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Clearwater Quadrangle

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The 1979 Resource Inventory  
for  
Clear Lake - Mississippi  
Scenic and Recreational River  
Scientific and Natural Areas

Section 14, 22, 23  
Township 34 North, Range 30 West  
Clearwater Quadrangle

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

December 1979 Draft



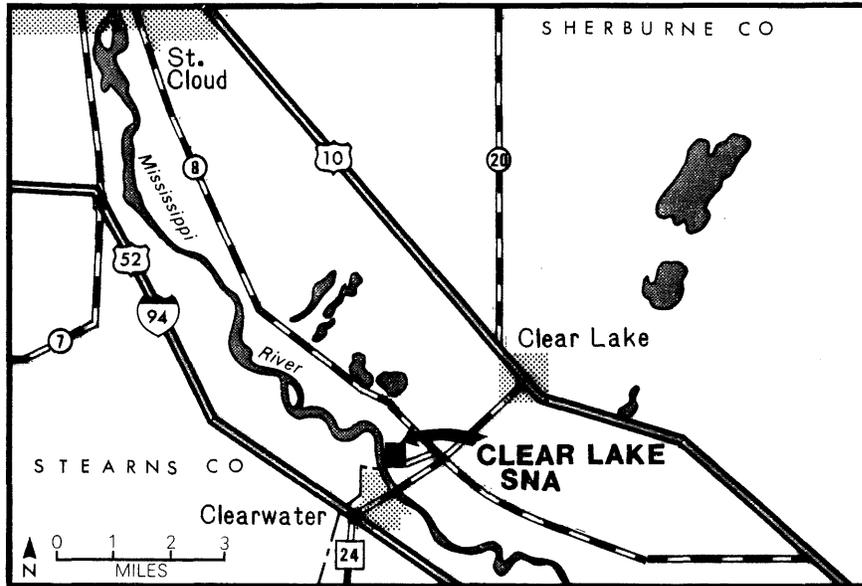




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## INTRODUCTION

### Scope and Organization

This report documents the information collected during a 1979 inventory of Clear 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 evaluators to assess the site as a potential Scientific and Natural Area (SNA). The document can also be used by scientists, educators, and others interested in the area. Should the site be designated an SNA, management plans can be written using this document as 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 Clear 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

Clear Lake natural area is a 62 acre unit along the Mississippi River in western Sherburne County, approximately 12 miles southeast of St. Cloud, Minnesota. The area's climate is mid-continental, relatively cool and moist, with warm summers and cold winters. The Clear Lake preserve consists of floodplain, steep slope, and upland areas formed by Mississippi fluvial processes. A 40 to 50 foot bluff separates a topographically higher upland from a relatively lower, periodically inundated floodplain. Drainage flows south and westward from the site directly into the Mississippi River. Sandy textured mineral soils and alluvial soils of variable composition formed under a variety of vegetation types. The area's present vegetation is primarily floodplain and oak forest with scattered sumac thickets.

Species observed on the tract include: 221 vascular plants, 55 birds, 11 mammals, and 3 amphibians. The natural area lies within a corn, oats, soybean, and hay farming area. Extensive grazing has occurred on the site, although it was never hayed or plowed. Evidence of human use of the tract

includes old homestead sites and a field road.

#### Preliminary Assessment of Significance

This section lists features identified by the Minnesota Natural Heritage Program (MNHP) as potential elements<sup>1</sup>, 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.

The Clear Lake natural area supports a vegetation type illustrating succession from the original vegetation for this area, as mapped by Marschner (1930). The original "oak opening" vegetation, consisting primarily of scattered Bur Oaks (Quercus macrocarpa) with prairie understory, has changed to an oak forest vegetation type. The oak forest is an example of succession from original conditions due to cessation of fires in the area. Some floral remnants of the original prairie understory can be found at Clear Lake, including Purple Prairie Clover (Petalostemum purpureum), Big Bluestem (Andropogon gerardi), Slender and Large-Flowered Beard-tongues (Penstemon gracilis and P. grandiflorus), and Prairie-Violet (Viola pedatifida). A positive nesting record was obtained for the Blue-grey Gnatcatcher (Polioptila caerulea), which is at the northwestern edge of its Minnesota range at Clear Lake (Green and Janssen, 1975).

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

The natural area also supports a river bottom vegetation type essentially representative of the original vegetation for this area, as described by Marschner (1930). The natural area contains virtually all species listed in Marschner's description of "river-bottom forest", including American and Slippery Elm (Ulmus americana and U. rubra), Black and Green Ash (Fraxinus nigra and F. pennsylvanica), Cottonwood (Populus deltoides), Box Elder (Acer negundo), Silver Maple (A. saccharinum), Basswood (Tilia americana), Hackberry (Celtis occidentalis), and Sandbar and Slender Willow (Salix interior and S. petiolaris). The relatively open structure of such forests is maintained by periodic flooding (Curtis, 1959).

## 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 Clear Lake natural area.

## CLIMATE

### Methods

Climatological data were gathered by researching reports from the National Oceanic and Atmospheric Administration (NOAA), Minnesota Agricultural Experiment Station, and Soil Conservation Service (SCS). Most numerical data were obtained from the NOAA station at St. Cloud approximately 12 miles northwest of Clear Lake.

### 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 Clear Lake area is 68° F; the December, January, and February mean is 12° F. On the average, there are less than ten 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).

About 75%, or slightly more than 20 inches, of the area's annual precipitation (water equivalent) falls during the period of April

Table 1. Selected Weather Data for St. Cloud.

TEMPERATURE	°F	°C
Mean annual temperature	41.7	5.39
Highest temperature recorded (7/1940 - 8/1947)	103	39.4
Lowest temperature recorded (1/1951)	-40	-40.0
Mean temperature warmest month		
Month: July	70.2	21.2
Mean daily maximum	81.8	27.7
Mean daily minimum	58.6	14.8
Mean temperature coldest month		
Month: January	8.9	-12.8
Mean daily maximum	19.2	-7.1
Mean daily minimum	-1.4	-18.6
Average date last freeze (Spring) <sup>a</sup>	c. 7 May	
Average date first freeze (Fall) <sup>b</sup>	c. 1 Oct.	
Average days freeze freeze season <sup>c</sup>	140	
Average days total crop season <sup>d</sup>	210	
PRECIPITATION	in.	cm.
Mean annual precipitation	26.84	68.2
Mean precipitation wettest month		
Month: June	4.64	11.8
Mean precipitation driest month		
Month: January	0.76	1.9
Mean annual snowfall	43.1	109.5
Mean snowfall heaviest month		
Month: March	9.9	25.1

<sup>a</sup>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.

<sup>b</sup>Based on Figure 4. Baker and Strub, 1963a.

<sup>c</sup>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.

<sup>d</sup>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.

through September. June is the wettest month, with numerous thunderstorms accounting for an average of 4.6 total inches of rain. There are about 38 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 53 inches. About 100 days a year have a ground cover of one inch or more. Precipitation of 0.01 inch or more can be expected about 100 days a year. 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 I is a summary of selected climatic data for the St. Cloud area.

#### Sources of Information

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

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Asheville, N.C.

## 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. Two separate ice lobes, the Superior lobe, and the Grantsburg sublobe of the Des Moines lobe, covered the Clear Lake area at different times during the late Wisconsin Stage. Glacial events had a profound effect on the flow regime of the Mississippi River. Erosion, sedimentation, and other fluvial processes combined to produce the present configuration of the Mississippi and adjacent land, including Clear Lake natural area.

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 characteristic 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. This northwest to southeast trending landform is approximately 10 miles southwest of the natural area.

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. 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 area. The natural area at this time was near the northwest edge of the Grantsburg sublobe, in the broad area where Mississippi waters were re-routed around the ice. A large proglacial lake, Glacial Lake Grantsburg, was formed east of the site from ponded meltwaters and tributary streams, mainly the Glacial Mississippi and St. Croix rivers. Wastage of stagnant Grantsburg ice opened south flowing channels which drained the lake; however, meltwaters and Mississippi waters continued to flow on and around the remaining ice. These waters deposited a series of coalescing sandy outwash fans over east central Minnesota until the Grantsburg sublobe disintegrated completely. This large glaciofluvial deposit, which lies east and southeast of the natural area, is called the Anoka Sandplain.

As the Grantsburg ice melted, the course of the Mississippi slowly migrated southwestward back to its original course. During this time the sediment-laden river was broad, shallow, and braided, and did not flow in a distinct valley. Eventually the Grantsburg ice melted completely, so the river was no longer diverted. The main Mississippi stream then broke through the St. Croix moraine near Minneapolis causing the river to straighten and establish a more channeled course. A 2 to 5 mile wide valley, called the Mississippi Valley Train (Cooper, 1938) was cut into the Anoka Sandplain at this time. The establishment of a distinct channel increased water velocity, so all but the coarsest sediments were washed away. Thus, the valley train is marked as a strip along both sides of the river consisting of deposits that are somewhat coarser

than those in the adjacent Anoka Sandplain (Wright, 1972). Clear Lake natural area is located within one of the widest areas of the Mississippi Valley train. The valley train was marked in pre-settlement times as a narrow extension of prairie vegetation in a deciduous forest region (Wright 1972; Marschner, 1930).

As glacial retreat continued, the sources of meltwater and sediment feeding into the Mississippi were cut off. The late glacial river began to cut down into the valley train, ultimately forming the more narrow, steep-sided valley which bounds the present floodplain. Since then, the trend has been reversed to a period of gradual valley filling which continues today. The development near the site of a large meander in the postglacial Mississippi is responsible for the bluff formation on the natural area. The bluff face is simply the cut bank portion of the meander, where water has eroded the shoreline and produced a steep escarpment. Recent geologic activity on the preserve has been limited to periodic flooding and accompanying erosion and sedimentation processes.

#### Topography and Bedrock

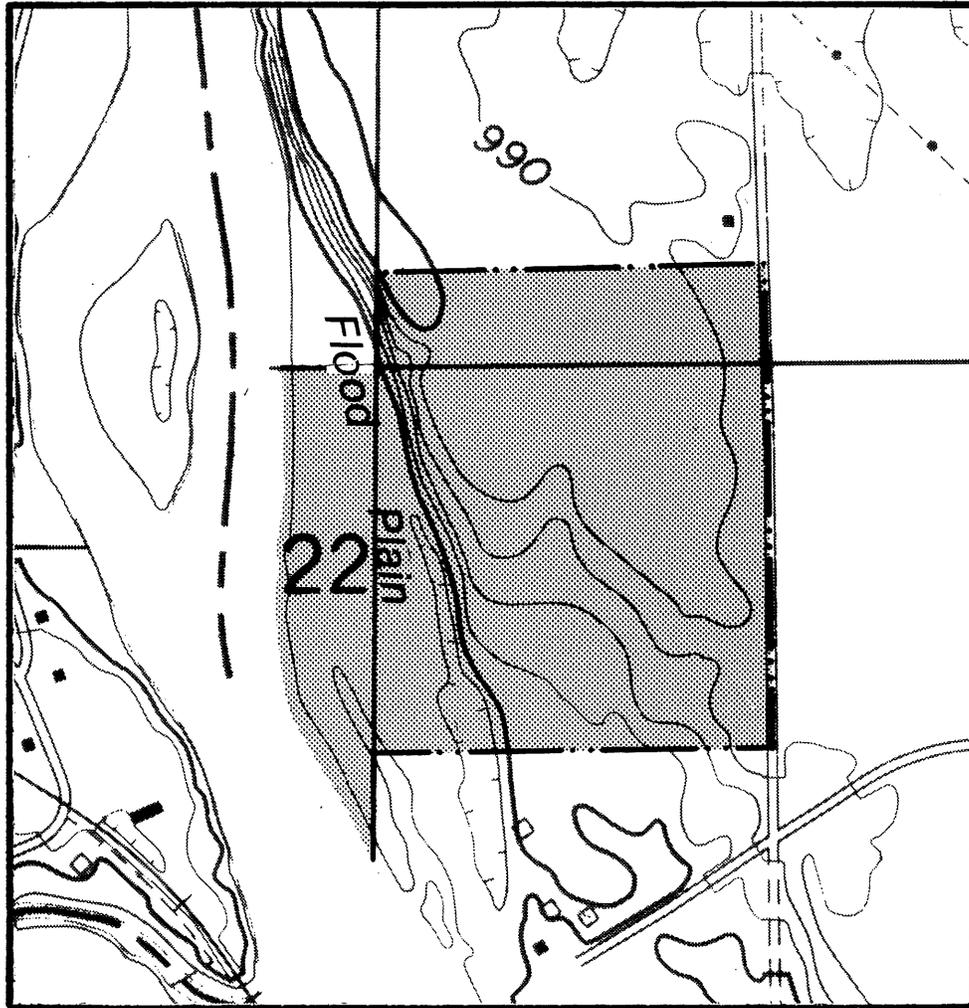
Clear Lake natural area has a varied topography with a maximum relief of over 60 feet. The highest point of the preserve, at about 1000 feet, is at the crest of a bluff separating an upland from a floodplain area. A small marshy depression on the level floodplain is the site's low point, with an elevation of less than 940 feet. The Mississippi-carved bluff, a steep feature in the northwest part of the tract, grades into a more gently sloping hillside on the southern portion.

Portions of east central Minnesota, including the Clear Lake natural area, are underlain by granitic rocks approximately 1.8 billion

years old (Sims and Morey, 1972). These rocks, emplaced during a geologic period known as the Penokean orogeny, intruded and metamorphosed older sedimentary rocks deposited in the area by ancient seas. Glacial drift deposits approximately 100 feet thick (USGS, 1975) at the natural area overlie the granite rocks, which crop out at the surface at some locations in east central Minnesota. No such outcroppings are present on the natural area.

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----- Preserve Boundary       N      Scale: 8 Inches=1 Mile

Figure 1. Topography of Clear Lake Natural Area adapted from U.S. Geological Survey - Clearwater Quadrangle (1:24000) 1974.

## SOILS

### Methods

Soil information was obtained from literature sources and from the Sherburne County Soil Survey manual published by the Soil Conservation Service (SCS). Soil series descriptions are based on interpretations found in this manual.<sup>1</sup>

### Soils of Clear Lake Natural Area

Clear Lake lies in an area of coarse to medium textured prairie soils formed from glacial outwash (Arneman, 1963). The site's soils formed from outwash deposits associated with the Grantsburg glacial sublobe and from Mississippi River alluvium. One soil association and four soil series are present on the tract.

The Hubbard-Estherville-Salida soil association (SCS, 1968) occupies a 1 to 10 mile strip along the Mississippi River in Sherburne County. Soils of this association are sandy to gravelly textured. Bluffs and terrace breaks similar to those at Clear Lake preserve are common. Frequently flooded lowland areas along the river are covered with recent alluvium.

The Becker, Hubbard, and Salida series soils are mollisols, characterized by nearly black, friable surface horizons rich in organic matter. The excessively drained Hubbard (entic haploborolls) and Salida (entic hapludolls) series consist of recently formed soils with minimum horizon development. Both are sandy textured, slightly acidic soils underlain by sand and/or gravel at relatively shallow depths.

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<sup>1</sup> Ray Diedrich, Soil Specialist, SCS, St. Paul, 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 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 Agr. Expt. Sta., 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 the 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.<sup>1</sup>

**M - Major:** 100,000 acres or more

**I - Intermediate:** 10,000 to 100,000 acres.

**m - Minor:** 10,000 acres or less.

<sup>1</sup> Determined by Ray Diedrich, Soil Specialist, SCS, St. Paul

Key to Table 2 (Continued)

LOCATION IN STATE:<sup>1</sup>

W - Western Minnesota  
NW - Northwestern Minnesota  
WC - West Central Minnesota

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<sup>1</sup> Determined by Ray Diedrich, Soil Specialist, SCS, St. Paul.

Table 2. Soil Characteristics of Clear Lake Natural Area.

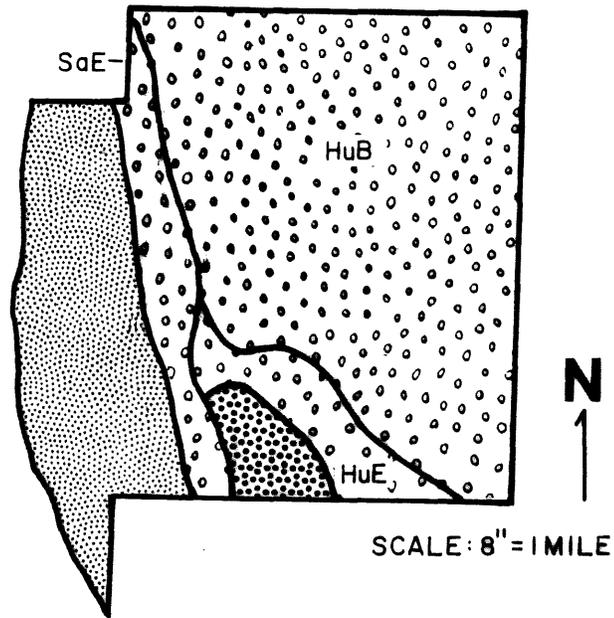
SOIL SERIES # ACRES PERCENT	DRAINAGE CLASS	DEPTH TO WATER TABLE	PARENT MATERIAL	LANDSCAPE POSITION	TEXTURE		VEGETATION		COMPONENT IN STATE	LOCATION IN STATE
					TOPSOIL	SUBSOIL	ORIGINAL	PRESENT		
cumelic hapludolls Becker 6.6 Acres 10.6%	MW- WD	>5.0'	loamy sedi- ments under- lain by sand	river terraces and bottom land 0-3% slopes	very fine sandy loam	loamy fine sand, very fine sandy loam &	deciduous forest	sumac and clearings	I	WC
entic hapludolls Salida 4.7 Acres 7.6%	ED	>10.0'	calcareous gravelly outwash	outwash plain 0-25% slopes	loamy sand	coarse sand coarse sand & gravel	prairie grasses	oak forest	M	W, NW, & WC
entic haploborolls Hubbard 31.9 Acres 51.4%	ED	>6.0'	outwash sands	outwash plain depressions and edges of drain- ageways 0-12% slopes	coarse sand	coarse sand	tall grass prairie and oak savanna	oak forest, sumac and clearings	M	WC
udifluvents Alluvial Land 18.8 Acres 30.3%	SP - VPD	--	mixed alluvial material	frequently flooded areas near waterways 0-3% slopes	variable	vari- able	aquatic grasses and water toler- ant trees	floodplain	M	State- wide

Salida soils occupy the steep bluff areas of Clear Lake natural area. Hubbard soils are found on moderately sloped upland areas and on steep terrace breaks.

Soils of the Becker series (cumulic hapludolls) formed from alluvial deposits on high river terraces. Their relatively thick surface horizons are a result of accumulated alluvial sediments deposited during infrequent periods of flooding. Becker soils are more uniform in texture than alluvial land because they occupy a higher topographic position, and are subject to less flooding. Surface layers are neutral. Poorly drained alluvial land consists of heterogeneous soil material recently deposited by flooding streams on flood plains and low terraces. It occupies the lowest sites of the natural area and is probably flooded annually.

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<u>DRAINAGE SYMBOL</u>	<u>DRAINAGE CLASS</u>	<u>KEY</u>	<u>SOIL SERIES</u>	<u>MAP SYMBOL</u>
	Excessively Drained		Salida Hubbard	SaE HuE Hub
	Moderately Well-Well Drained		Becker	BeA
	Somewhat Poorly-Very Poorly Drained		Alluvial	Af

Figure 2. Soil and drainage classes for Clear Lake.

## 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 Clear 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 Clear Lake natural area today. Sandy and gravelly outwash deposits laid down by Grantsburg sublobe meltwaters and the Glacial Mississippi and recent alluvial materials of varying composition are present on the tract. The morphology of these deposits and the soils formed in them dictate the flow patterns of both surface and subsurface waters at the site. No permanent bodies of water exist on the tract, which borders on the Mississippi River.

Drainage conditions at Clear Lake natural area vary greatly. Topographically higher upland, bluff, and slope areas on the tract are better drained than the lower floodplain because of the sandy nature of their soils and underlying deposits. The upland soils are capable of absorbing relatively large amounts of water, due to their high porosity (SCS, 1975). The floodplain is generally wetter because of periodic flooding, a high water table, and poor drainage conditions. Thus, floodwaters and runoff from higher elevations may remain near or ponded above the surface. In 1979, portions of the floodplain at Clear Lake natural area were flooded until mid-June.

The tract is located in the Mississippi River watershed. Ground water flows towards the Mississippi valley from the surrounding uplands,

and is generally plentiful in the outwash sands of the Anoka Sandplain and the Mississippi Valley Train (USGS, 1975).

Sources of Information

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

U.S. Department of the Interior, Geological Survey (USGS) 1974. Clear-water Quadrangle. MN: 7.5 Minute Series (Topographic). 1:24,000. Denver, Colorado.

\_\_\_\_\_. 1975. Water Resources of the Mississippi and Sauk Rivers Watershed, Central Minnesota. Hydrologic Investigations Atlas HA-534. Reston, Virginia.

## VEGETATIONAL COMPONENTS

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

## VEGETATIVE COMMUNITIES

### Methods

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

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

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

### Overview of Regional Plant Communities

Clear Lake is located near the western edge of the Mississippi River Sandplains landscape region. (Figure 3). Prior to European settlement, the plant communities were composed of: riverbottom forest,

# Minnesota's Landscape Regions

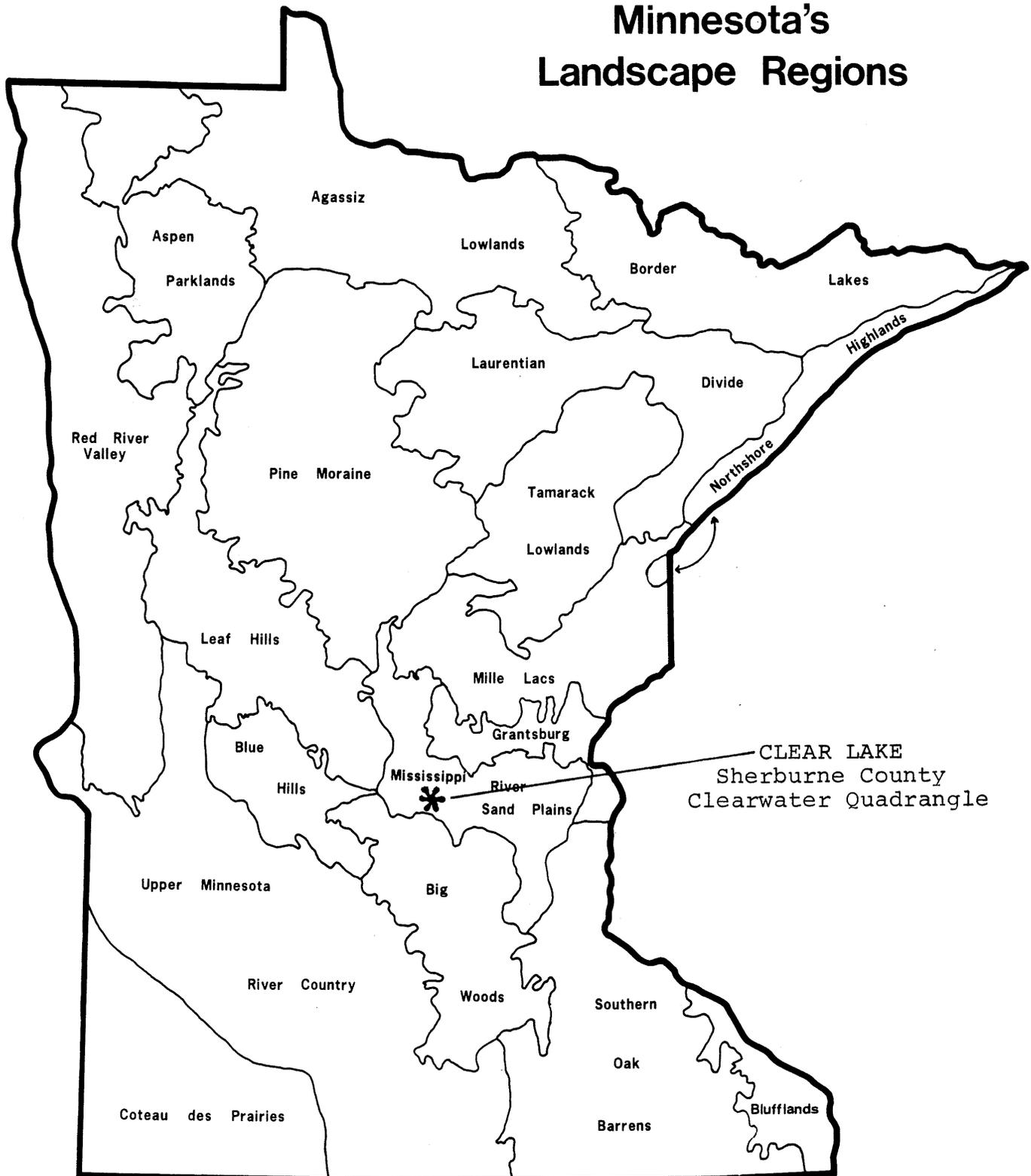


Figure 3. Clear Lake Natural Area in relation to Minnesota's landscape regions. Adapted from T. Kratz and G.L. Jensen, an ecological geographic division of Minnesota (Unpublished, 1977).

oak openings and barrens, and some prairie (Marschner, 1930; Figure 4). European settlers reduced the frequency of fires in this area and the original communities were replaced by oak woods on land not utilized for farming.

### Results

The vegetative communities of Clear Lake are mapped in Figure 5. The area supports a combination of oak forest, floodplain, sumac thickets, and clearings. A description of each community is given below.

OAK FOREST: 35 acres, 56% of preserve.

Dominant overstory species are Northern Pin Oak (Quercus ellipsoidalis), Bur Oak (Quercus macrocarpa), and Red Cedar (Juniperus virginiana). Prickly Ash (Zanthoxylum americanum) is the dominant shrub species. Common ground cover plants include Missouri Gooseberry (Ribes missouriense), Hog Peanut (Amphicarpa bracteata), and Pennsylvania Sedge (Carex pennsylvanica).

In the southeast corner of Clear Lake there are several small clearings with an overstory of widely spaced Bur Oak. Near the bluff American Elm (Ulmus americana), Hackberry (Celtis occidentalis) and Ironwood (Ostrya virginiana) become more common. Source of information: field inspection and releves CL-1,2 and 3.

FLOODPLAIN: 19 acres, 30% of preserve.

Common trees are American Elm (Ulmus americana) and Basswood (Tilia americana). Kentucky Blue Grass (Poa pratensis) and Smooth Brome (Bromus inermis) are dominant grasses. Several forbs are also common in the area.

A portion of this floodplain was under water until the middle of June. Source of information: field inspection and releve CL-4.  
CLEARINGS: 5 acres, 7% of preserve.

These areas are dominated by Kentucky Blue Grass (Poa pratensis). Common woody species, especially toward the fringe of the clearings, are Chokecherry (Prunus virginiana) and Smooth Sumac (Rhus glabra). Several species of forbs are also present. Source of information: field inspection and releve CL-5.

SUMAC THICKETS: 5 acres, 7% of preserve.

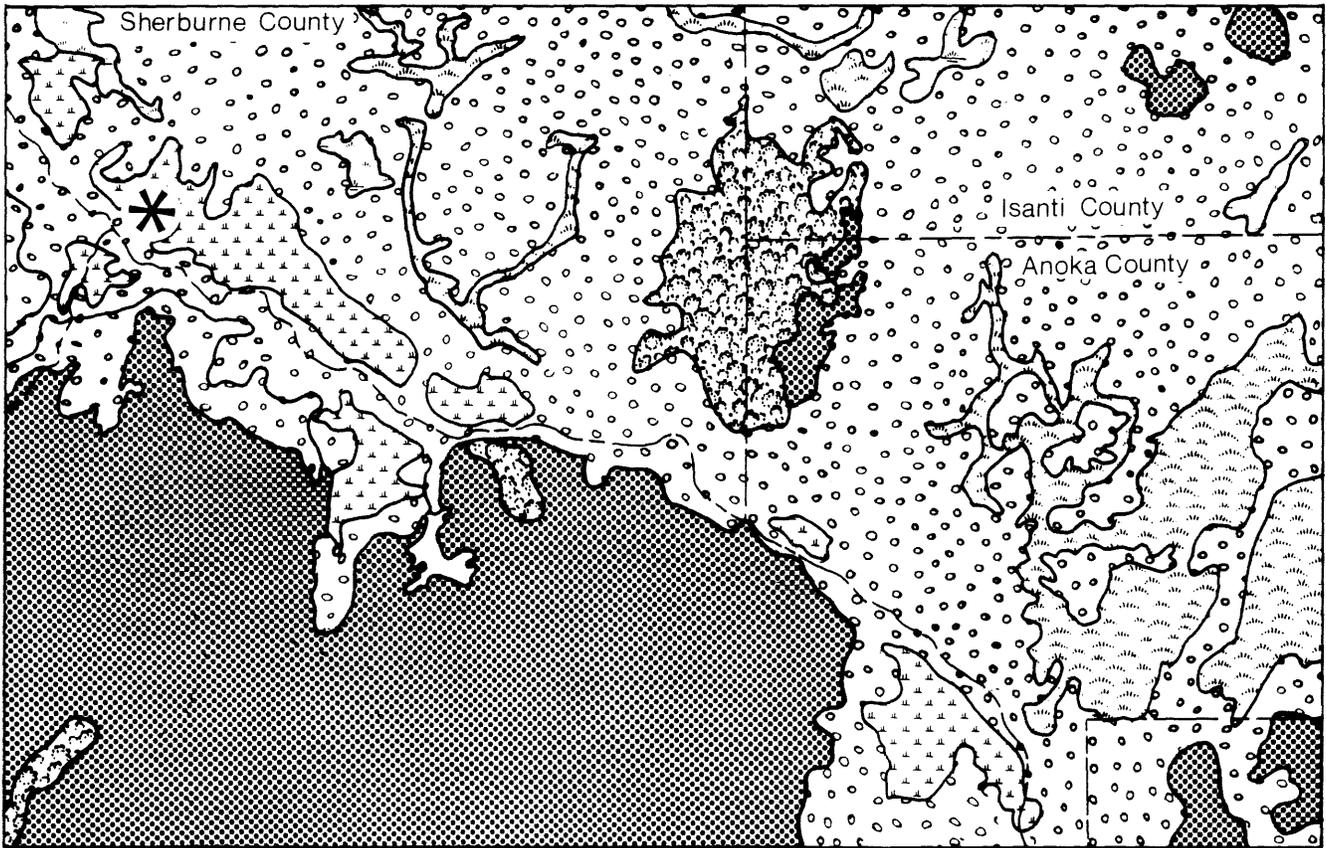
Smooth Sumac (Rhus glabra) is the dominant species in these thickets. Kentucky Blue Grass (Poa pratensis), Smooth Brome (Bromus inermis), and Fescue Sedge (Carex brevior) are common ground cover species. Source of information: field inspection and releve CL-6.

Source 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 Area Office, St. Paul.

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



Scale : 1:500,000

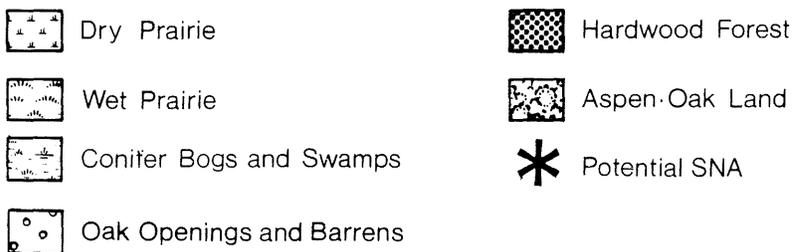


Figure 4. The original vegetation of east-central Minnesota, including Clear Lake. Adapted from F.J. Marschner, The Original Vegetation of Minnesota, 1:500,000.

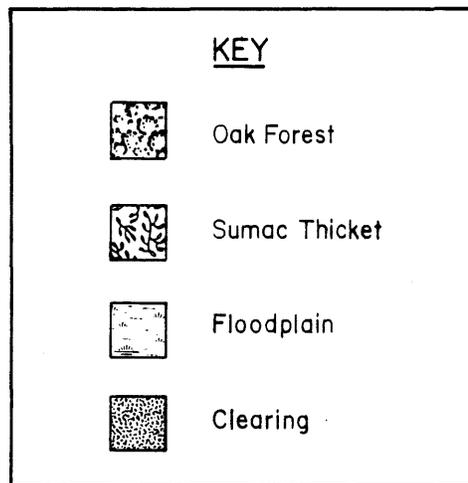
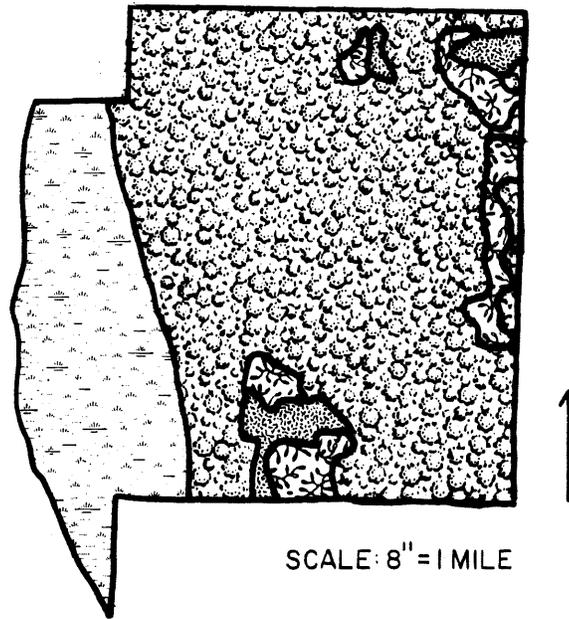


Figure 5. Vegetation communities identified on Clear Lake.

## FLORA

### Methods

Clear Lake natural area was visited on a weekly basis, when weather conditions permitted, from 1 May to 7 September 1979. Flowering or fruiting plants were collected and pressed. Habitat, associated species, and the collection date was recorded for all specimens. Locations of specimens were indicated on an aerial photograph of the area, or grid field map.<sup>1</sup> 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 34 specimens. Gerald Wheeler, Graduate Student, Botany Department, University of Minnesota, identified all species of the genus Carex. Dr. Gerald Ownbey, Curator of the Herbarium, University of Minnesota, verified the remaining specimens. Any specimens identified in the field but not collected, are indicated as such in the list.

Plants were designated alien if described as "introduced" in north-eastern 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.

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<sup>1</sup> On file, Scientific and Natural Areas Section, St. Paul.

## Results

Table 3 is an annotated list of the plants identified on the tract.<sup>1</sup> A total of 221 vascular plant species, representing 60 families, were recorded on the unit in 1979. Twenty-six of these species are alien. The families with the largest number of species were: Asteraceae with 33 species (15% of total), Poaceae with 19 species (9% of total), and Lamiaceae with 14 species (6% of total).

Figure 6 illustrates the number of species in flower on each visit to the preserve. A total of 179 species were included.<sup>2</sup> The peak of blooming occurred in late July.

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

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

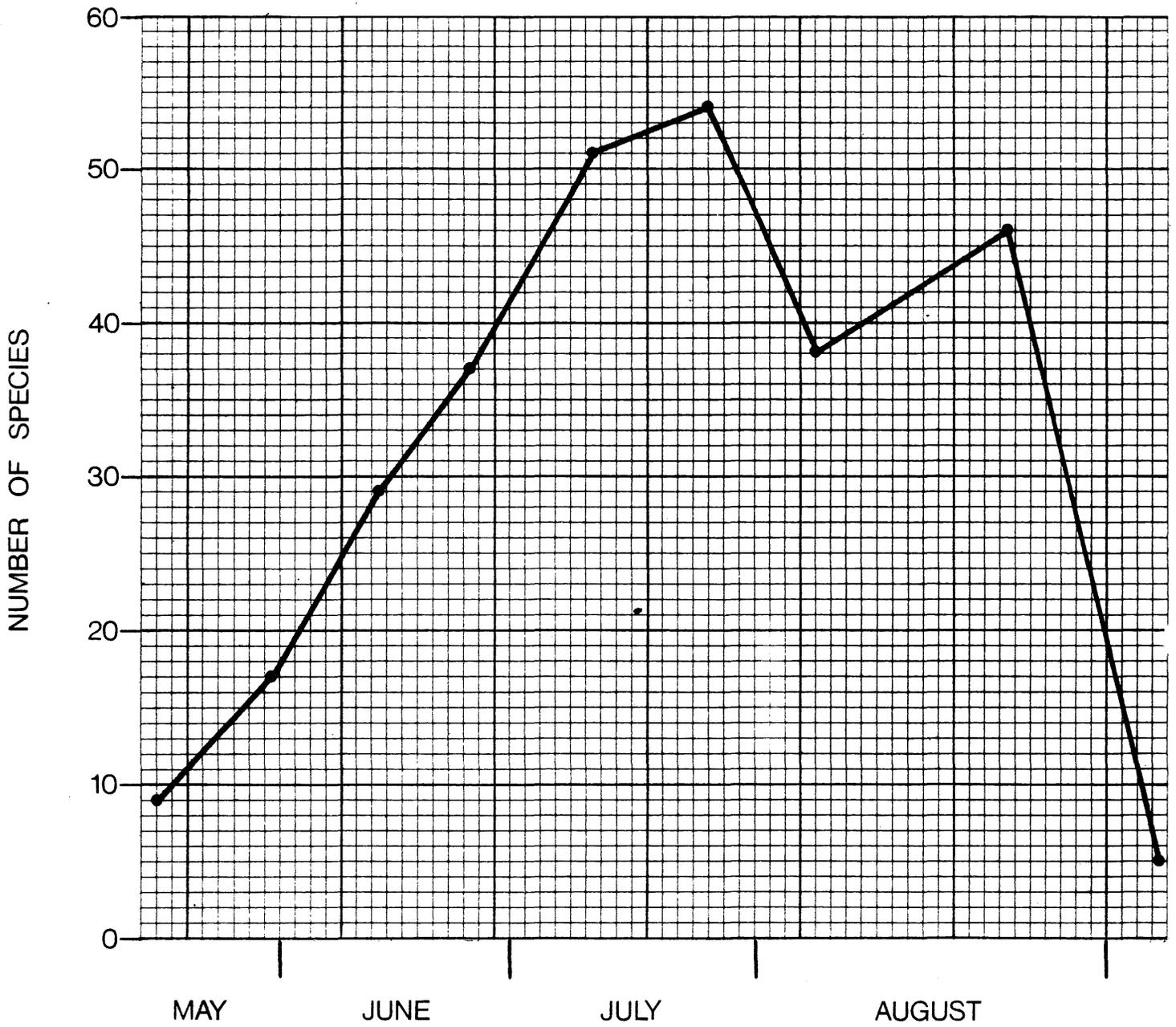


Figure 6. The 1979 blooming phenology on Clear Lake. Graph illustrates the number of plant species blooming on each trip to the preserve.

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

Format: Scientific name. Common Name. Collection number of voucher specimen. Community in Clear 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 Ownbey.

PTERIDOPHYTA - Spore-Bearing Plants

EQUISETACEAE - Horsetail Family

Equisetum hymale L. - Scouring Rush. #844. Scouring Rush.

OPHIOGLOSSACEAE - Adder's-Tongue Family

Botrychium virginianum (L.) SW. - Rattlesnake Fern. #792. Oak Woods.

POLYPODIACEAE - Polypody Family

Athyrium felix-femina (L.) Roth. - Lady Fern. #964. Old Path in Oak Woods.

Cystopteris fragilis (L.) Bernh. - Bladder-Fern. #693. Wooded Slope.

SPERMATOPHYTA - Seed Plants

GYMNOSPERMAE - Gymnosperms

CUPRESSACEAE - Cypress Family

Juniperus communis L. var. depressa Pursh. - Common Juniper. #952.  
Edge of Oak Woods.

Juniperus virginiana L. - Red Cedar. #702. Floodplain.

ANGIOSPERMAE - Angiosperms

MONOCOTYLENDONAE - Monocots

ARACEAE - Arum Family

Arisaema triphyllum (L.) Schott. - Jack-In-The-Pulpit. #351. Edge  
of Oak Woods.

COMMELINACEAE - Spiderwort Family

Tradescantia occidentalis (Britton) Smyth. - Western Spiderwort. #1172.

CYPERACEAE - Sedge Family

Carex alopecoidea Tuckerm. - Foxtail Sedge. #471. Oak Woods. \*

Carex brevior (Dew.) Mackenz. - Fescue Sedge. #451A. Brome Field. \*

Carex gravida Bailey. - Heavy Sedge. #795. Brome Field. \*

Carex laeviconica Dew. - Polished-Fruited Sedge. #462. Floodplain. \*

Carex pensylvanica Lam. - Pennsylvania Sedge. #235B. Old Road. \*

Carex retrorsa Schwein. - Retrorse Sedge. #865. Floodplain. \*

Carex sprengelii Dew. - Long-Beaked Sedge. #249. Clearing. \*

Cyperus filiculmis Vahl. (C. filiculmis var. macilentos (Vahl.) Fern.  
in Fernald, 1950) - Slender Cyperus. #840. Clearing.

IRIDACEAE - Iris Family

Sisyrinchium campestre Bicknell. - Blue-Eyed Grass. +

LILIACEAE - Lily Family

Allium stellatum Ker. - Prairie Wild Onion. #837. Clearing.

Allium vineale L. - Field Garlic. #520. Floodplain.

Asparagus officinalis L. - Asparagus. #452. Edge of Clearing.

Maianthemum canadense Desf. - Wild Lily of the Valley. #456. Edge of  
Oak Woods.

Polygonatum biflorum (Walt.) Ell. - Solomon's Seal. +

Smilax herbacea L. - Carrion Flower. +

Smilax hispida Muhl. - Carrion Flower. #1107. Oak Woods.

POACEAE - Grass Family

Agropyron repens (L.) Beauv. - Quack Grass. #603. Brome Field. Alien. \*

Agrostis hyemalis (Walt.) BSP. var. tenuis (Tuckerm.) Gl. (A. scabra  
Willd. in Fernald, 1950) Rough Bent Grass. #511. Clearing. \*

Agrostis stolonifera L. var. major (Gaud.) Farw. (A. alba L. in Fernald,  
1950) Redtop. #877. Near Shoreline. \*

Andropogon gerardi Vitman. - Big Bluestem. #956. Clearing.

Bouteloua curtipendula (Michx.) Torr. - Side Oats Grama. #839. Clearing. \*

Bromus inermis Leyss. - Smooth Brome. #450. Brome Field. Alien. \*

Elymus villosus Muhl. - Slender Wild Rye. #692. Wooded Slope. \*

Festuca obtusa Biehler. - Nodding Fescue Grass. #467. Oak Woods. \*

Muhlenbergia mexicana (L.) Trin. - Mexican Satin Grass. #871. Floodplain. \*

Panicum leibergii (Vasey) Scribn. - Leiberg's Panic Grass. #602. Brome  
Field. \*

Panicum praecocius Hitchc. & Chase - Panic Grass. #472. Clearing. \*

Panicum virgatum L. - Switch Grass. #868. Floodplain. \*

Phalaris arundinacea L. - Reed Canary Grass. #517. Floodplain. Possible  
Alien. \*

Phleum pratense L. - Timothy. #705. Floodplain. Alien. \*

Poa palustris L. - Fowl Meadow Grass. #695. Floodplain. \*

Poa pratensis L. (Poa pratensis var. angustifolia (L.) Sm.) - Lawn Blue  
Grass. #451. Brome Field. Possible Alien. \*

Setaria glauca (L.) Beauv. (S. lutescens (Weigel) F.T. Hubb; nom. illég.)  
Foxtail Grass. #841. Clearing. Alien. \*

Spartina pectinata Link. - Cord Grass. #876. Near Shoreline. \*

Stipa comata Trin. & Rupr. - Needle and Thread Grass. #604. Brome  
Field. \*

ORCHIDACEAE - Orchid Family

Orchis spectabilis L. - Showy Orchis. #361. Oak Woods.

DICOTYLEDONEAE - Dicots

ACERACEAE - Maple Family

Acer negundo L. - Box Elder. #254. Floodplain.

Acer saccharinum Marsh. - Silver Maple. #874. Floodplain.

ANACHARDIACEAE - Cashew Family

Rhus glabra L. - Smooth Sumac. #678. Brome Field.

Rhus radicans L. - Poison Ivy. +

APIACEAE - Parsley Family

- Angelica atropurpurea L. - Angelica. #698. Floodplain.  
Cicuta maculata L. - Water Hemlock. #777. Floodplain.  
Cryptotaenia canadensis (L.) DC. - Honewort. #685. Clearing.  
Osmorhiza claytoni (Michx.) Clarke. - Sweet Cicely. #689. Wooded Slope.  
Pastinaca sativa L. - Wild Parsnip. #701. Floodplain.

APOCYNACEAE - Dogbane Family

- Apocynum sibiricum Jacq. - Indian Hemp. #875. Floodplain.

ASCLEPIADACEAE - Milkweed Family

- Asclepias incarnata L. - Swamp Milkweed. #774. Floodplain  
Asclepias syriaca L. - Common Milkweed. +

ASTERACEAE - Composite Family

- Achillea millefolium L. - Yarrow. #509. Brome Field.  
Ambrosia artemisiifolia L. - Common Ragweed. #975. Edge of Clearing.  
Ambrosia psilostachya DC. - Western Ragweed. #832. Clearing.  
Antennaria neglecta Greene. - Pussy-Toes. #251. Old Field.  
Arctium minus Schk. - Common Burdock. #771. Floodplain. Alien.  
Artemisia ludoviciana Nutt. - Mugwort. #1109. Clearing.  
Aster ericoides L. - Heath's Aster. #1111. Clearing.  
Aster ontarionis Wieg. - Ontario Aster. #979. Old Road to Floodplain.  
Aster sagittifolius Willd. - Arrow-Leaved Aster. #1112. Oak Woods.  
Cirsium arvense (L.) Scop. - Canada Thistle. #783. Floodplain. Alien.  
Cirsium discolor (Muhl.) Spreng. - Field Thistle. #961. Edge of Clearing.  
Cirsium hillii (Canby) Fern. - Hill's Thistle. #794. Clearing.  
Cirsium vulgare (Savi) Tenore. - Bull Thistle. #961A. Edge of Clearing.  
Crepis tectorum L. - Hawk's Beard. #601. Clearing.  
Erigeron philadelphicus L. - Common Fleabane. #459. Wooded Slope.  
Erigeron strigosus Muhl. - Slender Daisy Fleabane. #532. Clearing.  
Eupatorium perfoliatum L. - Boneset. #867. Floodplain.  
Eupatorium rugosum Houtt. - White Snakeroot. #973. Edge of Oak Woods.  
Gnaphilum obtusifolium L. - Cudweed. #955. Clearing.  
Helenium autumnale L. - Sneezeweed. #1110. Clearing.  
Heliopsis helianthoides (L.) Sweet. var. scabra (Dunal) Fern. - Ox-Eye.  
#697. Floodplain. \*  
Lactuca canadensis L. - Wild Lettuce. #769. Wooded Slope.  
Rudbeckia hirta L. - Black-Eyed Susan. #677. Clearing. Alien.  
Rudbeckia laciniata L. - Goldenglow. #869. Floodplain.  
Senecio pauperculus Michx. - Dwarf Ragwort. #599. Edge of Oak Woods.  
Solidago canadensis L. - Canada Goldenrod. #852. Edge of Oak Woods.  
Solidago gigantea Ait. - Late Goldenrod. #976A. Clearing.  
Solidago graminifolia (L.) Salisb. - Lance-Leaved Goldenrod. #873.  
Floodplain.  
Solidago rigida L. - Stiff-Leaved Goldenrod. #974. Edge of Clearing.  
Sonchus arvensis L. - Canada Sow Thistle. #786. Floodplain. Alien.  
Taraxacum officinale Weber. - Common Dandelion. #466. Floodplain. Alien.  
Tragopogon dubius Scop. - Goat's Beard. #470. Oak Woods. Alien.  
Vernonia fasciculata Michx. - Ironweed. #853. Edge of Oak Woods.

BETULACEAE - Birch Family

Ostrya virginiana (Mill.) Koch. - Ironwood. #1101. Oak Woods.

BORAGINACEAE - Borage Family

Hackelia virginiana (L.) Johnst. - Virginian Stickseed. #793. Oak Woods. \*

Lithospermum incisum Lehm. - Narrow-Leaved Puccoon. #706. Clearing.

Myosotis laxa Lehm. - Smaller Forget-Me-Not. #694. Floodplain. \*

BRASSICACEAE - Mustard Family

Arabis divaricarpa A. Nels. - Pink Rock-Cress. #354. Clearing.

Berteroa incana (L.) DC. - Hoary Alyssum. #515. Edge of Clearing. Alien.

Erysimum cheiranthoides L. - Worm Seed-Mustard. #866. Old Road to Floodplain.

Erysimum inconspicuum (Wats.) Macmill. - Small-Flowered Rocket. #530. Clearing.

Hesperis matronalis L. - Dame's Rocket. #461. Floodplain.

CAMPANULACEAE - Harebell Family

Campanula rotundifolia L. - Harebell. #526. Floodplain.

CAPRIFOLIACEAE - Honeysuckle Family

Lonicera tatarica L. - Tartarian Honeysuckle. #358. Oak Woods.

Sambucus pubens Michx. - Red-Berried Elder. #468. Clearing.

Symphoricarpos occidentalis Hook. - Wolfberry. #846. Edge of Oak Woods.

Viburnum lentago L. - Nannyberry. #1108. Oak Woods.

CARYOPHYLLACEAE - Pink Family

Arenaria lateriflora L. - Blunt-Leaved Sandwort. #457. Oak Woods.

Stellaria aquatica (L.) Scop. (Cerastium a. (L.) Scop.) - Chickweed. #789. Floodplain.

Cerastium vulgatum L. - Larger Mouse-Ear Chickweed. #682. Oak Woods. \*

Lychnis alba Mill. - White Campion. #516. Clearing. Alien.

Stellaria longifolia Muhl. - Long-Leaved Stitchwort. #1170.

Stellaria media (L.) Cyrill. - Common Chickweed. #691. Oak Woods.

CELASTRACEAE - Bittersweet Family

Celastrus scandens L. - Climbing Bittersweet. +

Euonymus atropurpureus Jacq. - Burning Bush. #1105. Floodplain.

CISTACEAE - Rockrose Family

Helianthemum bicknellii Fernald. - Hoary Frostweed. #598. Clearing. \*

Lechea intermedia Leggett. - Pinweed. #835. Clearing. \*

CONVOLVULACEAE - Morning Glory Family

Convolvulus sepium L. - Hedge Bindweed. #778. Floodplain. Possible Alien.

ERICACEAE - Heath Family

Monotropa uniflora L. - Indian Pipe. #963. Oak Woods.

FABACEAE - Bean Family

- Amorpha fruticosa L. - False Indigo. #872. Shoreline.  
Astragalus canadensis L. - Milk-Vetch. #699. Floodplain.  
Desmodium canadense (L.) DC. - Canada Tick-Trefoil. #782. Floodplain.  
Lespedeza capitata Michx. - Bush-Clover. #951. Oak Woods.  
Medicago lupulina L. - Black Medick. #700. Floodplain. Alien.  
Melilotus alba Desr. - White Sweet Clover. #776. Floodplain. Alien.  
Melilotus officinalis (L.) Desr. - Yellow Sweet Clover. #780. Floodplain.  
Alien.  
Petalostemum purpureum (Vent.) Michx. - Purple Prairie Clover. Oak Woods.  
Trifolium pratense L. - Red Clover. #704. Floodplain. Alien.  
Trifolium repens L. - White Clover. #454. Brome Field. Alien.  
Vicia americana Muhl. - American Vetch. #522. Floodplain.

FAGACEAE - Beech Family

- Quercus borealis Michx. F. - Red Oak. #1104. Oak Woods.  
Quercus ellipsoidalis E.J. Hill - Pin Oak. #972. Oak Woods.  
Quercus macrocarpa Michx. - Bur Oak. #958. Oak Woods.

GENTIANACEAE - Gentian Family

- Gentiana andrewsii Griseb. - Andrew's Gentian. #1098. Floodplain.

HYDROPHYLLACEAE - Waterleaf Family

- Hydrophyllum virginianum L. - Virginia Waterleaf. #353. Edge of Oak Woods.

HYPERICACEAE - St. John's-Wort Family

- Hypericum pyramidalatum Ait. - Greater St. John's-Wort. #781. Floodplain.

JUGLANDACEAE - Walnut Family

- Juglans cinerea L. - Butternut. #960. Clearing.

LAMIACEAE - Mint Family

- Agastache foeniculum (Pursh) Kuntze. - Giant Hyssop. #978. Floodplain.  
Glechoma hederacea L. - Ground-Ivy. #356. Wooded Slope.  
Hedeoma hispida Pursh. - Mock Pennyroyal. #674. Brome Field.  
Leonurus cardiaca L. - Motherwort. #679. Clearing.  
Lycopus americana Muhl. - Water Horehound. #787. Floodplain.  
Lycopus virginicus L. - Virginia Bugleweed. #864. Floodplain. \*  
Mentha arvensis L. - Wild Mint. #770. Floodplain.  
Monarda fistulosa L. - Wild Bergamot. #848. Oak Woods.  
Nepeta cataria L. - Catnip. #675. Edge of Clearing. Alien.  
Physostegia virginiana (L.) Benth. False Dragon's Head. #987. Floodplain.  
Prunella vulgaris L. - Self-Heal. #775. Floodplain.  
Scutellaria parvula Michx. - Small Skullcap. #513. Edge of Clearing.  
Stachys palustris L. - Hedge Nettle. #784. Floodplain.  
Teucrium canadense L. - American Germander. #833. Clearing.

LOBELIACEAE - Lobelia Family

- Lobelia spicata Lam. - Pale-Spiked Lobelia. #683. Clearing.

LYTHRACEAE - Loosestrife Family

- Lythrum salicaria L. - Purple Loosestrife. #778A. Floodplain. Alien.

MENISPERMACEAE - Moonseed Family

Menispermum canadense L. - Moonseed. #957. Clearing.

NYCTAGINACEAE - Four O'clock Family

Oxybaphus hirsutus (Pursh) Sweet. (Mirabilis h. (Pursh) MacM. in Fernald, 1950) - Hairy Umbrella-Wort. #959. Clearing.

Oxybaphus nyctagineus (Michx.) Sweet. (Mirabilis nyctaginea (Michx.) MacM. in Fernald, 1950) - Heart-Leaved Umbrella-Wort. #834. Clearing.

OLEACEAE - Olive Family

Fraxinus pennsylvanica Marsh. - Green Ash. #525. Floodplain.

Syringa vulgaris L. - Common Lilac. #843. Edge of Clearing.

ONAGRACEAE - Evening-Primrose Family

Circaea quadrisulcata (Maxim.) Franch. & Sav. - Enchanter's Nightshade. #785. Floodplain.

Oenothera biennis L. - Tall Evening-Primrose. #878. Floodplain.

OXALIDACEAE - Wood-Sorrel Family

Oxalis dillenii Jacq. - Wood-Sorrel. #672. Brome Field. Possible Alien.

Oxalis violacea L. - Prairie Wood-Sorrel. #469. Oak Woods.

PHYRMACEAE - Lopseed Family

Phryma leptostachya L. - Lopseed. #686. Wooded Slope.

PLANTAGINACEAE - Plantain Family

Plantago rugelii Decne. - Rugel's Plantain. #681. Oak Woods.

POLEMONIACEAE - Phlox Family

Phlox divaricata L. - Wild Blue Phlox. #349. Edge Oak Woods.

POLYGONACEAE - Smartweed Family

Polygonum covolvulus L. - Black Bindweed. #671. Brome Field. Alien.

Rumex acetosella L. - Red Sorrel. #455. Brome Field.

Rumex orbiculatus Gray. - Great Water Dock. #790. Floodplain.

PRIMULACEAE - Primrose Family

Lysimachia ciliata L. - Fringed Loosestrife. #773. Floodplain.

RANUNCULACEAE - Crowfoot Family

Anemone canadensis L. - Canada Anemone. #519. Floodplain.

Anemone cylindrica Gray. - Thimbleweed. #600. Clearing.

Aquilegia canadensis L. - Wild Columbine. #348. Wooded Slope.

Clematis virginiana L. - Virginia Clematis. #870. Floodplain.

Delphinium virescens Nutt. - Prairie Larkspur. #707. Clearing.

Isopyrum biternatum (Raf.) T.&G. - False Rue Anemone. #253. Floodplain.

Ranunculus abortivus L. - Small-Flowered Crowfoot. #350. Floodplain.

Ranunculus pensylvanicus L.f. - Bristly Buttercup. #772. Floodplain.

Ranunculus rhomboideus Goldie. - Prairie Buttercup. #250. Edge of Oak Woods.

Ranunculus septentrionalis Poir. - Swamp Buttercup. #518. Floodplain.  
Thalictrum dasycarpum Fisch & Ave-Lall. - Tall Meadow Rue. #703.

Floodplain.

Thalictrum venulosum Trel. - Early Meadow Rue. #524. Floodplain.

ROSACEAE - Rose Family

Fragaria vesca L. var americana Porter. - American Wood Strawberry.

#347A. Wooded Slope. \*

Geum canadense Jacq. - White Avens. #680. Clearing.

Malus pumila Mill. (in Fernald, 1950) - Apple Tree. #357. Clearing.

Potentilla anserina L. - Silverweed. #696. Floodplain.

Potentilla argentea L. - Silvery Cinquefoil. #670. Clearing. Alien.

Potentilla recta L. - Rough-Fruited Cinquefoil. #597. Brome Field.

Alien.

Prunus americana Marsh. - Wild Plum. #360.

Prunus serotina Ehr. - Black Cherry. #474. Clearing.

Rosa blanda Ait. - Smooth Rose. #523. Floodplain.

Rubus occidentalis L. - Black Raspberry. #453. Edge of Clearing.

Rubus strigosus Michx. - Red Raspberry. #966. Oak Woods.

RUBIACEAE - Madder Family

Galium aparine L. - Cleaver's Bedstraw. #463. Floodplain.

Galium concinnum T. & G. - Elegant Bedstraw. #1171. \*

Galium triflorum Michx. - Sweet-Scented Bedstraw. #797. Wood Slope.

Houstonia longifolia Gaertn. - Large-Leaved Houstonia. #473. Old Road.

RUTACEAE - Rue Family

Zanthoxylum americanum Mill. - Prickly Ash. #850. Oak Woods.

SALICACEAE - Willow Family

Populus deltoides Marsh. - Cottonwood. #1100. Floodplain.

Salix interior Rowlee. - Sandbar-Willow. #529. Floodplain.

Salix petiolaris Sm. (S. gracilis Anderss. in Fernald, 1950) - Slender

Willow. #256. Floodplain.

SAXIFRAGACEAE - Saxifrage Family

Ribes americanum Mill. - Wild Black Currant. #456. Floodplain.

Ribes missouriense Nutt. - Missouri Gooseberry. +

SCROPHULARIACEAE - Figwort Family

Linaria vulgaris Hill. - Butter-And-Eggs. #845. Sumac Thicket. Alien.

Mimulus ringens L. - Monkey-Flower. #862. Floodplain.

Penstemon gracilis Nutt. - Slender Beard-Tongue. #510. Clearing.

Penstemon grandiflorus Nutt. - Large-Flowered Beard-Tongue. #531. Edge  
of Clearing.

Scrophularia lanceolata Pursh. - Figwort. #464. Floodplain

Verbascum thapsus L. - Great Mullein. #954. Clearing. Alien.

Veronicastrum virginicum (L.) Farw. - Culver's Root. #779. Floodplain.

SOLANACEAE - Nightshade Family

Physalis virginiana Mill. - Virginia Ground Cherry. #512. Clearing.

Solanum americanum Mill. (in Fernald, 1950) - American Black Nightshade.  
#673. Clearing.

TILIACEAE - Linden Family

Tilia americana L. - Basswood. #1102. Floodplain.

ULMACEAE - Elm Family

Celtis occidentalis L. - Hackberry. #971. Oak Woods.

Ulmus americana L. - American Elm. #255. Floodplain.

Ulmus rubra Muhl. - Slippery Elm. #965. Oak Woods.

URTICACEAE - Nettle Family

Laportea canadensis (L.) Wedd. - Wood Nettle. #970. Oak Woods.

Parietaria pensylvanica Muhl. - Pellitory. #676. Wooded Slope.

Urtica dioica L. - Stinging Nettle. #836. Edge of Clearing.

VERBENACEAE - Verbena Family.

Verbena stricta Vent. - Hoary Vervain. #707A. Sumac Thicket.

Verbena urticifolia L. - Nettle-Leaved Vervain. #788. Floodplain.

VIOLACEAE - Violet Family

Viola pedatifida G. Don. - Prairie-Violet. #355.

Viola sororia Willd. - Woolly Blue Violet. #352.

VITACEAE - Grape Family

Parthenocissus vitacea (Knerr) Hitch. (P. inserta (Kerner) Fritsch.,  
misapplied) - Thicket Creeper. #968. Oak Woods.

Vitis riparia Michx. - River-Bank Grape. #967. Oak Woods.

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

CHENOPODIACEAE

Chenopodium album

EQUISETACEAE

Equisetum arvense

FABACEAE

Amphicarpa cf. bracteata

GERANIACEAE

Geranium cf. maculatum

OLEACEAE

Fraxinus nigra

POACEAE

Elymus canadensis

ROSACEAE

Fragaria virginiana

Prunus virginiana

RUBIACEAE

Galium boreale

### Sources of Information

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## ZOOLOGICAL COMPONENTS

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

## BIRDS

### Methods

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). Five circular stations<sup>1</sup> (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 noncontemporaneous 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. Fifty-five species of birds, representing 24 families were observed on or above Clear Lake. Five species were found nesting on the area with 15 others recorded as inferred breeders.<sup>2</sup>

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1 Maps showing location of these stations are on file, Scientific and Natural Areas Section, St. Paul.

2 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.

Flp1 - Floodplain  
S/OBF - Sumac, Old Brome Field  
OWo - Oak Woods

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

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

BREEDING STATUS:

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

FAMILY/SCIENTIFIC NAME	COMMON NAME	DATE	HABITAT	RESI-DENCY	BREEDING STATUS	REMARKS
ARDEIDAE						
<u>Ardea lenodias</u>	Great Blue Heron	1 May	Flpl	S		
ANATIDAE						
<u>Anas platyrhynchos</u>	Mallard	13 June	S/OBF	S		
<u>Aix sponsa</u>	Wood Duck	19 April	Flpl	S		
ACCIPITRIDAE						
<u>Buteo jamaicensis</u>	Red-Tailed Hawk	19 April	Flpl	S	●	Nest found 4/23/79
TETRAONIDAE						
<u>Bonasa umbellus</u>	Ruffed Grouse	23 April	OWo	P	●	Nest found 10 eggs 5/16/79
COLUMBIDAE						
<u>Zenaida macroura</u>	Mourning Dove	1 May	S/OBF OWo Flpl	S	⊕	
Cuculidae						
<u>Coccyzus erythrophthalmus</u>	Black-Billed Cuckoo	25 June	OWo S/OBF	S		
APODIDAE						
<u>Chaetura pelagica</u>	Chimney Swift	25 June	OWo	S		
PICIDAE						
<u>Colaptes auratus</u>	Common Flicker	23 April	Flpl S/OBF OWo	S		
<u>Dryocopus pileatus</u>	Pileated Woodpecker	6 July	Flpl	P		
<u>Melanerpes erythrocephalus</u>	Red-Headed Woodpecker	31 May	S/OBF Flpl	S		
<u>Dendrocopus villosus</u>	Hairy Woodpecker	12 June	Flpl	P	●	Nest found 6/12/79
<u>Dendrocopus pubescens</u>	Downy Woodpecker	23 April	Flpl S/OBF	P		
TYRANNIDAE						
<u>Sayornis phoebe</u>	Eastern Phoebe	1 May	Flpl	S		
<u>Empidonax minimus</u>	Least Flycatcher	25 June	Flpl	S		
<u>Contopus virens</u>	Eastern Wood Pewee	31 May	S/OBF Flpl OWo	S		

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

FAMILY/SCIENTIFIC NAME	COMMON NAME	DATE	HABITAT	RESI-DENCY	BREEDING STATUS	REMARKS
HIRUNDINIDAE						
<u>Iridoprocne bicolor</u>	Tree Swallow	23 April	Flpl S/OBF OWo	S		
<u>Stenlgidopteryx ruficallis</u>	Rough-Winged Swallow	23 April	Owo Flpl	S		
<u>Progne subis</u>	Purple Martin	16 May	Flpl	S		
CORVIDAE						
<u>Cyanocitta cristata</u>	Blue Jay	23 April	Flpl S/OBF OWo	P	⊕	
<u>Corvus brachyrhynchos</u>	Common Crow	23 April	Owo Flpl	S	⊕	
PARIDAE						
<u>Parus atricapillus</u>	Black-Capped Chickadee	19 April	Flpl S/OBF OWo	P	●	Nest found 5/1/79
SITTIDAE						
<u>Sitta carolinensis</u>	White-Breasted Nuthatch	23 April	Flpl S/OBF OWo	P	⊕	
TROGLODYTIDAE						
<u>Troglodytes aedon</u>	House Wren	12 June	Owo Flpl	S		
MIMIDAC						
<u>Dumetella carolinensis</u>	Gray Catbird	1 May	S/OBF Flpl OWo	S	⊕	
<u>Toxostoma rufum</u>	Brown Thrasher	1 May	S/OBF OWo	S	⊕	
TURDIDAC						
<u>Turdus migratorius</u>	American Robin	23 April	Flpl S/OBF OWo	S	⊕	
SYLVIIDAE						
<u>Polioptila caerulea</u>	Blue-Gray Gnatcatcher	13 June		S	●	2 nests found 6/13/79
<u>Regulus caledula</u>	Ruby-Crowned Kinglet	23 April	Owo	S		
BOMBYCILLIDAE						
<u>Bombycilla cedrorum</u>	Cedar Waxwings	27 June	S/OBF	S		
STURNIDAE						
<u>Sturnus vulgaris</u>	Starling	23 May	Owo	P		

TABLE 4. (Continued)

## ANNOTATED LIST OF BIRDS OBSERVED AT CLEAR LAKE

FAMILY/SCIENTIFIC NAME	COMMON NAME	DATE	HABITAT	RESI-DENCY	BREEDING STATUS	REMARKS
VIVEONIDAE						
<u>Vireo olivaceus</u>	Red-Eyed Vireo	31 May	OWo Flpl	S	⊕	
PARULIDAE						
<u>Vermivora peregrina</u>	Tennessee Warbler	31 May	OWo	S		
<u>Dendroica petechia</u>	Yellow Warbler	23 April	Flpl S/OBF OWo	S		
<u>Dendroica coronata</u>	Yellow-rumped Warbler	23 April	OWo Flpl	S		
<u>Dendroica virens</u>	Black-Throated Green Warbler	16 May	OWo	S		
<u>Geothlypis trichos</u>	Common Yellowthroat	31 May	Flpl	S		
<u>Setophaga ruticilla</u>	American Redstart	16 May	Flpl	S		
ICTERIDAE						
<u>Sturnella neglecta</u>	Western Meadowlark	27 June	OWo	S		
<u>Agelaius phoeniceus</u>	Red-Winged Blackbird	23 April	Flpl	S		
<u>Icterus galbula</u>	Northern Oriole	16 May	Flpl S/OBF OWo	S	⊕	
<u>Euphagus cyanocephalus</u>	Brewers Blackbird	1 May	S/OBF	S		
<u>Quiscalus quiscula</u>	Common Grackle	23 April	S/OBF OWo	S		
<u>Molothrus ater</u>	Brown-Headed Cowbird	1 May	OWo Flpl	S	⊕	
THRAUPIDAE						
<u>Piranga olivacea</u>	Scarlet Tanager	12 June	Flpl	S		
FRINGILLIDAE						
<u>Cardinalis cardinalis</u>	Cardinal	1 May	Flpl S/OBF OWo	P	⊕	
<u>Pheucticus ludovicianus</u>	Rose-Breasted Grosbeak	16 May	Flpl S/OBF OWo	S	⊕	
<u>Passerina cyana</u>	Indigo Bunting	31 May	Flpl S/OBF OWo	S	⊕	
<u>Spinus tristis</u>	American Goldfinch	16 May	Flpl S/OBF OWo	S		
<u>Pipilo erythrophthalmus</u>	Rufus-Sided Towhee	27 June	Flpl	S		
<u>Ammodramus savannarum</u>	Grasshopper Sparrow	27 June	S/OBF	S		

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

FAMILY/SCIENTIFIC NAME	COMMON NAME	DATE	HABITAT	RESI- DENCY	BREEDING STATUS	REMARKS
FRINGILLIDAE (CON'T)						
<u>Spizella passerine</u>	Chipping Sparrow	27 June	OWo	S		
<u>Spizella pallida</u>	Clay-Colored Sparrow	31 May	S/OBF	S	⊕	
<u>Spizella pusilla</u>	Field Sparrow	1 May	S/OBF OWo	S	⊕	
<u>Melospiza melodia</u>	Song Sparrow	23 April	Flpl S/OBF OWo	S	⊕	

### Sources of Information

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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 Ag. Forest Service General Technical Report SE-14:142-163.

### Additional Sources of Information

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

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

## 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 reopened. Scent stations, 1 m. diameter, were established on mounds of soil excavated by pocket gophers. Artificial scent was placed in the center of these stations.

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

### Results

The results of the 1979 mammal inventory are presented in the form of an annotated list, Table 5. Eleven species, representing seven families were observed or captured on Clear Lake.<sup>1</sup>

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

Table 5. Mammals Identified on Clear Lake Natural Area.

Family Name/ Scientific Name	Common Name	Habitat
SCIURIDAE		
<u>Marmota monax</u>	Wood Chuck	
<u>Tamiasciurus hudsonicus</u>	American Red Squirrel	Mixed Woods
<u>Tamias striatus</u>	Eastern Chipmunk	Mixed Woods
<u>Sciurus carolinensis</u>	Eastern Gray Squirrel	Mixed Woods
GEOMYIDAE		
<u>Geomys bursarius</u>	Plains Pocket Gopher	
CRICETIDAE		
<u>Peromyscus leucopus</u>	White Footed Mouse	Mixed Forest, Grassy Flood- plain
<u>Clethrionomys gapperi</u>	Gapper's Red-backed Vole	Sumac
<u>Microtus pennsylvanicus</u>	Prairie Vole	Grassy Flood- plain
ZAPODIDAE		
<u>Zapus hudsonius</u>	Meadow Jumping Mouse	Sumac, Grassy Floodplain
PROCYONIDAE		
<u>Procyon lotor</u>	Raccoon	
MUSTELIDAE		
<u>Mephitis mephitis</u>	Striped Skunk	

Sources of Information

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

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

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

## AMPHIBIANS AND REPTILES

### Methods

Amphibians and reptiles were identified by vocalizations, sight and collection of specimens.<sup>1</sup> 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 placed in the Bell Museum of Natural History, University of Minnesota, Department of Ecology and Behavioral Biology.

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

The results of the 1979 amphibian and reptile inventory are presented in the form of an annotated list, Table 6. Three amphibians were identified on Clear Lake natural area.

Table 6. Amphibians and Reptiles Identified on Clear Lake Natural Area.

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AMPHIBIA

BUFONIDAE

Bufo americanus americanus American Toad

HYLIDAE

Pseudacris triseriata triseriata Western Chorus Frog

RANIDAE

Rana pipiens pipiens Leopard Frog

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

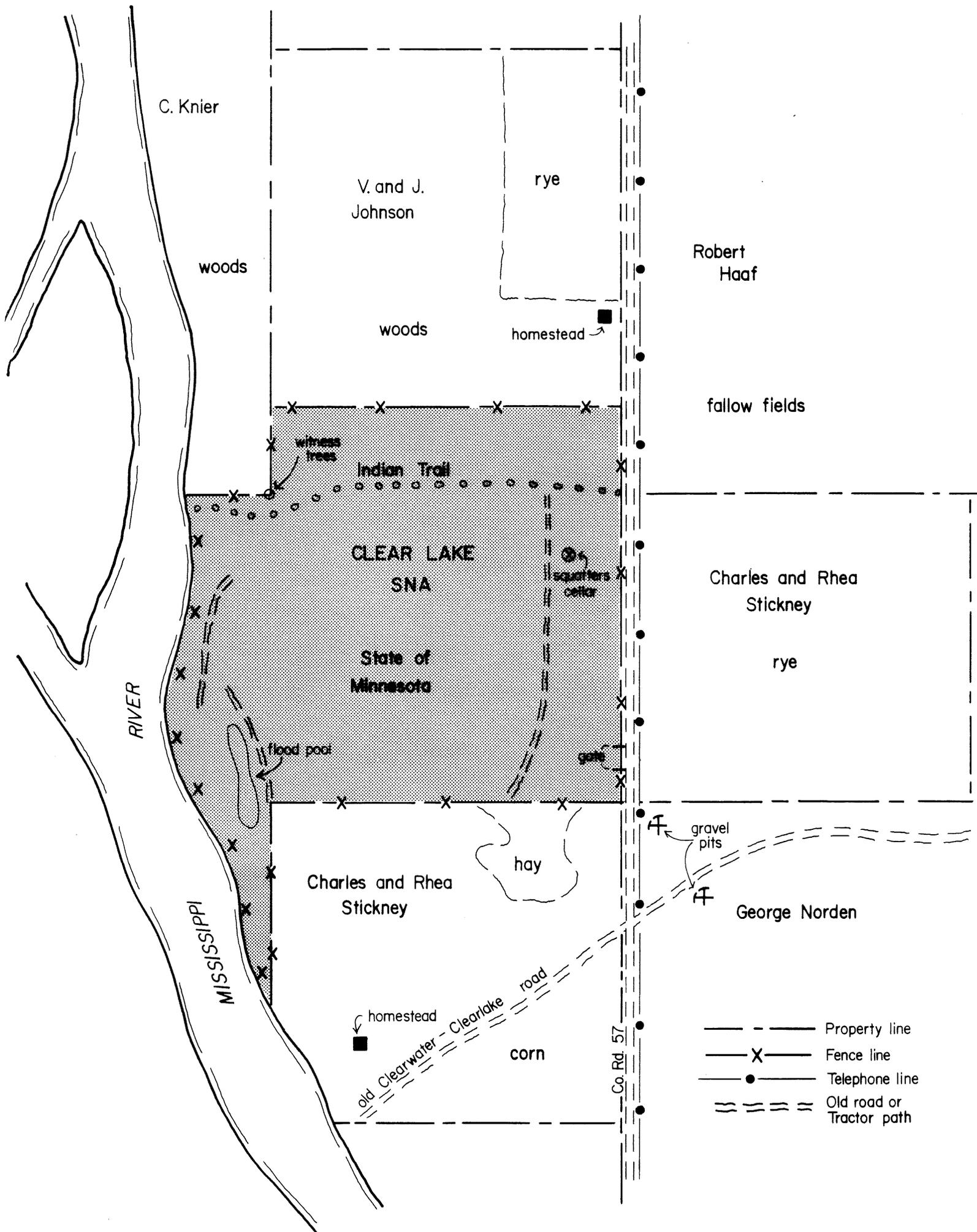
The land use information presented here is based on historical records, aerial photographs, inspections of the site, and interviews with former landowners and other individuals who are knowledgeable about the site.

### Recent Land Use History

Clear Lake Township was first settled by Europeans in 1850. With time, land in the area was cleared and utilized for crop production and grazing. Across the river from the preserve, a saw mill and flour mill began operating, and the town of Clearwater was organized. Figure 7 shows the landowners and land uses near the preserve in 1979. Cultivated fields surround the tract on three sides, although there are some woods immediately adjacent to the tract on the north and south sides. Two abandoned gravel pits are present near the southeast corner of the site.

The Clear Lake natural area has been affected by the activities of people. Prior to European settlement Chippewa Indians travelled through the area. The Indians would walk from their camp several miles

Figure 7. Past and present land use practices in the vicinity of Clear Lake.



down river to the shallow area south of the island on the Mississippi River, cross there, and then walk across the northern part of the tract. This path supposedly was the way the Indians travelled between their camp and Mille Lac.

Squatters entered the area around 1850. According to the former owner of Clear Lake, six squatter families built 12' x 14' shacks, dug vegetable storage pits, and cleared the area immediately adjacent to their homes on the tract. One of these storage pits, 10-12" in diameter, is identified in Figure 7. Today it is overgrown and surrounded by lilacs which the squatters probably planted.

Over the years several parties have owned different parts of the tract.<sup>1</sup> However, all of the owners apparently used the tract primarily for grazing: from 1856 to 1977 approximately 30-40 head of cattle and two horses grazed the entire site. None of the tract has been mowed, nor were culverts, ditches or water holes dug in the area. No commercial logging occurred on the tract. However, dead trees, often 150-200 years old, were hauled out by horses and sled. No hunting has occurred on the site since at least 1953 when the tract was incorporated into the Clear Lake Game Refuge.

County Road 57 and a telephone line border the tract on the east. It is not known when the dirt road was built. In 1977 the County leveled the road using dirt along the side when necessary. Brome and rye were often planted by the County on the road's back slopes.

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<sup>1</sup> A description of the ownership changes which have occurred on Clear Lake is on file, Scientific and Natural Areas Section, St. Paul.

Barbed wire fences enclose all of the tract. It is not known when the north, east, and south fences were first erected, but they were rebuilt around 1930. The south and east barbed wire fences are in different states of repair today. The south fence looks much sturdier and newer than the east fence. A twelve foot long gate, consisting of barbed wire and moveable posts, is present in the southeast corner. The north fence consists of posts, barbed wire, and a large mesh type fence. In 1940 the river front was fenced off to prevent the livestock from drinking polluted river water. This fence consists of barbed wire strung between wooden posts and an occasional metal post. Another fence may also have been present at one time in the NW $\frac{1}{4}$ , NW $\frac{1}{4}$  of Section 23, dividing it in half from north to south.

Several other activities have affected the landscape and vegetation of the Clear Lake natural area. Several tractor paths are evident on the area, some of which are still used by an adjacent landowner (See Figure 7). One path goes through the sumac on the east, while another path goes down and into the floodplain on the west. A few years ago the sumac on the eastern part of the tract was cut in an attempt to eliminate the species from the area. However, this treatment had the opposite effect - the sumac is now thriving in the area. The former landowner built wood duck nesting boxes all along the area's river front. A few of these boxes are now in need of repair.















DATE: 13 June, 26 July 1979SURVEYOR: LuttingPLOT #: 4 Clear LakeLOCATION: Approx. 200 feet E of riverCOVER TYPE: floodplain

SOIL SERIES: \_\_\_\_\_

PLOT SIZE: 20 x 20 square meters

## Height Classes

	8	7	6	5	4	3	2	1
Coverage for Height Class -			5%		45%		45%	75%

Species	8	7	6	5	4	3	2	1	Remarks
<i>Juglans cinerea</i>			1/1						
<i>Xanthoxylum americanum</i>					1/1				
<i>Juniperus virginiana</i>					+1/1				
<i>Verbascum thapsus</i>							2/1		
<i>Fraxinus pensylvanica</i> +							2/1	+1	
<i>Poa pratensis</i>								4/1	
<i>Bromus inermis</i>								3/1	
<i>Solidago cf. gigantea</i>								2/1	?
<i>Rubus occidentalis</i>								1/1	
<i>Eupatorium rugosum</i>								1/1	
<i>Ambrosia artemisiifolia</i>								1/1	
<i>Cirsium arvense</i>								1/1	
<i>Titis riparia</i>								+1/1	
<i>Parthenocissus inserta</i>								+1/1	
<i>Menispermum canadense</i>								+1/1	
<i>Ribes missouriense</i>								+1/1	
<i>Acer negundo</i>								+1/1	
<i>Ulmus americana</i>								+1/1	?
<i>Celtis occidentalis</i>								+1/1	
<i>Fraxinus nigra</i>								+1/1	
<i>Tilia americana</i>								+1/1	
<i>Celastrus scandens</i>								+1/1	?
<i>Lysimachia ciliata</i>								+1/1	
<i>Oxalis diellenii</i>								+1/1	
<i>Galium aparine</i>								+1/1	
<i>Stachys palustris</i>								+1/1	
<i>Equisetum arvense</i>								+1/1	
<i>Verbena stricta</i>								+1/1	
<i>Melilotus alba</i>								+1/1	
<i>Physalis virginiana</i>								+1/1	
<i>Carex sprengei</i>								+1/2	
<i>Carex</i>								+1/2	
<i>Linaria vulgaris</i>								+1/1	
<i>Scrophularia lanceolata</i>								+1/1	
<i>Nepeta cataria</i>								+1/1	
<i>Eriogonum striosus</i>								+1/1	?











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