. The area conservation officer reports that on occasion the lake has been harvested illegally before the season or at night. Further harvesting of the rice is not allowed under SNA policies.

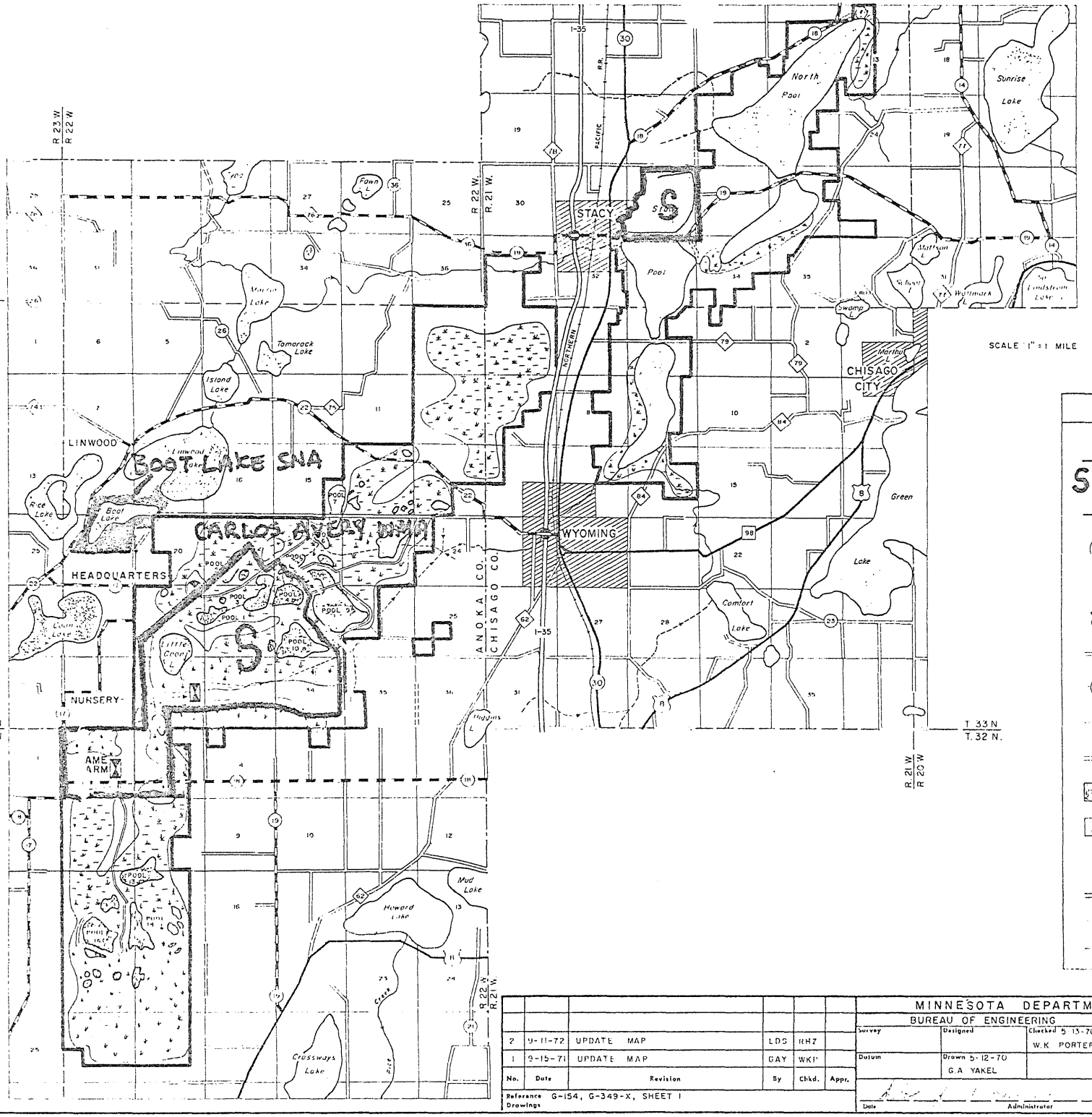
Fishing-Boating. Since designation some fishing or boating has apparently taken place on Boot Lake. A fish house was reported on the lake during the winter of 1980-81. Evidence of a boat being slid into the water from CSAH 22 was also noted fall of 1981.

Boat launching on Linwood Lake. During the summer of 1981 boats were being launched onto Linwood Lake from SNA property. The boats were brought up the trail that starts at the west end of 207th Ave NE. The county has lot #1 of Grants Linwood Shores (adjacent the SNA) for the purposes of public access. This access however has not yet been developed.

Linwood Lake trail. A trail exists along the shore of Linwood Lake between houses on the north side of the Boot Lake outlet and houses on the south. It follows an old road bed. A small bridge across the creek was built by local youths. The trail is situated on peat soils. As mentioned previously, the southeast side of the trail is used for boat access onto Linwood Lake. A small fire ring is present at the landing. The trail is also used by foot traffic and a 3-wheeled ATV. These activities have caused ruts, puddles and loss of ground cover along the trail. With the development of the county park on the east side on Linwood Lake it is expected that use of the trail will increase considerably. Development plans for the county park call for a picnic area and swimming beach near the southeast shore of Linwood Lake (See also Martin, Island, Linwood Regional Park, pg).

Snowmobiling. In the past a heavily used snowmobile trail went from E.J's bar south of the SNA across Boot Lake, to Linwood Lake and up to Martin Lake. The last few years prior to 1981-82 have been poor snow seasons. Snowmobile use in general has been low. During the 1981-82 winter snowmobiles have been observed using the south side of Boot Lake in .

Hunting. During the 1981 hunting season there was one report of hunters coming off SNA land onto private adjacent property. The 1981 season was the first year the area had been posted as a "restricted area, no hunting allowed."



LEGEND

- BOUNDARY OF WILDLIFE MANAGEMENT AREA
- S — BOUNDARY OF SANCTUARY
- COUNTY BOUNDARY
- HEADQUARTERS
- INSTALLATIONS
- (61) UNITED STATES NUMBERED HIGHWAY
- 7 STATE HIGHWAY SYSTEM
- (33) COUNTY STATE AID HIGHWAY
- CONCRETE FORD OR DIP
- 29 COUNTY ROAD
- OPEN WATER AREA
- MARSH AREA
- TOWNSHIP ROADS AND OTHERS
- UNIMPROVED ROAD
- DITCH

No.	Date	Revision	By	Chkd.	Appr.
2	9-11-72	UPDATE MAP	LDS	RHZ	
1	9-15-71	UPDATE MAP	GAY	WKP	

Reference Drawings: G-154, G-349-X, SHEET 1

22 X 17

MINNESOTA DEPARTMENT OF NATURAL RESOURCES

BUREAU OF ENGINEERING

Survey | Designed | Checked 5-13-70 W.K. PORTER

Datum | Drawn 5-12-70 G.A. YAKEL

Date | Administrator

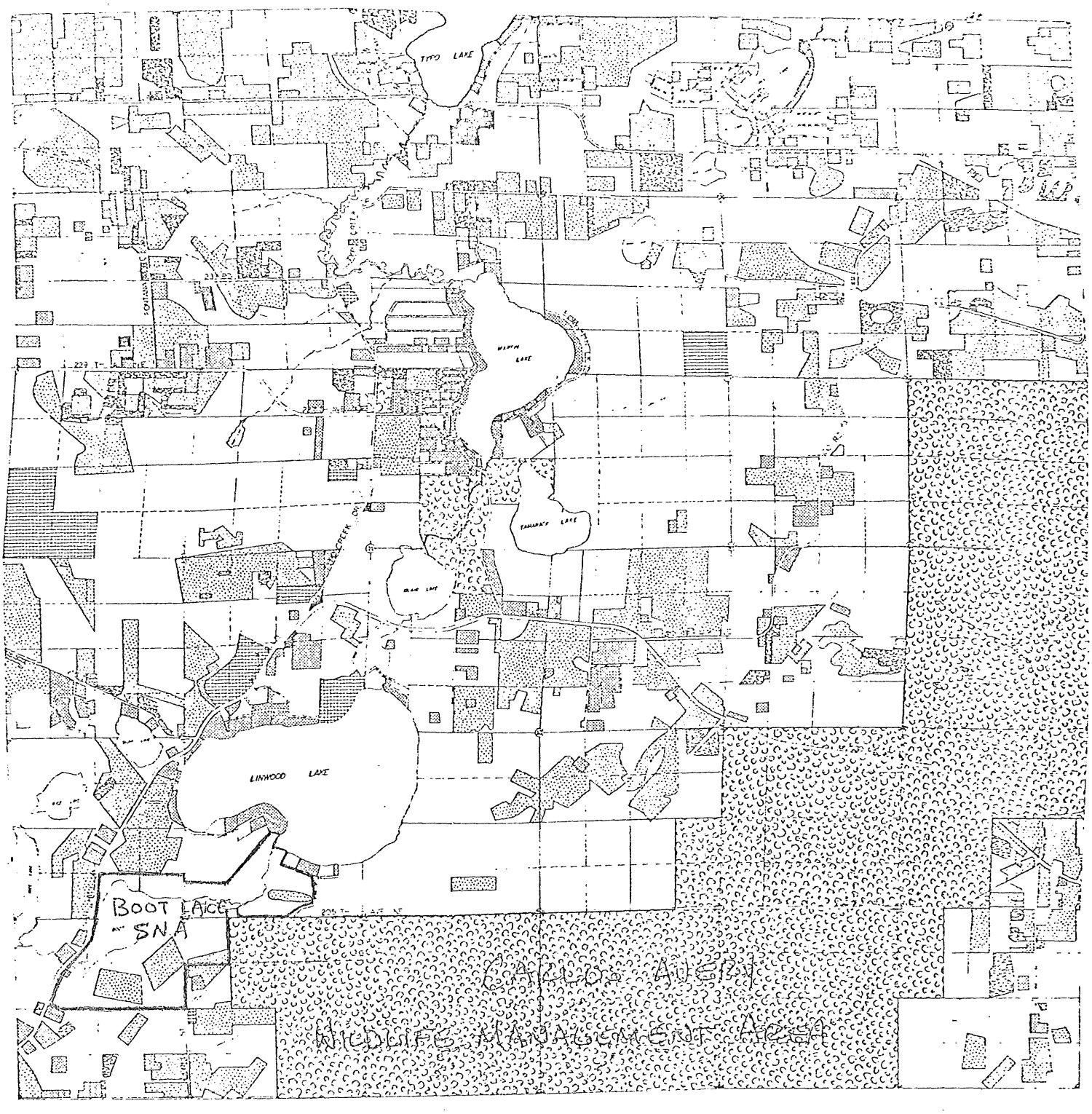
DIVISION OF GAME AND FISH

AREA MAP

CARLOS AVERY WMA
INCLUDING SUNRISE RIVER ADDITION
ANOKA AND CHISAGO COUNTIES

Sec. | T. 32, 33, 34 N | R 20, 21, 22 W

Dept. Code REG-431 | Req. 70-20 | Sheet 2 | File G-1514 — G-349-X



Vacant/Undeveloped

Croplands

Residential

Public/Semi Public

Pine Groves

Public Open Space

Commercial/Industrial

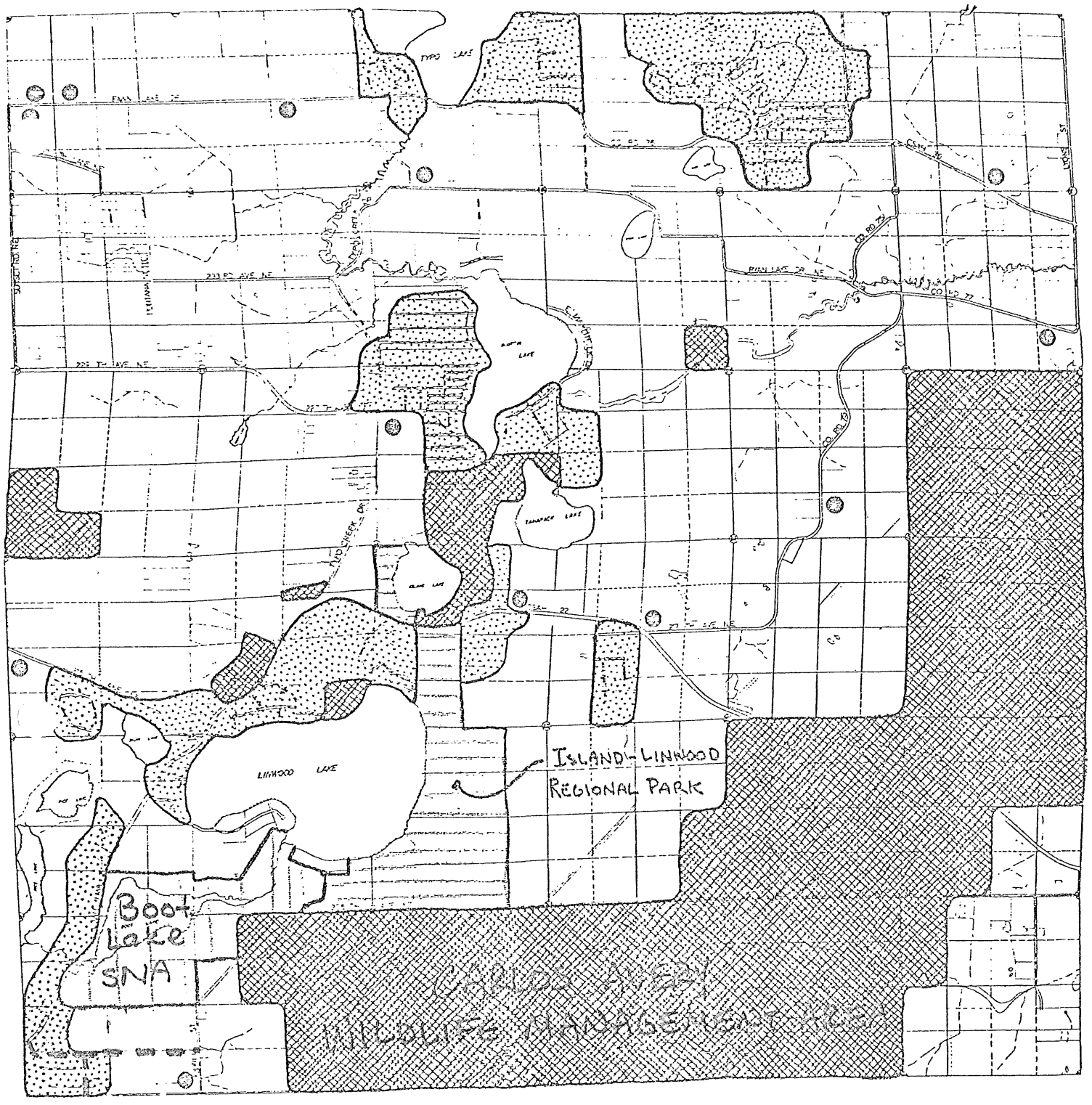
Midwest Planning Research

EXISTING LAND USE

LINWOOD TOWNSHIP

800 0 1600 3200 1Mi N

This map is for planning purposes only and should not be used when precise measurement is required.



Primary growth staging areas

Residential/agricultural districts

Public and semi public

Existing farmsteads

Future roads

Midwest Planning/ Research

GROWTH STAGING PLAN

LINWOOD TOWNSHIP

800' 0' 1600' 3200' 1 1/2

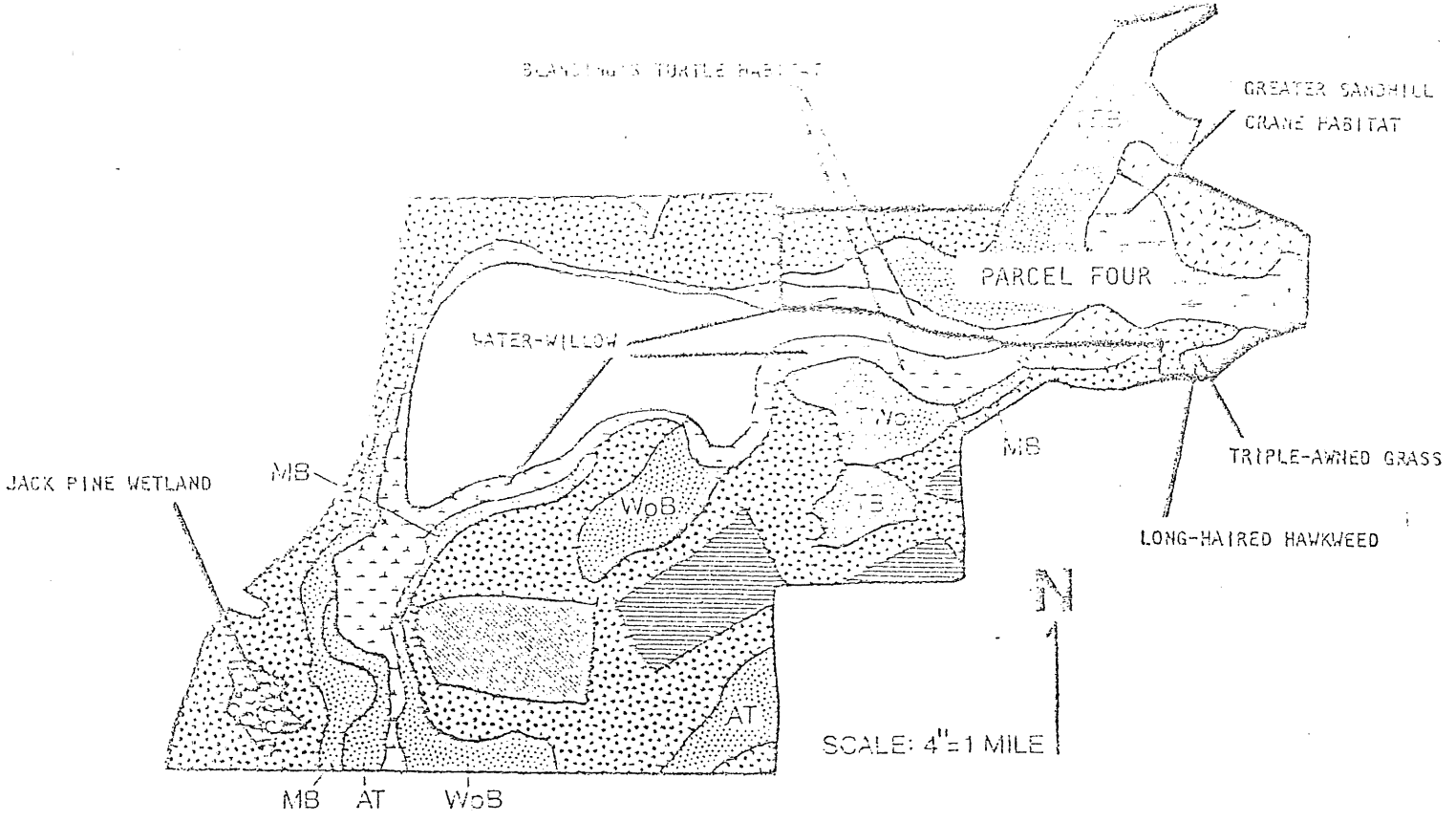
This map is for planning purposes only and should not be used when precise measurement is required.

REV. 4-79 VJH

Addendum # 2

Feb 1, 1982

ELEMENT STATUS SHEETS



KEY

Oak Forest	Shrub Thicket
TEB — Tamarack-Elm-Birch Wet Forest	Old Field
TWp — Tamarack-White Pine Wet Forest	Cultivated Field
MB — Maple-Birch Wet Forest	Clearing
AT — Alder-Tamarack Wet Forest	Wet Meadow
WoB — White Pine-Birch Wet Forest	Floating Mat/Emergents
TB — Tamarack-Birch Wet Forest	Water (Open)
Jack Pine Bog	

Figure 2. Vegetation Communities, Element occurrences and "Parcel Four" on the Boot Lake project area.

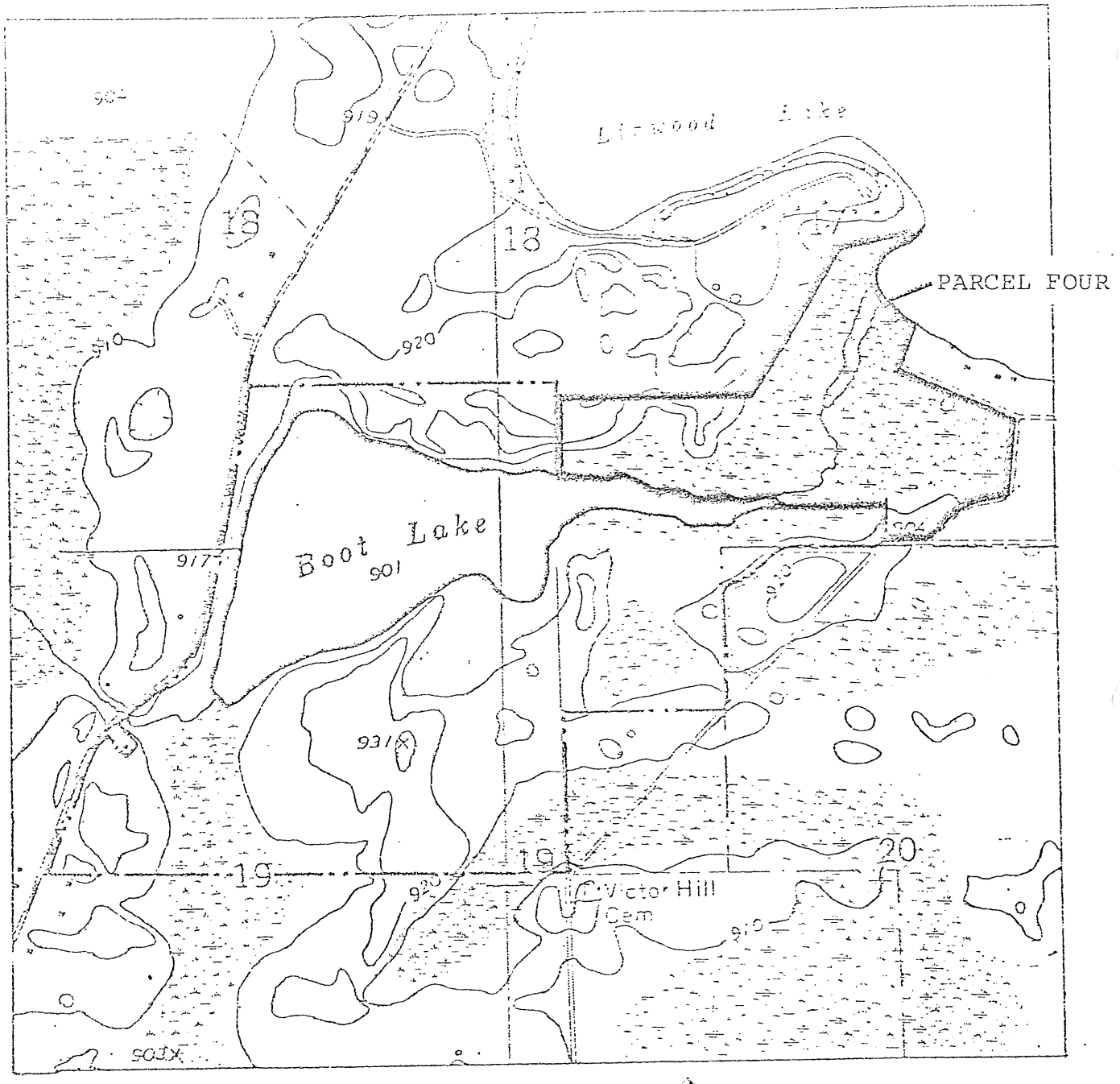
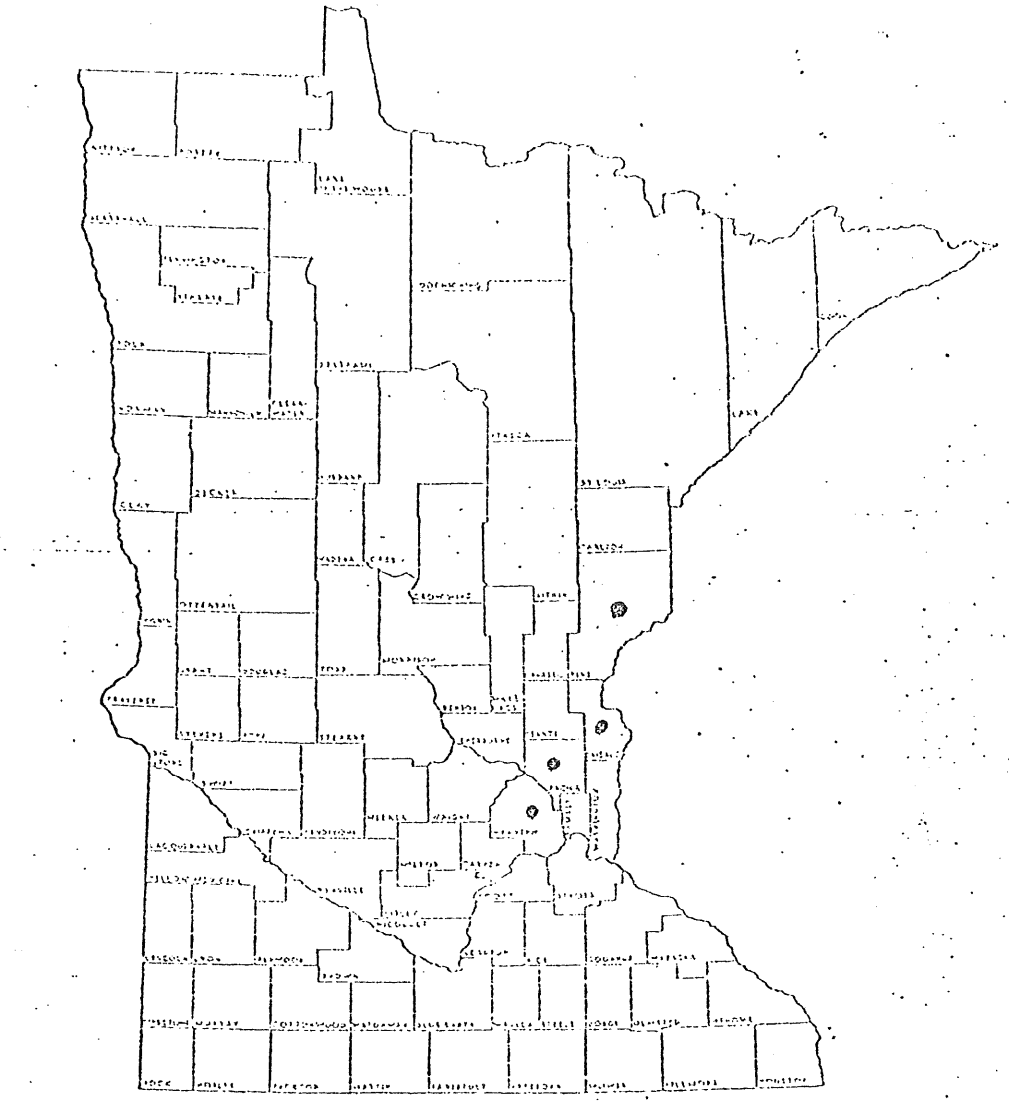


Figure 1. Topography of the Boot Lake area and the position of "Parcel Four". Adapted from U.S. Geological Survey, Coon Lake Beach and Linwood, MN Quadrangles (1:24,000) 1955, 1974.

STATUS SHEET

ELEMENT NAME:	Decodon verticillatus; (Water-willow)
FEDERAL STATUS:	None
STATE STATUS:	None
NATURAL HERITAGE PROGRAM STATUS:	Rare
BASIS FOR STATUS CLASSIFICATION:	This species is limited in range to a narrow band of four counties in east central Minnesota. Even within this range it is seen infrequently and usually in low numbers. A number of potential sites for this species have recently been destroyed by urban construction projects.
PREFERRED HABITAT:	Bog margins and lake shores.
DISTRIBUTION:	See attached maps.
OCCURRENCES IN MINNESOTA:	Decodon verticillatus is known from one site each in Pine, Chisago and Anoka counties and two sites in Hennepin county. The Hennepin county sites have not been verified for several years and may have been destroyed by urban development.
# OF OCCURRENCES IN MANAGED AREAS:	The only occurrence of Decodon verticillatus in a managed area is at Cedar Creek Natural History Area.
POTENTIAL THREATS:	Decodon verticillatus is threatened by any activity that would alter its aquatic environment. This would commonly include draining, filling and nutrient enrichment.

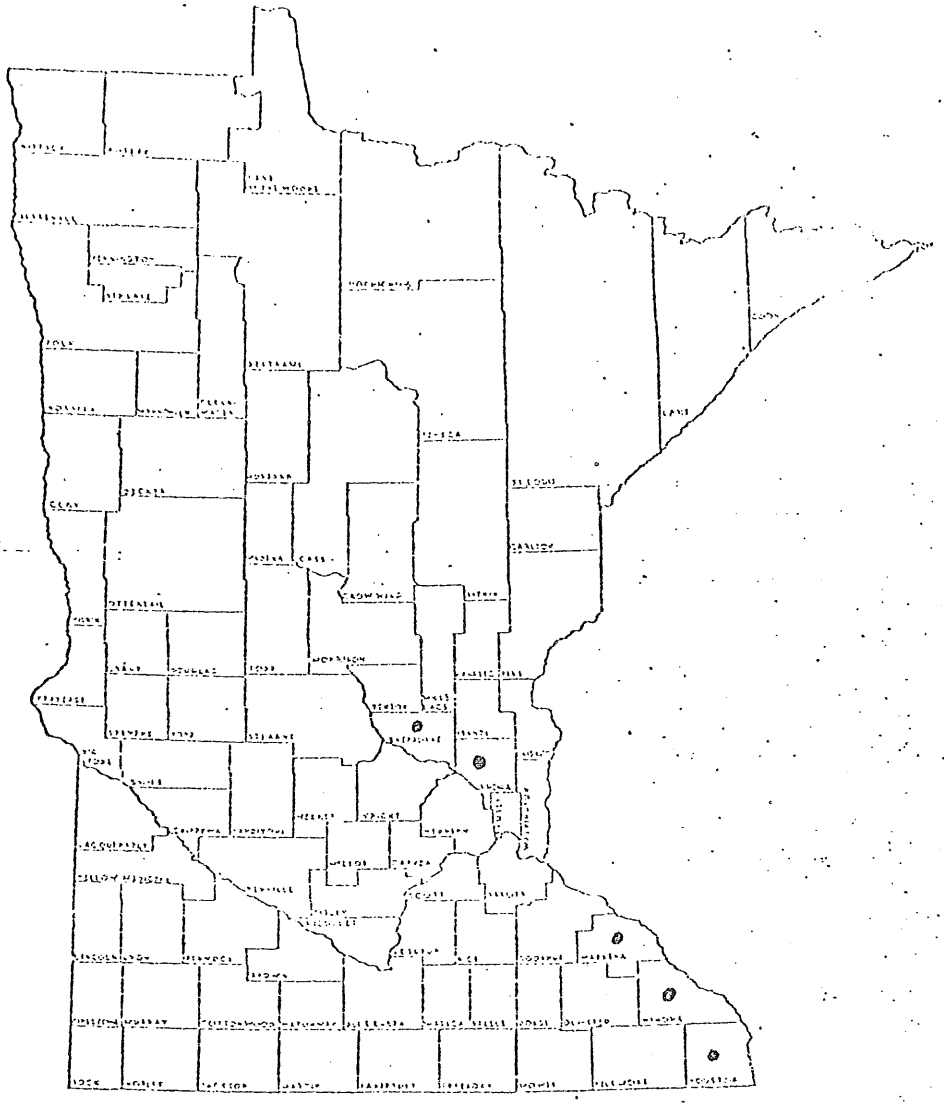
Distribution of Decodon verticillatus; (Water-willow)

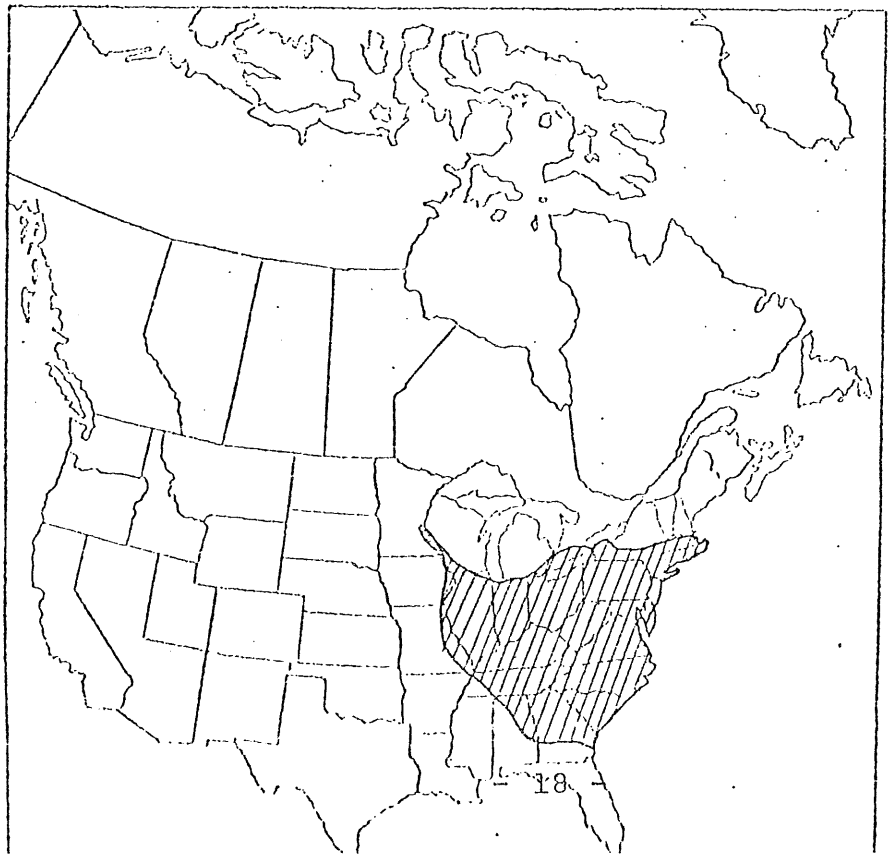


STATUS SHEET

ELEMENT NAME:	Aristida tuberculosa; (Triple-awned Grass)
FEDERAL STATUS:	None
STATE STATUS:	None
NATURAL HERITAGE PROGRAM STATUS:	Rare
BASIS FOR STATUS CLASSIFICATION:	This species has highly specialized habitat requirements and a very restricted geographical range. Of the six recorded occurrences of Aristida tuberculosa in Minnesota one is known to have been destroyed and another is suspected to have been destroyed.
PREFERRED HABITAT:	Sandy prairies and dunes.
DISTRIBUTION:	See attached maps.
OCCURRENCES IN MINNESOTA:	Aristida tuberculosa is known from two sites in Anoka county and one each from Wabasha, Houston, Winona and Sherburne. The Winona county site has not been verified since 1897.
# OF OCCURRENCES IN MANAGED AREAS:	One of the two Anoka county sites occurs in Cedar Creek Natural History Area, but the other sites are unprotected.
POTENTIAL THREATS TO SPECIES:	One of the sites in Anoka county was recently destroyed by the construction of a school. Threats to the remaining populations are not clear, but any large scale construction project or agricultural development could severely damage or destroy the sites or supporting habitat of the species.

Distribution of Aristida tuberculosa; Triple-awned Grass

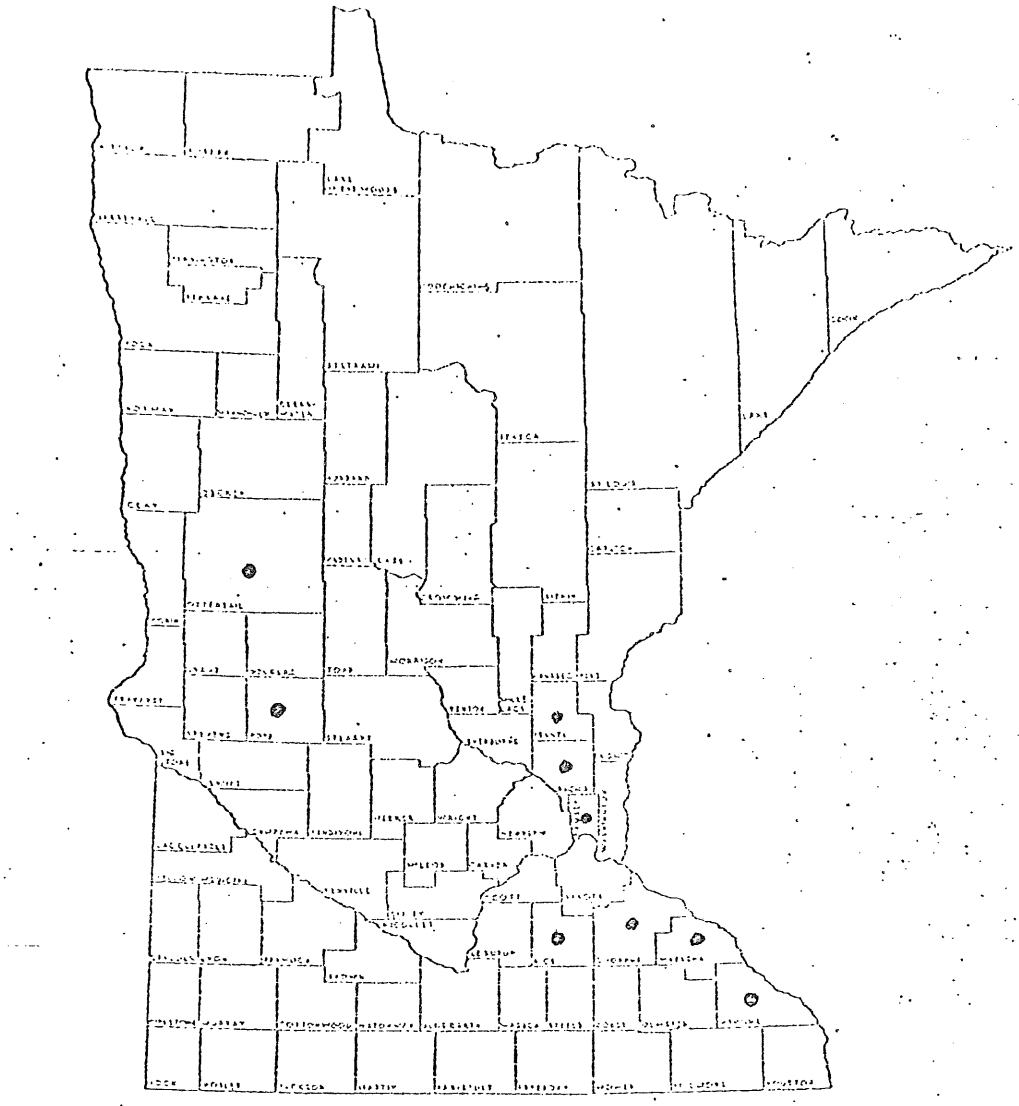


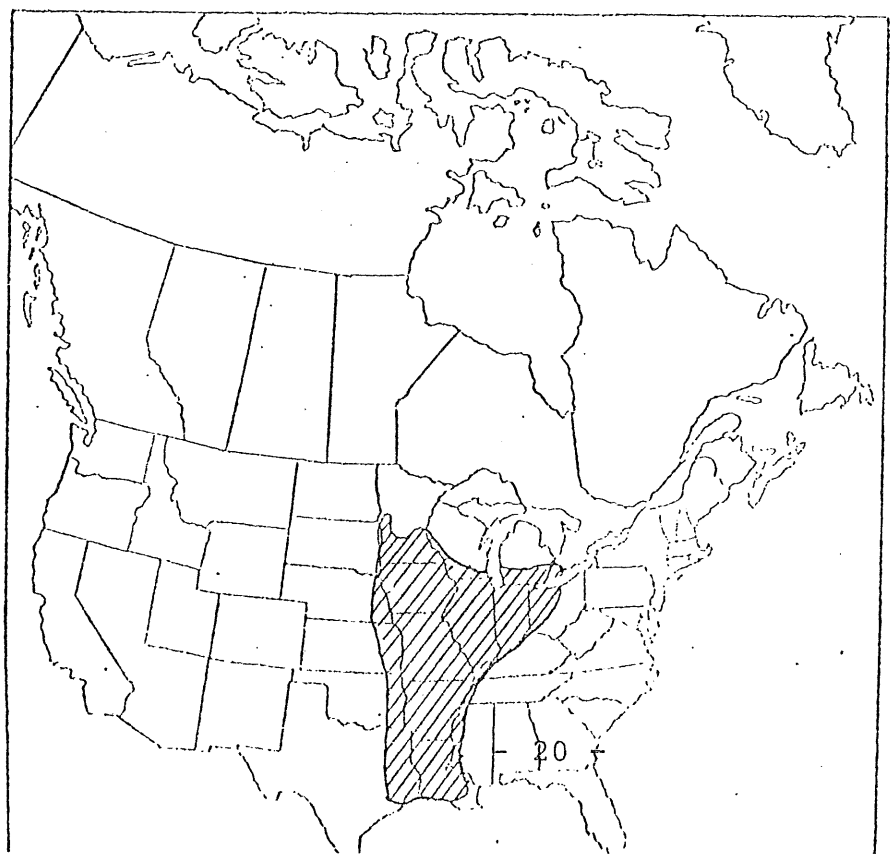


STATUS SHEET

ELEMENT NAME:	Hieracium longipilum; (Long-haired Hawkweed)
FEDERAL STATUS:	None
STATE STATUS:	None
NATURAL HERITAGE PROGRAM STATUS:	Rare
BASIS FOR STATUS CLASSIFICATION:	Approximately 65% of the occurrences of this species in Minnesota were recorded before 1910. The six records since then were from small remnant populations. One site was recently destroyed by gravel mining and another site faces imminent destruction from land conversion.
PREFERRED HABITAT:	Sandy soil, dunes, dry prairies and, in rare cases, mesic prairies.
DISTRIBUTION:	See attached maps.
OCCURRENCES IN MINNESOTA:	Hieracium longipilum is known from one site each in Isanti, Anoka, Wabasha, Pope, Dakota and Rice counties. In addition, the species is known historically from Goodhue, Winona, Ramsey and Ottertail counties. In these counties the species has not been collected recently and perhaps has been extirpated.
# OF OCCURRENCES IN MANAGED AREAS:	Two sites where Hieracium longipilum is known to occur are currently protected; Cedar Creek Natural History Area in Anoka county and Strandness Prairie in Pope county.
POTENTIAL THREATS TO SPECIES:	The small population numbers of Hieracium logipilum and the fragile and accessible nature of their habitat make this species susceptible to exploitation. It is especially vulnerable to agricultural practices, gravel mining and off-the-road vehicles.

Distribution of Hieracium longipilum; Long-haired Hawkweed





STATUS SHEET

ELEMENT NAME:	Grus canadensis tabida (Greater Sandhill Crane)
FEDERAL STATUS:	None
STATE STATUS:	None
NATURAL HERITAGE PROGRAM STATUS:	Threatened
BASIS FOR STATUS CLASSIFICATION:	The 'threatened' status for the sandhill crane has been officially recommended by the Records Committee of the Minnesota Ornithologist Union (1980). The basis for the classification rests upon the fact that in the 1800's and early 1900's the bird was considerably more abundant and widespread in the state than it is currently. At present its distribution is limited to the muskegs and swamps of northwestern and east-central Minnesota. The continued destruction of wetlands poses the largest threat to the species.
PREFERRED HABITAT:	An observation card survey for sandhill cranes in Minnesota produced the following analysis of habitat use (Henderson, 1978). During the spring migration, the months of March and April, nearly 80% of the reported observations were from old fields and small grain fields. As the breeding and nesting season commenced in May the habitat preference shifted to include wet meadows and marshes for nesting activities while the old fields were still utilized for feeding. Another major habitat shift was observed in August as the cranes moved from nesting marshes to begin feeding in the small grain fields of wheat, oats, rye and barley prior to their migration south.
DISTRIBUTION:	See attached maps.
OCCURRENCES IN MINNESOTA:	As illustrated by the distribution map the summer range of Grus canadensis tabida includes fifteen counties in northwestern and east-central Minnesota. At present approximately 125 breeding season occurrences have been entered into the Natural Heritage information system.
# OF OCCURRENCES IN MANAGED AREAS:	Nearly one-third of the 125 breeding season occurrences mentioned above occur within a variety of protected and managed areas including state wildlife management areas, national wildlife refuges and lands owned by the Nature Conservancy. The cranes receive adequate protection in all of these areas.
POTENTIAL THREATS TO SPECIES:	The most serious threat faced by the greater sandhill crane is the continued demise of wetlands; a habitat that is essential for the breeding and nesting activities of the species.

REFERENCES:

Green, J. C. and R. B. Janssen. 1975. Minnesota Birds: Where, When and How Many. University of Minnesota Presses. 217p.

Henderson, C. 1978. Results of an Observation Card Survey for Sandhill Cranes in Minnesota for 1977. Loon 50(2): 112-118.

Johnson, J. 1976. Distribution of Sandhill Cranes in Minnesota. Proc. Int. Crane Workshop I. 59-68.

Walkinshaw, L. H. 1949. The Sandhill Cranes. Bulletin No. 29. Cranbrook Inst. of Science.

SUMMARY:

There are two major population centers of greater sandhill cranes in Minnesota, one in northwest and one in east-central Minnesota. This second population center is concentrated primarily around Carlos Avery Wildlife Management Area which abuts directly on the eastern edge of the proposed SNA.

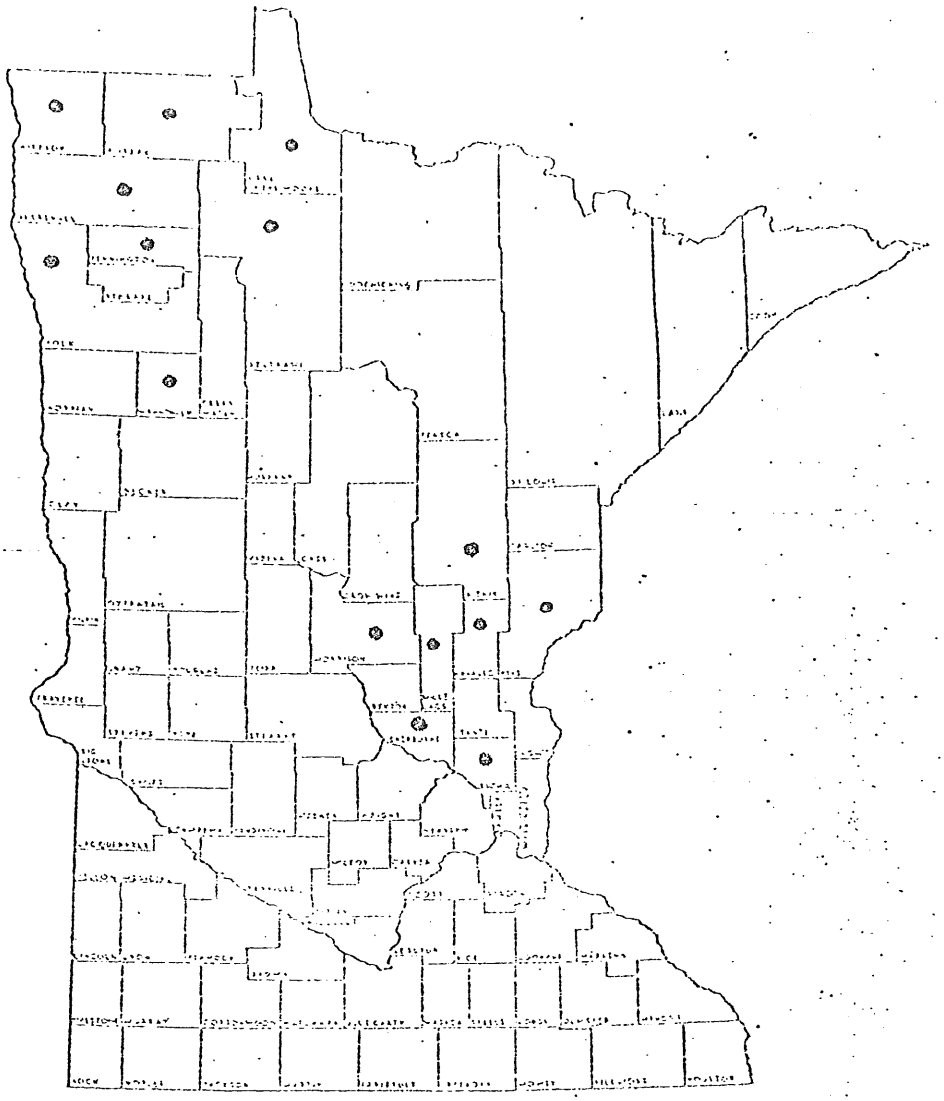
During the course of the 1979 SNA inventory of Boot Lake, the field crew did not observe any sandhill cranes. However, through the Observation Card Program initiated by Carrol Henderson, DNR non-game biologist, there have during the last couple of years been observations of cranes from the proposed SNA.

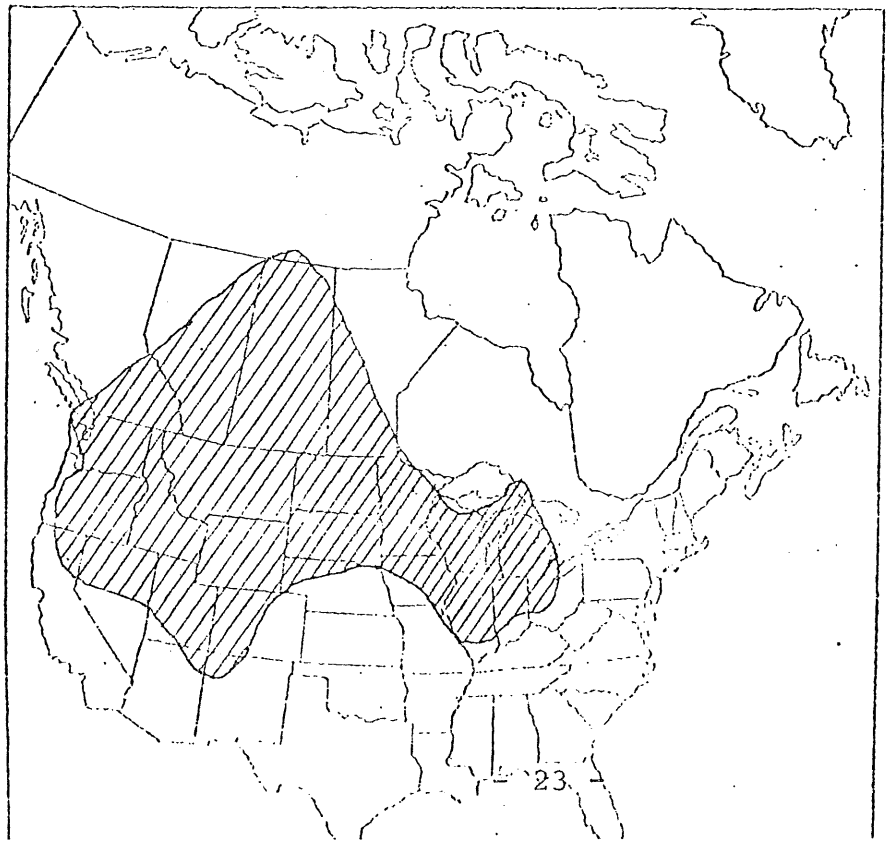
In 1979 W. Rohl reported that throughout April and May of that year he observed two adults on T33N R22W Section 17. He observed the birds in a marsh habitat of the Book Lake tract south of Linwood Lake and assumed the birds were a breeding pair.

In 1977 (April 8) one additional observation was reported by L. Knudson and R. Johnson in the Boot Lake tract. Little information about the observation was reported other than the fact that the sex and age of the bird was unknown.

In addition, during the last two or three years, several breeding pairs have also been reported within one mile of the northern and eastern boundaries of the Boot Lake tract.

Distribution of Grus canadensis tabida; Greater Sandhill Crane





STATUS SHEET

ELEMENT NAME: Emydoidea blandingi (Blanding's Turtle)

FEDERAL STATUS: None

STATE STATUS: None

NATURAL HERITAGE PROGRAM STATUS: Rare

BASIS FOR STATUS CLASSIFICATION: Like so many other members of Minnesota's herptofauna very little is known about the status of the Blanding's turtle. The infrequent sightings and collection records that have accumulated over the years indicate that the species is restricted to east-central and southeastern Minnesota. Some experts suggest that the species may be more widespread than the records suggest. On the other hand, because of the turtles dependence on wetland habitats, most professionals argue that the increasing demise of our wetlands poses a substantial threat to the survival of the species. In light of this concern the state of Iowa has officially listed the species as threatened while Wisconsin has put it on the 'watch' list.

PREFERRED HABITAT: Ernst and Barbour (1972) state that Emydoidea blandingi "prefers shallow water with a soft bottom and abundant aquatic vegetation." Throughout much of the year it is dependent upon the lakes, ponds, marshes, creeks and sloughs that provide such habitat. Although the turtle may feed, breed and overwinter in wetlands, in Minnesota it also appears to require sandy banks or dunes for nesting.

DISTRIBUTION: See attached map.

OCCURRENCES IN MINNESOTA: At present 13 records from specimens collected in 8 different counties (Anoka, Hennepin, Pine, Ramsey, Wabasha, Washington, Watonwan, Winona) have been accessed to the data base. Records from the 8 remaining counties illustrated on the distribution maps are sighting records for which the original reports have not yet been located.

The area best known for its population of Blanding's turtle is the Kellogg/Weaver Sand Dunes along the Mississippi River Floodplain.

OF OCCURRENCES IN MANAGED AREAS: At present none of the occurrence records are known to receive adquate protection.

POTENTIAL THREATS TO SPECIES: The life history and habitat requirements of the Blanding's turtle are still poorly understood. Nevertheless most biologists concur that the loss of wetland habitats may pose the largest threat to the continued survival of this species.

REFERENCES:

Babcock, H. L. 1919. The Turtles of New England. Mem. Boston Soc. Nat. Hist. 8(3): 323-431. (Available in a recent Dover reprint.)

Breckenridge, W. J. 1944. Reptiles and Amphibians of Minnesota. University of Minnesota Press. 202 pages.

Carr, A. 1952. Handbook of Turtles. Comstock. Ithaca, N.Y.

Conant, R. 1975. A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Houghton Mifflin Co., Boston.

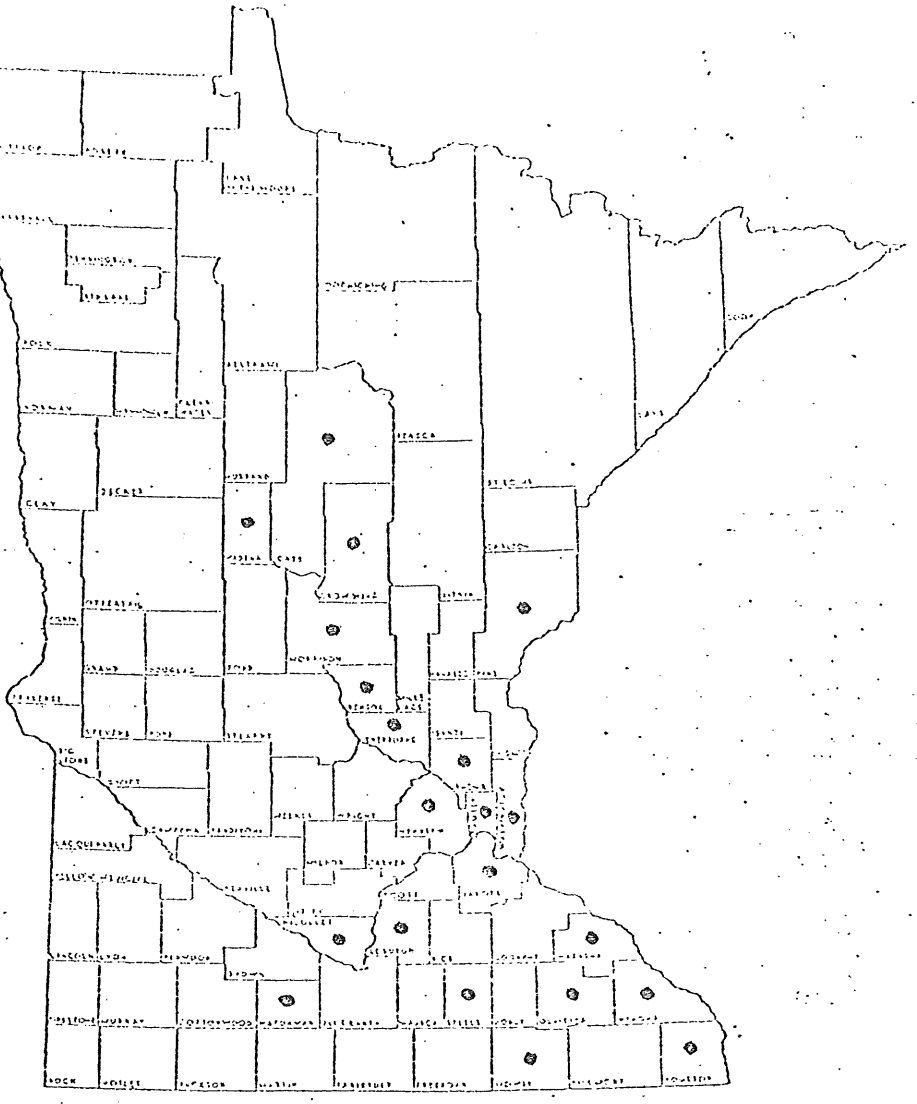
Ernst, C. and R. W. Barbor. 1972. Turtles of the United States. University Press of Kentucky. 347 pages.

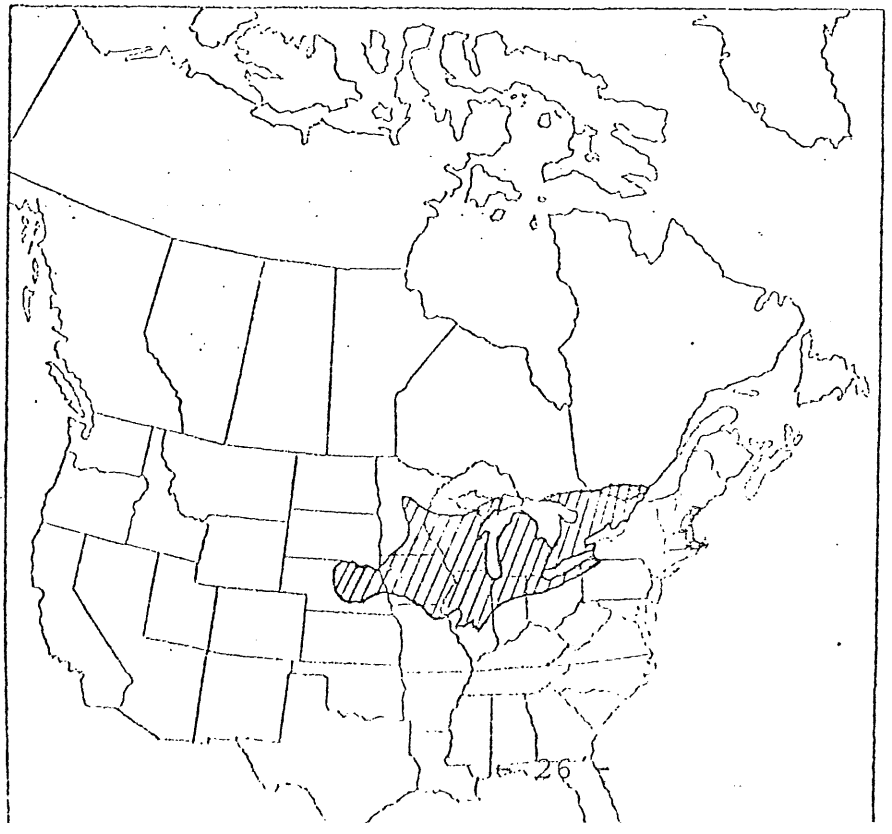
Graham, T. E. and T. Doyle. 1977. Growth and population characteristics of Blanding's turtle, Emydoidea blandingi, in Massachusetts. Herpetologica 33(4): 410-414.

SUMMARY:

Research efforts directed towards understanding the turtles biological requirements are direly needed. Some progress towards this goal was begun by researchers Mike Pappus and Bruce Brecke in the Kellogg/Weaver Sand Dune Prairie several years ago (to date this study has not been published). Nevertheless, considerable data regarding the species distribution and status is still needed. Meanwhile efforts to protect known nesting and breeding areas should be encouraged.

Distribution of Emydoidea blandingi; Blanding's Turtle





STATUS SHEET

ELEMENT NAME: *Pinus banksiana* wetland cover type.

COMMON NAME: Jack Pine wetland cover type.

NATURAL HERITAGE PROGRAM STATUS: Protection priority plant community.

BASIS FOR STATUS CLASSIFICATION: A natural plant community with an unusual assemblage of plants. Apparently rare in Minnesota.

DESCRIPTION & DISTRIBUTION OF THE PLANT COMMUNITY: Although Jack Pine (*Pinus banksiana*) is found occasionally in wetlands in Minnesota, it very seldomly occurs as a dominant. Bogs where Jack Pine is dominant are therefore noteworthy. This type of plant community is presently thought to be quite limited in its occurrence in Minnesota although it may be slightly more frequent in Wisconsin. The best known site in Minnesota at present is a small bog located approximately ¼ mile southwest of Boot Lake, Anoka County, where a Jack Pine stand occurs on a mucky peat soil growing with tamarack (*Larix laricina*), bog rosemary (*Andromeda glaucophylla*), leatherleaf (*Chamaedaphne calyculata*), narrow-leaved cottongrass (*Eriophorum angustifolium*), small cranberry (*Vaccinium oxycoccos*), sphagnum moss (*Sphagnum* sp.), and a species usually restricted to dry sites, the sweet blueberry (*Vaccinium angustifolium*).

Curtis in *The Vegetation of Wisconsin* (1959) made the following observations,

> Jack Pine, on the other hand, may achieve as high as 100 per cent dominance in certain bogs. This may seem surprising in view of the position of jack pine as a typical member of the driest sand barrens in the region, but in the boreal forests of northern Ontario, jack pine is most typically found on poorly drained flats in company with black spruce, Labrador tea (*Ledum groenlandicum*), sphagnum, and pitcher-plant (*Sarracenia purpurea*). The jack pine swamp forests of Wisconsin can be regarded as outliers of this more widespread Canadian community.

NUMBER OF OCCURRENCES IN THE STATE: Very few occurrences are presently known in Minnesota and they are located on the Anoka sandplain at the edge of the natural range of jack pine in central Minnesota.

OCCURRENCES ADQUATELY PROTECTED IN MANAGED AREAS: None known.

POTENTIAL THREATS TO COMMUNITY: This community is particularly sensitive to any construction or development project that would cause drainage or in some way alter the local water table.

REFERENCES:

Curtis, J. T. 1959. *The Vegetation of Wisconsin.* The University of Wisconsin Press, Madison.