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Fish and Wildlife Resources of the Great Lakes Coastal Wetlands within the United States

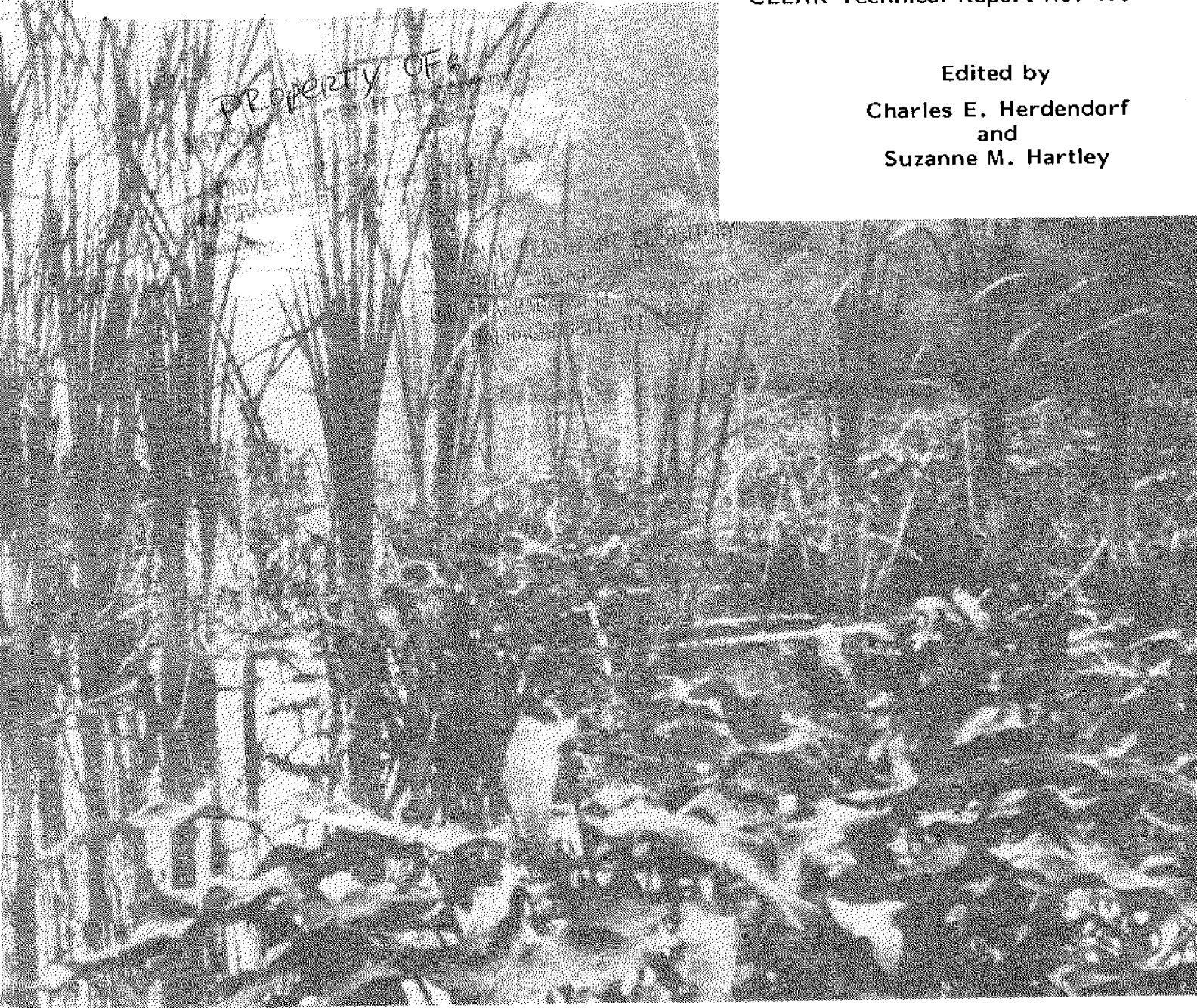
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VOLUME FIVE: LAKE MICHIGAN, PART III

CLEAR Technical Report No. 170

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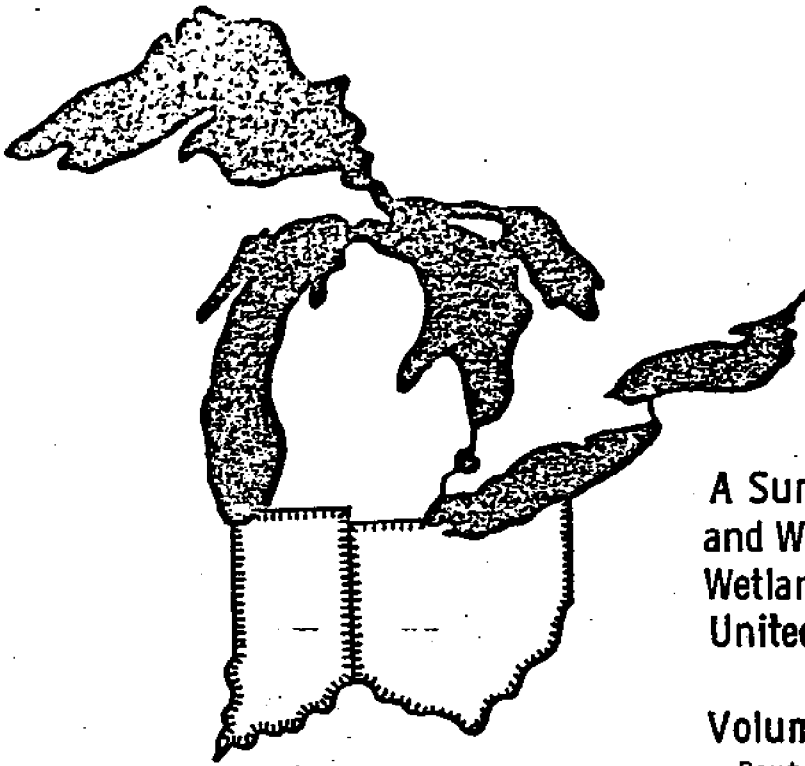
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**A Summary of Knowledge of the Fish
and Wildlife Resources of the Coastal
Wetlands of the Great Lakes of the
United States**

Five Michigan
Volume Three: Lake Erie
Part Three

Prepared for

**U.S. Fish and Wildlife Service
Division of Ecological Services - Region 3
Twin Cities, Minnesota**

Compiled by

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LAKE SECTION 12

INTRODUCTION

Lake Section 12 extends along the Green Bay shoreline from the Wisconsin-Michigan border along the Menominee River to Escanaba, Michigan, on the western shore of Little Bay de Noc. The topography in the region is generally flat along the shoreline; further inland, it is rolling at higher elevations. The predominant shore type along this approximately 60 mile stretch of shoreline is erodible low plain. Non-erodible low plain and artificial fill are also present in the vicinity of several of the wetlands in this lake section (Great Lakes Basin Commission, 1975).

Figures 12-1 12-2 show the approximate location of the 15 coastal wetlands in Lake Section 12. Latitude, longitude, acreage, and classification for each of these wetlands are presented in Table 12-1. Most of the wetlands in Lake Section 12 have elevations ranging from 580 to 590 feet above sea level (lake level to ten feet above the approximate mean elevation of Lake Michigan). However, several wetlands, including Ingallston Township Wetland and Deer Creek Wetland, have elevations ranging up to 610 feet above sea level. The majority of wetlands within the lake section are Lacustrine Systems; Riverine and Palustrine Systems are also present.

Information related to the physiographic and cultural features of the 15 coastal wetlands is summarized in the individual wetland narratives presented in this chapter. Published sources lack site-specific information on the biotic characteristics of many of these wetlands. However, site specific information is available for Cedar River Wetland, Deer Creek Wetland, the Ford River Area Wetland Complex, and Portage Marsh.

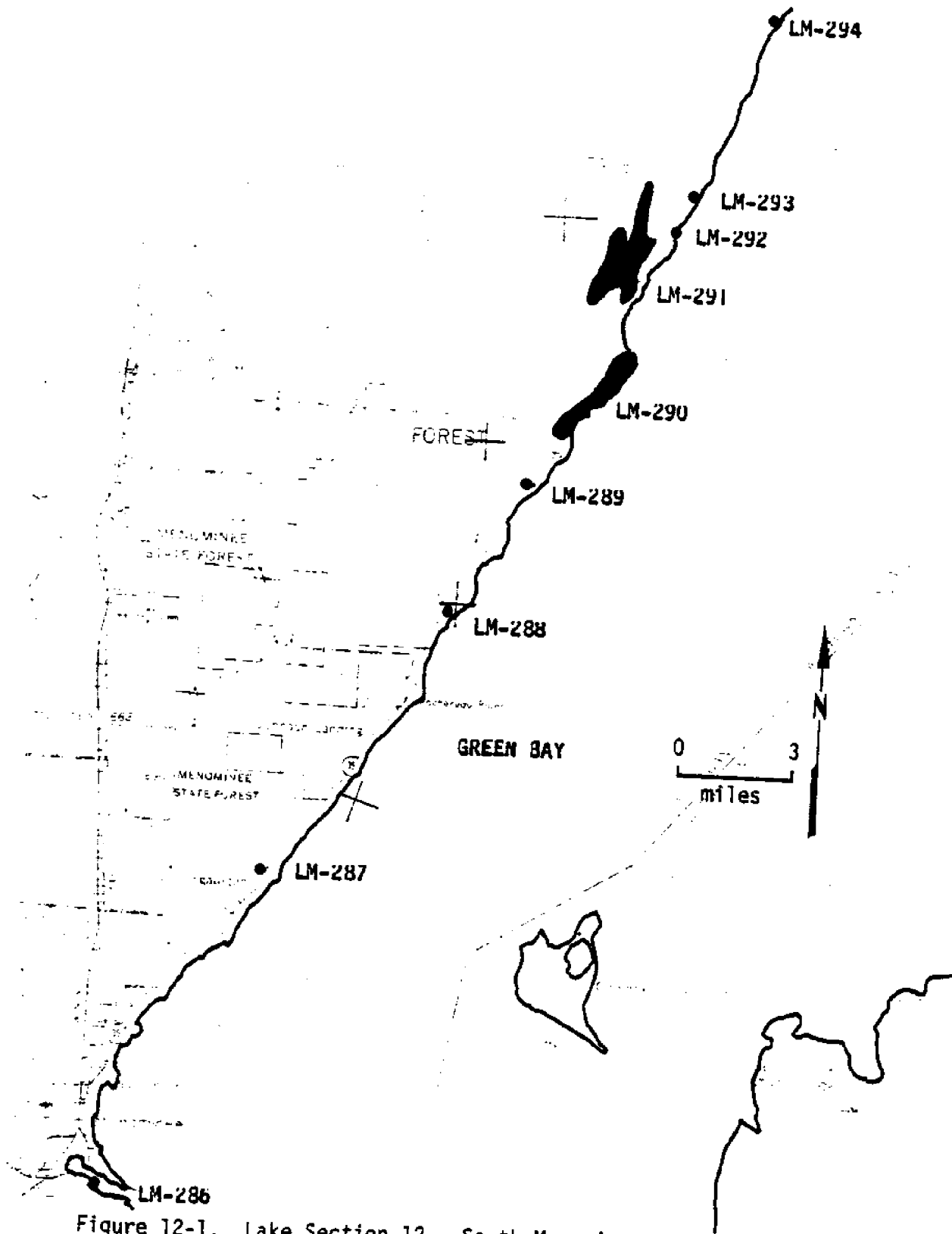


Figure 12-1. Lake Section 12 - South Menominee State Forest Area

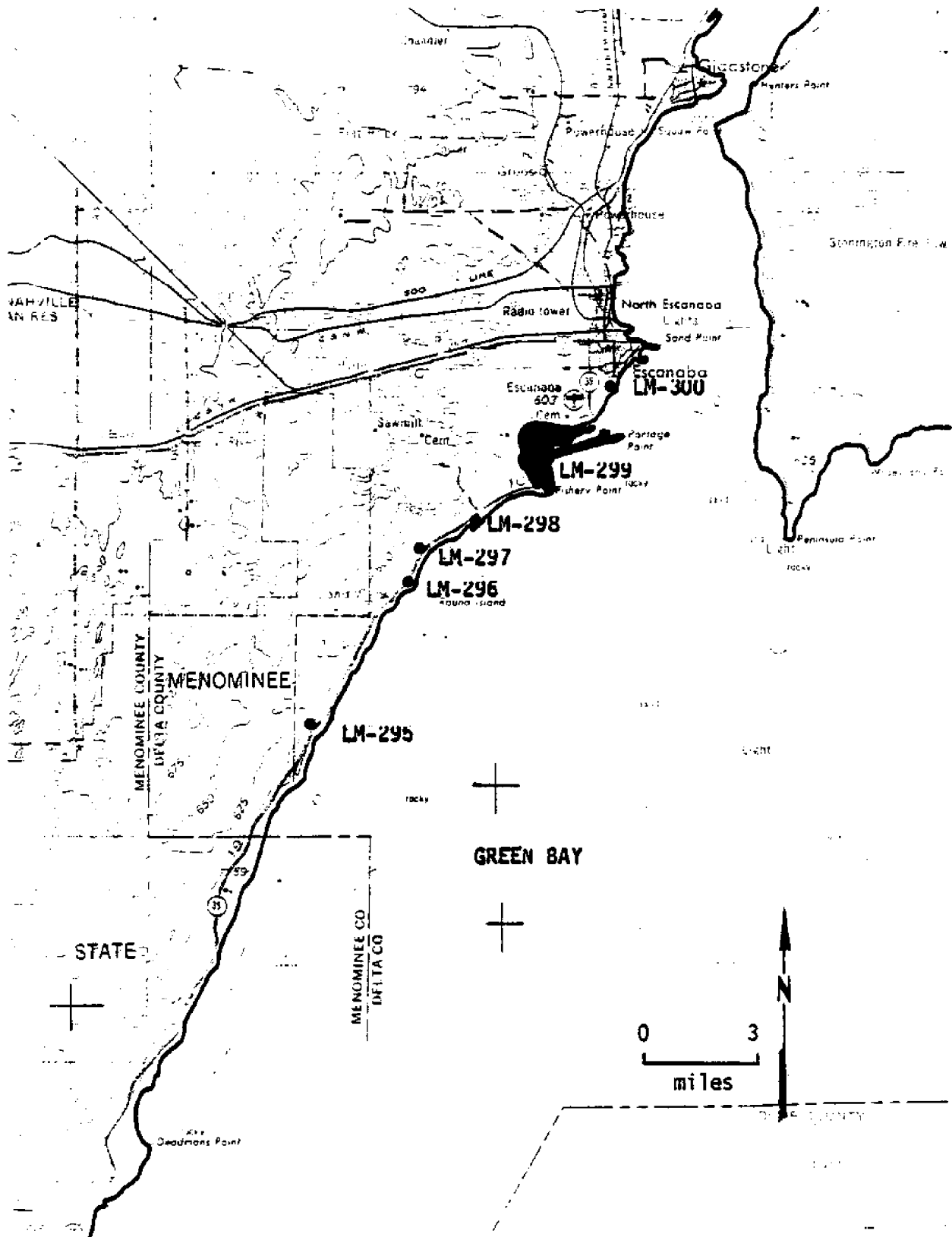


Figure 12-2. Lake Section 12 - North Menominee State Forest Area

Table 12-1. Location, Acreage, and Classification of Wetlands
in Lake Section 12

Wetland Number	Wetland	Latitude	Longitude	Acreage	Classification ^a
286	Menominee River Wetland	45°06'20"	87°36'32"	4	R
287	Ingallston Township Wetland	45°14'20"	87°30'55"	39	P
288	Arthur Bay Wetland	45°19'30"	87°25'30"	4	L
	CEDAR RIVER AREA WETLAND COMPLEX				
289	Cedarville Township Wetland #1	45°23'00"	87°22'30"	39	P
290	Cedar River Wetland	45°24'00"	87°20'00"	1283	L,P,R
291	Deer Creek Wetland	45°28'00"	87°20'00"	205	L,P,R
292	Fox Park Wetland	45°28'00"	87°18'30"	19	L
293	Cedarville Township Wetland #2	45°29'50"	87°17'30"	10	L
294	Bark River Wetland	45°34'10"	87°14'50"	39	P
295	Henderson Lakes Wetland	45°36'30"	87°13'30"	253	P
296	North Lake Area Wetland	45°39'00"	87°13'30"	39	L
	FORD RIVER AREA WETLAND COMPLEX				
297	Ford River Township Wetland	45°40'20"	87°09'40"	292	L
298	Ford River Delta Wetland	45°40'30"	87°08'30"	97	R
299	Portage Marsh	45°42'30"	87°06'20"	1302	L
300	Escanaba City Wetland	45°43'50"	87°03'50"	49	L

^aP=palustrine
L=lacustrine
R=riverine

MENOMINEE RIVER WETLAND

PHYSIOGRAPHIC SETTING

LM 286

Setting

Menominee River Wetland is located near the north bank of the Menominee River, about one mile upstream from the river mouth and approximately 0.4 mile from the Green Bay shoreline. The wetland is located within the city of Menominee, Michigan, in Menominee County. Although this wetland lies more than 1,000 feet from the Green Bay shoreline, it is included in this study because it lies on the cusped delta of the Menominee River, which is a lake-level water body. The area surrounding the wetland is industrialized, and the local terrain has been substantially altered by dredge and fill activity. This Riverine wetland occupies a low, non-wooded site (U.S.G.S. quadrangle map, Marinette East, Wisconsin-Michigan, 1976).

Topography

The total relief of Menominee River Wetland is five feet. Wetland elevations range from 580 to 585 feet above sea level, zero to five feet above the approximate mean elevation of Lake Michigan. Menominee River Wetland lies on a lacustrine plain within the Green Bay-Lake Winnebago-Rock River Lowland. The shoreline along this portion of Green Bay is flat, low, sandy, and poorly drained. Fluctuations in the level of Green Bay-Lake Michigan considerably alter the size of wetlands in this area. The Great Lakes Basin Commission (1975) describes this portion of the Green Bay shoreline as an erodible low plain. Topography at higher elevations in this region is generally rolling.

Surficial Geology

The surficial geology of Menominee River Wetland is characterized by lake beds and sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion, mainly sand (Sommers, 1977).

Soils

The soil type in Menominee River Wetland is Granby sand, which has a surface layer (4 to 10 inches) consisting of organic material, peat, or muck underlain by a layer of gray or brownish-gray sand, with a substratum of water-logged gray sand mottled with yellow and brown. Granby sand is a poorly drained soil found in flat areas, notably along the Green Bay shore (Moon et al., 1925).

Hydrology

Menominee River Wetland is located approximately 270 feet from the Menominee River (U.S.G.S. quadrangle map, Marinette East, Wisconsin-Michigan, 1976). The water quality of the Menominee River is considered to be good, except near municipalities and industries (Great Lakes Basin Commission, 1975).

The literature search provided no site-specific data pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Menominee River Wetland.

Climate

The closest weather station providing climatic data for Menominee River Wetland is located in Marinette, Wisconsin. In 1975, the average monthly temperature was 46.0°F, the average daily low for January was 13.3°F and the average daily high in July was 86.4°F. The average annual precipitation is 30.68 inches, with a mean monthly precipitation of 1.32 inches in January and 3.43 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a quarter months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on October 29 (National Oceanic and Atmospheric Administration, 1975).

Special Features

There are several islands within the river near the wetland (U.S.G.S. quadrangle map, Marinette East, Wisconsin-Michigan, 1976).

BIOTIC SETTING

LM 286

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Menominee River Wetland.

Fish

Fish species abundant in the lower Menominee River include northern pike (Esox lucius), lake sturgeon (Acipenser fulvescens), alewife (Alosa pseudoharengus), rainbow trout (Salmo gairdneri), brown trout (Salmo trutta), brook trout (Salvelinus fontinalis), coho salmon (Oncorhynchus kisutch), chinook salmon (Oncorhynchus tshawytscha), rainbow smelt (Osmerus mordax), carp (Cyprinus carpio), white sucker (Catostomus commersoni), redhorses (Moxostoma spp.), white bass (Morone chrysops), walleye (Stizostedion vitreum), and smallmouth bass (Micropterus dolomieu) (U.S. Army Corps of Engineers, 1975). Some of these species may be found in Menominee River Wetland, but it is doubtful that this small wetland supports a diverse fauna. A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Menominee River Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Menominee River Wetland.

Reptiles and Amphibians

According to Wendel J. Johnson (University of Wisconsin Center-Marinette, personal communication), the mudpuppy (Necturus maculosus) is common in the Menominee River. Appendix C-12 contains general information on reptiles and amphibians of Lake Section 12, but care should be exercised in the interpretation of the relevance of these studies to Menominee River Wetland.

The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food source, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Appendix D-29 contains information on wetland birds of Lake Section 12, but care should be exercised in the interpretation of the relevance of these studies to Menominee River Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Menominee River Wetland.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Menominee River Wetland by the literature search. The bald eagle (Haliaeetus leucocephalus) nests and roosts in the Menominee River Valley (U.S. Army Corps of Engineers, 1975). However, this species probably does not utilize Menominee River Wetland since the wetland is situated in an urbanized area.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland. However, several NPDES permit holders discharge into the Menominee River and this may have some effect on the health of the wetland.

Population

Menominee River Wetland is located in the city of Menominee in Menominee County, Michigan. The county is sparsely populated, having a density of 24 persons per square mile. Table 12-2 indicates that Menominee County experienced a moderate rate of population growth between 1970 and 1975. The city of Menominee experienced a moderate rate of population decline during the same time period. Projections for 1990 indicate Menominee County is expected to undergo a rapid rate of population growth in the future.

Table 12-2. Population Data for the Vicinity of Menominee River Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Menominee County	25,563	4.0	29,498
City of Menominee	10,374	-3.5	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Menominee River Wetland is urban open space. The area surrounding the wetland is characterized by industrial use bordering the Menominee River to the east, west, and south of the wetland. A mixture of industrial, commercial, and residential uses exists to the north. The central business district of the city of Menominee lies only a few blocks north of the wetland. Rail lines abut the wetland along its northern border, and a sewage disposal plant is located to the west. The river channel is dredged near the river mouth, and navigation aids and lights lie close by (U.S.G.S. quadrangle map, Marinette East, Wisconsin-Michigan, 1976; Wisconsin Coastal Zone Management Development Program aerial photograph, 1975; Central Upper Peninsula Planning and Development Regional Commission, 1978).

Since Menominee River Wetland lies within the corporate limits of the city of Menominee (Rockford Map Publishers, Inc., 1974), detailed ownership records of the area are not available, but the wetland is assumed to be under private ownership. The proximity of the wetland to the center of Menominee and the status of the wetland as one of the few remaining open areas in an area of intensive industrial uses suggest that the wetland is subject to high development pressure.

Recreation

There are no known state or federal recreational facilities in the vicinity of Menominee River Wetland.

Mineral, Energy, and Forest Resources

Menominee River Wetland is situated within an area underlain by limestones and dolomites, but there are no quarrying operations in the vicinity of the wetland (Gere, 1977). There are no known oil, gas, or coal resources in the wetland (Michigan Geological Survey, 1977; Smith, 1915), nor are there any significant forest resources (U.S.G.S. quadrangle map, Marinette East, Wisconsin-Michigan, 1976).

Public Utilities and Facilities

A sewage disposal plant is situated to the west of Menominee River Wetland (U.S.G.S. quadrangle map, Marinette East, Wisconsin-Michigan, 1976).

Pollution Sources

There are no NPDES permit holders adjacent to Menominee River Wetland. However, there are several permit holders discharging into the Menominee River in the vicinity of the wetland. The city of Marinette operates a sewage treatment plant to the west of the wetland which discharges into the Menominee River. The Marinette Waterworks discharges process water to the river, as does the Menominee Waste Water Treatment Plant (Wisconsin Industrial Discharge Section; 1978; Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Menominee River Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 286

The literature search identified no on-going or impending research projects pertaining to Menominee River Wetland.

INGALLSTON TOWNSHIP WETLAND

PHYSIOGRAPHIC SETTING

LM 287

Setting

Ingallston Township Wetland is located 0.2 mile from the western shoreline of Green Bay in Menominee County, Michigan, nine miles north of the city of Menominee. Beattie Point lies roughly one mile to the south of the wetland. Ingallston Township Wetland may have been contiguous with Green Bay at one time, but it is now separated from the lake by a primary highway and lakeshore residential development. This Palustrine wetland occupies a low, wooded site (U.S.G.S. quadrangle map, Birch Creek, Michigan, 1976).

Topography

The total relief of Ingallston Township Wetland is 15 feet. Wetland elevations range from 595 to 610 feet above sea level, 15 to 30 feet above the approximate mean elevation of Lake Michigan. Ingallston Township Wetland lies on a lacustrine plain within the Green Bay-Lake Winnebago-Rock River Lowland. This plain slopes gently to the east. Much of the area is poorly drained and covered by large inland wetlands. The Great Lakes Basin Commission (1975) describes the shoreline near the wetland as an erodible low plain. Topography at high elevations in this region is generally rolling.

Surficial Geology

The surficial geology of Ingallston Township Wetland is characterized by sand and lake beds. These glaciolacustrine sediments consist of fine-grained products of glacial erosion, mainly sand and gravel (Sommers, 1977).

Soils

There are two types of soil in Ingallston Township Wetland, Rifle peat and Bergland loam. Rifle peat is an organic soil comprised of decayed forest material, which has a surface layer of recently deposited forest litter underlain by layers of moderately decayed peat and fibrous sedge peat. Bergland loam is an organic soil consisting of muck or peat underlain with sandy loam or light sandy clay. Bergland loam is a poorly drained soil found on lake plains and interdunal spaces (Moon et al., 1925). Most of Ingallston Township Wetland consists of Bergland loam soil. Rifle peat is found along the northern edge of the wetland.

Hydrology

An unnamed intermittent stream flows through Ingallston Township Wetland. This stream has an elevational change of approximately 12 feet as it travels through the wetland (U.S.G.S. quadrangle map, Birch Creek, Michigan, 1976).

The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Ingallston Township Wetland.

Climate

The closest weather station providing climatic data for Ingallston Township Wetland is located in Marinette, Wisconsin. In 1975, the average monthly temperature was 46.0°F, the average daily low for January was 13.3°F and the average daily high in July was 86.4°F. The average annual precipitation is 30.68 inches, with a mean monthly precipitation of 1.32 inches in January and 3.43 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a quarter months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on October 29 (National Oceanic and Atmospheric Administration, 1975).

Special Features

A small tombolo lies to the southeast of Ingallston Township Wetland (U.S.G.S. quadrangle map, Birch Creek, Michigan, 1976).

BIOTIC SETTING

LM 287

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Ingallston Township Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Ingallston Township Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Ingallston Township Wetland.

Reptiles and Amphibians

Appendix C-12 contains general information on reptiles and amphibians of Lake Section 12, but care should be exercised in the interpretation of the relevance of these studies to Ingallston Township Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Appendix D-29 contains information on wetland birds of Lake Section 12, but care should be exercised in the interpretation of the relevance of these studies to Ingallston Township Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Ingallston Township Wetland.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Ingallston Township Wetland by the literature search. The bald eagle (Haliaeetus leucocephalus) is an uncommon summer resident of the northern Green Bay area. In 1977, eagles built a nest near the Green Bay shoreline of Michigan's Upper Peninsula (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication). Site-specific information can be obtained from the Michigan Department of Natural Resources, Endangered and Threatened Species Program.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland.

CULTURAL SETTING

LM 287

Population

Ingallston Township Wetland is located in Ingallston Township of Menominee County, Michigan. The county is sparsely populated, having a density of 24 persons per square mile. Table 12-3 indicates that Menominee County experienced a moderate rate of population growth between 1970 and 1975. Ingallston Township experienced a rapid rate of population growth during the same time period. Projections for 1990 indicate Menominee County is expected to undergo rapid population growth in the future.

Table 12-3. Population Data for the Vicinity of Ingallston Township Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Menominee County	25,563	4.0	29,498
Ingallston Township	925	5.5	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Ingallston Township Wetland and most of the surrounding area is rural open space. Mobile home parks and other forms of residential development lie between the wetland and the Lake Michigan shoreline. An access road lies roughly 2,000 feet south of the wetland (U.S.G.S. quadrangle map, Birch Creek, Michigan, 1976; Central Upper Peninsula Planning and Development Regional Commission, 1978). The wetland is under private ownership (Rockford Map Publishers, Inc., 1974).

The location of Ingallston Township Wetland inland from the lakeshore suggests that developmental pressures on the wetland are low. Developmental pressures are more likely to occur in the area directly along the lakeshore where residential development currently exists.

Recreation

There are no known state or federal recreational facilities in the vicinity of Ingallston Township Wetland.

Mineral, Energy, and Forest Resources

Ingallston Township Wetland is situated within an area underlain by limestone and dolomites, but there are no quarrying operations in the vicinity of the wetland (Gere, 1977). There are no known oil, gas, or coal resources in the wetland (Michigan Geological Survey 1977; Smith, 1915).

Ingallston Township Wetland is wooded, but it was not determined through the literature search whether the area is used for wood production.

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Ingallston Township Wetland (U.S.G.S. quadrangle map, Birch Creek, Michigan, 1976).

Pollution Sources

There are no NPDES permit holders adjacent to Ingallston Township Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Ingallston Township Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 287

The literature search identified no on-going or impending research projects pertaining to Ingallston Township Wetland.

ARTHUR BAY WETLAND

PHYSIOGRAPHIC SETTING

LM 288

Setting

Arthur Bay Wetland is located 0.1 mile from the western shore of Green Bay in Menominee County, Michigan, seven miles southwest of the community of Cedar River. The wetland is within the Menominee State Forest (U.S.G.S. quadrangle map, Cedar River, Michigan-Wisconsin, 1963).

Arthur Bay is formed by Sawyer Point to the north and Rochereau Point to the south; Fowler Creek flows into the bay approximately 0.5 mile south of the wetland. Arthur Bay Wetland is a Lacustrine System and occupies a low, wooded site (U.S.G.S. quadrangle map, Cedar River, Michigan-Wisconsin, 1963).

Topography

The total relief of Arthur Bay Wetland is approximately five feet. Elevations within the wetland range from 583 to 588 feet above sea level, 3 to 8 feet above the approximate mean elevation of Lake Michigan. The shoreline of Arthur Bay is paralleled by a series of coastal beach ridges, and Arthur Bay Wetland occupies a swale which lies within these ridges. The wetland lies on a lacustrine plain within the Green Bay-Lake Winnebago-Rock River Lowland. This plain slopes gently to the east. Much of the area is poorly drained and is covered by large inland wetlands. Drumlins are also common in the area. The Great Lakes Basin Commission (1975) describes the shoreline near the wetland as an erodible low plain. Topography at higher elevations in this region is generally rolling.

Surficial Geology

The surficial geology of Arthur Bay Wetland is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in Arthur Bay Wetland is Granby sand, which has a surface layer (4 to 10 inches) of organic material, peat or muck. This organic layer is underlain by a layer of gray or brownish-gray sand, with a substratum of water-logged gray sand mottled with yellow and brown. Granby sand is a poorly drained soil found in flat areas, notably along the Green Bay shore (Moon et al., 1925).

Hydrology

Kleinke Creek drains Arthur Bay Wetland. The creek once drained more surface area from its origin north of Arthur Bay Wetland, but it now begins in the southern part of the wetland and flows into Green Bay (Moon et al., 1925; U.S.G.S. quadrangle map, Cedar River, Michigan-Wisconsin, 1963).

The literature search provided no site-specific data pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Arthur Bay Wetland.

Climate

The closest weather station providing climatic data for Arthur Bay Wetland is located in Stephenson, Michigan. In 1975, the average monthly temperature was 43.7°F, the average daily low for January was 8.0°F and the average daily high in July was 83.3°F. The average annual precipitation is 32.09 inches, with a mean monthly precipitation of 1.62 inches in January and 3.53 inches in July based on the normal period from 1941-1970. The growing season is approximately four and a half months long, with the last killing frost (28°F) in 1975 occurring on April 26 and the first killing frost on September 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Arthur Bay Wetland (U.S.G.S. quadrangle map, Cedar River, Michigan-Wisconsin, 1963; Michigan Shorelands Management Unit aerial photograph, 1974).

BIOTIC SETTING

LM 288

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Arthur Bay Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Arthur Bay Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Arthur Bay Wetland.

Reptiles and Amphibians

Appendix C-12 contains general information on reptiles and amphibians of Lake Section 12, but care should be exercised in the interpretation of the relevance of these studies to Arthur Bay Wetland. The literature search yielded

no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food source, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Appendix D-29 contains general information on wetland birds of Lake Section 12, but care should be exercised in the interpretation of the relevance of these studies to Arthur Bay Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Arthur Bay Wetland.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Arthur Bay Wetland by the literature search. The bald eagle (Haliaeetus leucocephalus) is an uncommon summer resident of the northern Green Bay area. In 1977, eagles built a nest near the Green Bay shoreline of Menominee County (Postupalsky, 1977). This is the only nesting site on the Lake Michigan shoreline of Michigan's Upper Peninsula (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication). Site-specific information can be obtained from the Michigan Department of Natural Resources, Endangered and Threatened Species Program.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland.

CULTURAL SETTING

LM 288

Population

Arthur Bay Wetland is located in Ingallston Township of Menominee County, Michigan. The county is sparsely populated, having a density of 24 persons per square mile. Table 12-4 indicates that Menominee County experienced a moderate

rate of population growth between 1970 and 1975. Ingallston Township experienced a rapid rate of population growth during the same time period. Projections for 1990 indicate Menominee County is expected to undergo rapid population growth in the future.

Table 12-4. Population Data for the Vicinity of Arthur Bay Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Menominee County	25,563	4.0	29,498
Ingallston Township	925	5.5	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Arthur Bay Wetland and the surrounding area is rural open space. A primary highway, built on a levee, lies approximately 200 feet inland from Arthur Bay Wetland, and an access road lies to the south (U.S.G.S. quadrangle map, Cedar River, Michigan-Wisconsin, 1963; Michigan Shorelands Management Unit aerial photograph, 1974; Central Upper Peninsula Planning and Development Regional Commission, 1978). The wetland is under private ownership (Rockford Map Publishers, Inc., 1974). The proximity of the wetland both to the shoreline and to transportation facilities suggests that it may be subject to moderate developmental pressure.

Recreation

Arthur Bay Wetland lies within the Menominee State Forest. Although there are no known areas specifically designated for recreation near the wetland, all Michigan state forest lands are open to camping unless otherwise posted. Hunting and fishing are also major uses of state forest lands (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Mineral, Energy, and Forest Resources

Arthur Bay Wetland is situated within an area underlain by limestones and dolomites, but there are no quarrying operations in the vicinity of the wetland (Gere, 1977). No oil, gas, or coal resources are present in the wetland (Michigan Geological Survey, 1977; Smith, 1915).

Arthur Bay Wetland is wooded and is situated within the Menominee State Forest. State forest lands in the coastal area are designated as a "water influence zone," in which water quality, water use, and aesthetic surroundings are the principal management concerns. Cover treatments are designed to

maintain or enhance the status of these management concerns, and timber harvesting within this area is conducted accordingly (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Arthur Bay Wetland (U.S.G.S. quadrangle map, Cedar River, Michigan-Wisconsin, 1963).

Pollution Sources

There are no NPDES permit holders adjacent to Arthur Bay Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Arthur Bay Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 288

The literature search identified no on-going or impending research projects pertaining to Arthur Bay Wetland.

CEDAR RIVER AREA WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LM 289-293

Setting

The Cedar River Area Wetland Complex is comprised of Cedarville Township Wetlands #1 and #2, Cedar River Wetland, Deer Creek Wetland, and Fox Park Wetland. These wetlands are included in a single complex because they are situated in close proximity to one another in a low area surrounding the mouths of Cedar River and Deer Creek. The wetland complex is located on the west side of Green Bay in Menominee County, Michigan, within the Menominee State Forest; Cedarville Township Wetland #1 and Cedar River Wetland are also in the J. W. Wells State Park. The distances of these wetlands relative to the Green Bay shoreline and the community of Cedar River, Michigan, are indicated in Table 12-5.

Table 12-5. Location of Cedar River Area Wetland Complex

	Distance to shoreline	Distance from Cedar River, Michigan
Cedarville Township Wetland #1	0.2 mile	2.1 miles southwest
Cedar River Wetland	adjacent	adjacent
Deer Creek Wetland	adjacent	1.75 miles north
Fox Park Wetland	adjacent	4.5 miles northeast
Cedarville Township Wetland #2	250 feet	6.5 miles northeast

Cedarville Township Wetland #1 is a Palustrine System located to the south of the mouth of the Cedar River. It is separated from the Green Bay shoreline by a primary highway. Cedar River Wetland is a Riverine, Palustrine, and Lacustrine wetland which extends northward from Cedar River to a headland named Deadmans Point. The Michigan Wildlife Division (Martz, 1976) classifies this wetland as Type 4 (inland deep fresh marshes) and Type 6 (shrub swamps) wetland under the Circular 39 classification system (U.S. Fish and Wildlife Service, 1956).

Deer Creek Wetland is a Riverine, Palustrine, and Lacustrine System which lies to the northwest of Deadmans Point and extends approximately four miles northward to Deer Creek. Fox Point Wetland and Cedarville Township Wetland #2, located on either side of the mouth of Deer Creek, are both small Lacustrine wetlands. All of the wetlands in this complex occupy low, wooded or partially

wooded sites (U.S.G.S. quadrangle map, Cedar River, Michigan-Wisconsin, 1963; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

Topography

Elevations within the Cedar River Area Wetland Complex range from 580 to 610 feet above sea level, lake level to 30 feet above the approximate mean elevation of Lake Michigan. Table 12-6 presents the elevations and total relief of the individual wetlands comprising the complex.

Table 12-6. Elevations and Total Relief of Individual Wetlands in Cedar River Area Wetland Complex

	Minimum elevation (feet) ^a	Maximum elevation (feet) ^a	Total relief (feet)
Cedarville Township Wetland #1	580	585	5
Cedarville Township Wetland #2	580	585	5
Fox Park Wetland	580	585	5
Deer Creek Wetland	580	610	30
Cedar River Wetland	580	600	20

^a Elevations measured in feet above sea level; approximate mean elevation of Lake Michigan is 580 feet above sea level.

The wetlands lie on a lacustrine plain within the Green Bay-Lake Winnebago-Rock River Lowland. The plain slopes gently to the east. Much of the area is poorly drained and covered by large inland wetlands. Drumlins are also common in the area. The Great Lakes Basin Commission (1975) describes the shoreline in the vicinity of the wetlands as an erodible low plain. Topography at higher elevations in this region is generally rolling.

Surficial Geology

The surficial geology of the five wetlands in the Cedar River Area Wetland Complex is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

There are six soil types present in the Cedar River Area Wetland Complex. Table 12-7 lists the soil types for the individual wetlands.

Table 12-7. Soil Types for the Wetlands in Cedar River Area
Wetland Complex^a

Wetland	Soil
Cedarville Township Wetland #1	Eastport sand
Cedar River Wetland	Rifle peat, Granby sand, Greenwood peat
Deer Creek Wetland	Rifle peat, Granby sand, Bergland clay loam
Fox Park Wetland	Coastal beach and Made land
Cedarville Township Wetland #2	Granby sand

^a Moon et al. (1925)

Eastport sand has been altered by shifting wind, which has prevented the formation of a distinct soil profile. This soil is alkaline, and the surface layer consists of dark-gray sand which includes organic matter underlain by loose, light-brown sand or fine sand. Eastport sand is well drained and is found in small areas scattered along Green Bay. The surface layer of Granby sand (4 to 10 inches) consists of organic material, peat or muck, underlain by a layer of gray or brownish-gray sand with a substratum of water-logged gray sand mottled with yellow and brown. Granby sand is a poorly drained soil found in flat areas, notably along the Green Bay shore (Moon et al., 1925).

Rifle peat is an organic soil comprised of decayed forest material, having a surface layer of recently deposited forest litter underlain by layers of moderately decayed peat and fibrous sedge peat. Coastal beach is a narrow strip of wave-washed land which is mostly sand or cobbles. Made land includes areas filled or altered by man. Greenwood peat is an organic soil ranging from 3 to 16 feet in depth. The top layer consists of live and dead sphagnum underlain with fibrous peat and other fibrous materials. Greenwood peat is poorly drained and is principally derived from heath, mosses, and sedge, with very little woody material. Bergland clay loam consists of an organic layer of muck for the first 5 to 8 inches, underlain with gray silty clay and dull gray plastic clay mottled with yellow and red. Both the surface drainage and internal drainage of this soil is very poor. Bergland clay loam is calcareous and developed from lacustrine clays (Moon et al., 1925).

Hydrology

There are no streams flowing through Cedarville Township Wetlands #1 and #2 or Fox Park Wetland. The Walton River borders the southern part of Cedar River Wetland and joins the Cedar River near the center of the wetland. The mouth of the Cedar River divides Cedar River Wetland. There is little elevational change in the Cedar River as it flows through the wetland (U.S.G.S. quadrangle map, Cedar River, Michigan-Wisconsin, 1963).

Deer Creek flows through the northern portion of Deer Creek Wetland. There is an elevational change of approximately eight feet in Deer Creek as it travels through the wetland. An unnamed tributary of Deer Creek flows through part of Deer Creek Wetland; this unnamed stream has an elevational change of four feet as it travels through the wetland (U.S.G.S. quadrangle maps, Cedar River, Michigan-Wisconsin, 1963; Bark River, Michigan, 1963).

The literature search provided no site-specific data pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in the wetlands of the Cedar River Area Wetland Complex.

Climate

The closest weather station providing climatic data for the Cedar River Area Wetland Complex is located in Stephenson, Michigan. In 1975, the average monthly temperature was 43.7°F, the average daily low for January was 8.0°F and the average daily high in July was 83.3°F. The average annual precipitation is 32.09 inches, with a mean monthly precipitation of 1.62 inches in January and 3.53 inches in July based on the normal period from 1941-1970. The growing season is approximately four and a half months long, with the last killing frost (28°F) in 1975 occurring on April 26 and the first killing frost on September 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of the Cedar River Area Wetland Complex (U.S.G.S. quadrangle map, Cedar River, Michigan-Wisconsin, 1963; Michigan Shorelands Management Unit aerial photograph, 1974).

BIOTIC SETTING

LM 289-293

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of the Cedar River Area Wetland Complex.

Fish

Species recorded in the Cedar River, Deer Creek, and the Walton River include northern pike (Esox lucius), white sucker (Catostomus commersoni), goldenshiner (Notemigonus crysoleucas), creek chub (Semotilus atromaculatus), hornyhead chub (Hybopsis biguttato), blacknose dace (Rhinichthys atratulus), rosyface shiner (Notropis rubellus), common shiner (Notropis cornutus), blackchin shiner (Notropis heterodon), spottail shiner (Notropis hudsonius), blacknose shiner (Notropis heterolepis), bluntnose minnow (Pimephales promelas), smallmouth bass (Micropterus dolomieu), black crappie (Pomoxis nigromaculatus), johnny darter (Etheostoma nigrum), and mottled sculpin (Cottus bairdi) (Taylor, 1954). All these species may occur in the five wetlands

comprising this complex, although Taylor's (1954) records were specific only to the three streams. A search of the literature provided no site-specific information pertaining to spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in the Cedar River Area Wetland Complex.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in the Cedar River Area Wetland Complex.

Reptiles and Amphibians

According to Wendel J. Johnson (University of Wisconsin Center-Marinette, personal communication), the red-backed salamander (Plethodon cinereus) is common at J. D. Wells State Park, which includes Cedar River Wetland and Cedarville Township Wetland #1. The species is non-aquatic but occurs under logs and stones and in the soil humus layer.

Appendix C-12 contains general information on reptiles and amphibians of Lake Section 12, but care should be exercised in the interpretation of the relevance of these studies to the Cedar River Area Wetland Complex. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in these wetlands.

Avifauna

The northwestern part of Cedar River Wetland and the western portion of Deer creek Wetland are included in the Mississippi Flyway Waterfowl Habitat Reconnaissance (Martz, 1976). This study is a cooperative effort between the Michigan Department of Natural Resources and the U.S. Fish and Wildlife Service, designed to identify high quality waterfowl habitat that is inadequately protected. Cedar River Wetland is an important staging area for diving ducks during spring and fall migration. The study estimates their use of Cedar River Wetland as follows: average duration is two weeks; average peak population is 500; and average fall population is 1,000. Cedar River Wetland and Deer Creek Wetland function as a waterfowl breeding area, particularly suited to the wood duck (Aix sponsa). Breeding estimates for the wood duck as well as other ducks are presented in Table 12-8.

Table 12-8. Estimated Waterfowl Breeding Activity at Cedar River Wetland^a

Species	Breeding pairs/sq. mi.	Young produced/wetland acre
wood duck	16	0.6
other ducks	7	0.3
total ducks	23	0.9

^a adapted from Martz (1976)

Scharf et al. (1977) visited the area north of the Cedar River in late June and observed one green heron (Butorides striatus) nest in some flooded willows and a black tern (Chilodnias nigra) nesting area (an estimated six pairs) in sedges. Numerous herring gulls (Larus argentatus) were present, but were not nesting in the vicinity.

Appendix D-29 contains general information on wetland birds of Lake Section 12, but care should be exercised in the interpretation of the relevance of these studies to the Cedar River Area Wetland Complex. The literature search provided no site-specific information pertaining to recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing these wetlands.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting the five wetlands comprising the Cedar River Area Wetland Complex.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in the Cedar River Area Wetland Complex by the literature search. The bald eagle (Haliaeetus leucocephalus) is an uncommon summer resident of the northern Green Bay area. In 1977, eagles built a nest near the Green Bay shoreline of Menominee County (Postupalsky, 1977). This is the only nesting site on the Lake Michigan shoreline of Michigan's Upper Peninsula (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication). Site-specific information can be obtained from the Michigan Department of Natural Resources, Endangered and Threatened Species Program.

Health

Site-specific information indicates that the environmental quality of the Cedar River Area Wetland Complex is adequate for the nesting and breeding of migratory waterfowl. An NPDES permit holder discharges waste-water into the groundwater of Cedar River Wetland and this may have some effect on its health.

CULTURAL SETTING

LM 289-293

Population

The Cedar River Area Wetland Complex is located in Cedarville Township of Menominee County, Michigan. The county is sparsely populated, having a density of 24 persons per square mile. Table 12-9 indicates that Menominee County experienced a moderate rate of population growth between 1970 and 1975. Cedarville Township experienced a rapid rate of population growth during the same time period. Projections for 1990 indicate Menominee County is expected to undergo rapid population growth in the future.

Table 12-9. Population Data for the Vicinity of the Cedar River Area Wetland Complex

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Menominee County	25,563	4.0	29,498
Cedarville Township	277	19.9	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

The town of Cedar River is situated within the central portion of Cedar River Wetland. The remaining portion of the wetland is largely rural open space. Land use both within and surrounding Cedarville Township Wetlands #1 and #2, Deer Creek Wetland, and Fox Park Wetland is primarily rural open space, with areas of residential development situated along the Green Bay shore. Cedarville Township Wetland #1 and the southern portion of Cedar River Wetland lie in J. W. Wells State Park. Fox Park Wetland lies in an area used by Menominee County as a lakeshore park. A Coast Guard light, pilings, and the ruins of an old lighthouse are located near the mouth of the Cedar River (Scharf et al., 1977). A primary highway crosses through or lies very close to all of the wetlands in this complex. A small dump is located within the northern portion of Cedar River Wetland and a campground lies to the east of the southern portion of this wetland (U.S.G.S. quadrangle map, Cedar River, Michigan-Wisconsin, 1963;

Michigan Shorelands Management Unit aerial photograph, 1974; Central Upper Peninsula Planning and Development Regional Commission, 1978).

Cedarville Township Wetland #1 is owned by the state, while Cedar River Wetland and Deer Creek Wetland are under mixed (state-private) ownership. Fox Park Wetland is owned by Menominee County and Cedarville Township Wetland #2 is privately owned (Rockford map Publishers, Inc., 1974).

The location of Cedarville Township Wetland #1 and the southern portion of Cedar River Wetland within J. W. Wells State Park suggests that these areas may be subject to low development pressures. The remaining portion of Cedar River Wetland is considered to be under moderate development pressures due to its proximity to the town of Cedar River. Residential development is also present along the shoreline near the wetland. Fox Park Wetland is under low development pressures since it is located within a county park. However, the presence of a primary highway and residential development along the shoreline suggest that Duck Creek Wetland and Cedarville Township Wetland #2 may be subject to moderate development pressures.

Recreation

Cedarville Township Wetland #1 and the southern portion of Cedar River Wetland lie within the 974-acre J. W. Wells State Park. Activities available within the park include camping, boating, hiking, and fishing. The camping area is considered to be one of the finest in the Michigan state park system. One of the two centers of activity within the park is located immediately east of Cedarville Township Wetland #1 (Central Upper Peninsula Planning and Development Regional Commission, 1978; Michigan Department of Natural Resources, undated).

Fox Park Wetland lies within Menominee County's Fox Park, which is primarily a camping facility (Menominee County Roads Department, personal communication).

Mineral, Energy, and Forest Resources

The five wetlands of the Cedar River Area Wetland Complex are situated within an area underlain by limestones and dolomites, but there are no quarrying operations in the vicinity of the wetlands (Gere, 1977). There is one active sand and gravel pit in the area, just west of the southern portion of Cedar River Wetland (Michigan Department of State Highways and Transportation aerial photograph, 1976). There are no oil, gas, or coal resources in the wetland (Michigan Geological Survey, 1977; Smith, 1915).

All of the wetlands in the Cedar River Area Wetland Complex are either partially or totally wooded and lie within the Menominee State Forest (U.S.G.S. quadrangle map, Cedar River, Michigan-Wisconsin, 1963; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978). It was

not determined through the literature search whether these areas are used for wood production.

Public Utilities and Facilities

There are no public utilities within 0.5 mile of the five wetlands of the Cedar River Area Wetland Complex (U.S.G.S. quadrangle map, Cedar River, Michigan-Wisconsin, 1963).

Pollution Sources

The Bauer Laundromat, an NPDES permit holder, discharges waste water into the groundwater of Cedar River Wetland. The discharge point is located within the wetland (T35N, R25W, NE $\frac{1}{4}$ of SW $\frac{1}{4}$). There are no NPDES permit holders adjacent to any of the other wetlands in the Cedar River Area Wetland Complex (Michigan Water Quality Division, 1978).

No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of the five wetlands of the Cedar River Area Wetland Complex, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 289-293

The literature search identified no on-going or impending research projects pertaining to the Cedar River Area Wetland Complex.

BARK RIVER WETLAND

PHYSIOGRAPHIC SETTING

LM 294

Setting

Bark River Wetland is located 0.2 mile from the western shore of Green Bay in Delta County, Michigan, west of the mouth of Bark River, and nine miles southwest of the community of Ford River, Michigan. Bark River Wetland is located within the Menominee State Forest. It has been separated from a larger wetland to the west by construction of a primary highway. Bark River Wetland is a Palustrine System occupying a low, wooded site (U.S.G.S. quadrangle maps, Bark River, Michigan, 1963; Escanaba, Michigan, 1958).

Topography

The total relief of Bark River Wetland is approximately 10 feet. Elevations within the wetland range from 590 to 600 feet above sea level, 10 to 20 feet above the approximate mean elevation of Lake Michigan. The wetland lies on a lacustrine plain within the Green Bay-Lake Winnebago-Rock River Lowland. This plain slopes gently to the east. Much of the area is poorly drained and is covered by large inland wetlands. Drumlins are also common in the area. The Great Lakes Basin Commission (1975) describes the shoreline near the wetland as a non-erodible low plain which is subject to lake flooding. Topography at higher elevations in the region is generally rolling.

Surficial Geology

The surficial geology of Bark River Wetland is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in Bark River Wetland is Eastport-Roscommon sands. Eastport sands are found on ridges and Roscommon sand in swales. The soil in the wetland is the Roscommon series. The surface layer consists of black muck underlain by sand. Roscommon soils formed from sandy material and are found on poorly drained lake plains. They have low available water capacity, rapid permeability, and low natural fertility (Berndt, 1967).

Hydrology

There are no streams flowing through Bark River Wetland (U.S.G.S. quadrangle maps, Bark River, Michigan, 1963; Escanaba, Michigan, 1958). The literature search provided no site-specific data pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Bark River Wetland.

Climate

The closest weather station providing climatic data for Bark River Wetland is located in Stephenson, Michigan. In 1975, the average monthly temperature was 43.7°F, the average daily low for January was 8.0°F and the average daily high in July was 83.3°F. The average annual precipitation is 32.09 inches, with a mean monthly precipitation of 1.62 inches in January and 3.53 inches in July based on the normal period from 1941-1970. The growing season is approximately four and a half months long, with the last killing frost (28°F) in 1975 occurring on April 26 and the first killing frost on September 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Bark River Wetland (U.S.G.S. quadrangle maps, Bark River, Michigan, 1963, and Escanaba, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974).

BIOTIC SETTING

LM 294

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Bark River Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Bark River Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Bark River Wetland.

Reptiles and Amphibians

Appendix C-12 contains general information on reptiles and amphibians of Lake Section 12, but care should be exercised in the interpretation of the relevance of these studies to Bark River Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Appendix D-29 contains general information on wetland birds of Lake Section 12, but care should be exercised in the interpretation of the relevance of these studies to Bark River Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Bark River Wetland.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Bark River Wetland by the literature search. The bald eagle (Haliaeetus leucocephalus) is an uncommon summer resident of the northern Green Bay area.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland.

CULTURAL SETTING

LM 294

Population

Bark River Wetland is located in Ford River Township of Delta county, Michigan. The county is sparsely populated, having a density of 31 persons per square mile. Table 12-10 indicates that both the county and the township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that rapid population growth is expected to continue in Delta County.

Table 12-10. Population Data for the Vicinity of Bark River Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Delta County	39,358	9.6	45,953
Ford River Township	2,389	35.6	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Bark River Wetland is rural open space. The surrounding area is primarily in rural open space uses, with residential areas immediately west of the wetland and to the east along the Lake Michigan shore. Areas of recreational development lie to the southeast and north of the wetland. A primary highway lies adjacent to the west side of the wetland, and an access road lies to the south and east. Hiking trails are also located close by (U.S.G.S. quadrangle maps, Bark River, Michigan, 1963, and Escanaba, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974; Central Upper Peninsula Planning and Development Regional Commission, 1978; Michigan Shorelands Management Unit aerial photograph, 1974). Most of the wetland lies within Fuller Park and is under local governmental ownership. The remaining portion is privately owned (Rockford Map Publishers, Inc., 1976).

Fuller Park has been nominated as a coastal management area of particular concern (Central Upper Peninsula Planning and Development Regional Commission, 1978). The status of Fuller Park as a recreational Area of Particular Concern suggests that the park may, in time, be developed for more intensive recreational use. As this represents the only significant threat to the greatest portion of the wetland, developmental pressure is assumed to be low. Pressures on the privately owned portion of the wetland appear to be low, owing to the proximity of Fuller Park and a primary highway.

Recreation

Bark River Wetland lies largely within the 93.7-acre Fuller Park, which is owned and operated by Delta County. Fuller Park is a roadside park with little recreational development and no overnight camping (Delta County Highway Department, personal communication).

Mineral, Energy, and Forest Resources

Bark River Wetland is within an area underlain by limestones and dolomites, but there are no quarrying operations in the vicinity (Gere, 1977). There are no oil, gas, or coal deposits in the wetland (Michigan Geological Survey, 1977; Smith, 1915).

Bark River Wetland is wooded (U.S.G.S. quadrangle map, Bark River, Michigan, 1963). It was not determined through the literature search whether the area is used for wood production.

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Bark River Wetland (U.S.G.S. quadrangle map, Bark River, Michigan, 1963).

Pollution Sources

There are no NPDES permit holders adjacent to Bark River Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Bark River Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 294

The literature search identified no on-going or impending research projects pertaining to Bark River Wetland.

HENDERSON LAKES WETLAND

PHYSIOGRAPHIC SETTING

LM 295

Setting

Henderson Lakes Wetland is located in Delta County, Michigan, 0.1 mile from the Green Bay shoreline and six miles southwest of the community of Ford River, Michigan. The wetland surrounds three small, open-water lakes located north of the mouth of the Bark River. Part of the southern extent of the wetland is periodically dry. Henderson Lakes Wetland is a Palustrine System occupying a partially wooded and slightly raised site within the Menominee State Forest (U.S.G.S. quadrangle map, Escanaba, Michigan, 1958; Michigan Department of Natural Resources, Shorelands Management Unit aerial photograph, 1974).

Topography

The total relief of Henderson Lakes Wetland is approximately 10 feet. Wetland elevations range from 585 to 595 feet above sea level, 5 to 15 feet above the approximate mean elevation of Lake Michigan. Henderson Lakes and a portion of the surrounding wetland are situated within a slight depression behind a very low coastal bluff. The wetland lies on a lacustrine plain within the Green Bay-Lake Winnebago-Rock River Lowland. This plain slopes gently to the east. Much of the area is poorly drained and is covered by large inland wetlands. Drumlins are also common in the area. The Great Lakes Basin Commission (1975) describes the shoreline near the wetland as an erodible low bluff. Topography at higher elevations in this region is generally rolling.

Surficial Geology

The surficial geology of Henderson Lakes wetland is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soils found in Henderson Lakes Wetland are mostly Carbondale, Lupton, and Rifle soils, and Cathro and Tacoosh mucks. Charlevoix sandy loam is found in the southern portion of the wetland, which may be dry during parts of the year. Carbondale, Lupton, and Rifle soils have a surface layer ranging from muck to peat. These soils formed from decomposed herbaceous and woody material, and are very poorly drained; they have high water storage capacities. Cathro and Tacoosh mucks consist of organic soils underlain by loam. These soils have low natural fertility and are wet, although permeability is rapid in the upper part of these soils. Carbondale, Lupton, and Rifle soils and Cathro and Tacoosh mucks are found in depressions on plains and may be as deep as 51 inches. Charlevoix sandy loam has a surface layer of dark brown sandy loam, underlain with grayish-brown sandy loam. This soil is somewhat poorly drained and is wet in the spring and after heavy rains, with ponding occurring for short periods.

Charlevoix soils have medium natural fertility and are found in depressions and drainage ways (Berndt, 1967).

Hydrology

There are no streams flowing through Henderson Lakes Wetland. However, the wetland surrounds three small lakes named Henderson Lakes (U.S.G.S. quadrangle map, Escanaba, Michigan, 1958). The literature search provided no site-specific data pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Henderson Lakes Wetland.

Climate

The closest weather station providing climatic data for Henderson Lakes Wetland is located in Escanaba, Michigan. In 1975, the average monthly temperature was 42.7^oF, the average daily low for January was 12.2^oF and the average daily high in July was 76.2^oF. The average annual precipitation is 28.01 inches, with a mean monthly precipitation of 1.27 inches in January and 3.42 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a half months long, with the last killing frost (28^oF) in 1975 occurring on April 21 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Henderson Lakes Wetland (U.S.G.S. quadrangle map, Escanaba, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974).

BIOTIC SETTING

LM 295

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Henderson Lakes Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Henderson Lakes Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Henderson Lakes Wetland.

Reptiles and Amphibians

Appendix C-12 contains general information on reptiles and amphibians of Lake Section 12, but care should be exercised in the interpretation of the relevance of these studies to Henderson Lakes Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

A portion of Henderson Lakes Wetland is included in the Mississippi Flyway Waterfowl Habitat Reconnaissance (Martz, 1976). This study is a cooperative effort between the Michigan Department of Natural Resources and the U.S. Fish and Wildlife Service, designed to identify high quality waterfowl habitat that is inadequately protected. Henderson Lakes Wetland functions as important habitat for waterfowl during migration.

Appendix D-29 contains general information on wetland birds of Lake Section 12, but care should be exercised in the interpretation of the relevance of these studies to Henderson Lakes Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Henderson Lakes Wetland.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Henderson Lakes Wetland by the literature search. The bald eagle (Haliaeetus leucocephalus) is an uncommon summer resident of the northern Green Bay area.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland.

Population

Henderson Lakes Wetland is located in Ford River Township of Delta County, Michigan. The county is sparsely populated, having a density of 31 persons per square mile. Table 12-11 indicates that both the county and the township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that rapid population growth is expected to continue in Delta County.

Table 12-11. Population Data for the Vicinity of Henderson Lakes Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Delta County	39,358	9.6	45,953
Ford River Township	2,389	35.6	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Henderson Lakes Wetland and most of the surrounding area is rural open space. Parcels of abandoned agricultural land lie to the south and the east of the wetland, while an active agricultural area lies to the north. There are limited number of residences south and northeast of the wetland. A primary highway lies adjacent to Henderson Lakes Wetland, separating the wetland from the lakeshore (U.S.G.S. quadrangle map, Escanaba, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974; Central Upper Peninsula Planning and Development Regional Commission, 1978; Michigan Shorelands Management Unit aerial photograph, 1974). The wetland is under private ownership (Rockford Map Publishers, Inc., 1976), but development pressures should be minimal because the Henderson Lakes have been nominated and approved as a coastal management area of particular concern (Central Upper Peninsula Planning and Development Regional Commission, 1978). Furthermore, the presence of abandoned agricultural land near the wetland implies that there is little threat to the wetland from agricultural development.

Recreation

Henderson Lakes Wetland is located within the Menominee State Forest. Although there are no areas specifically designated for recreational use near the wetland, all state forest lands are open to camping unless otherwise posted.

Hunting and fishing are also major recreational uses of state forest lands (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Mineral, Energy, and Forest Resources

Henderson Lakes Wetland lies within an area underlain by limestone and dolomites, but there are no quarrying operations in the vicinity (Gere, 1977). An active sand and gravel pit is located approximately 0.5 mile southwest of the southern edge of the wetland (Michigan Department of State Highways and Transportation aerial photograph, 1973). There are no oil, gas, or coal resources in the wetland (Michigan Geological Survey, 1977; Smith, 1915).

Henderson Lakes Wetland is partially wooded (U.S.G.S. quadrangle map, Escanaba, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974), but it was not determined through the literature search whether the area is used for wood production.

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Henderson Lakes Wetland (U.S.G.S. quadrangle map, Escanaba, Michigan, 1958).

Pollution Sources

There are no NPDES permit holders adjacent to Henderson Lakes Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Henderson Lakes Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 295

The literature search identified no on-going or impending research projects pertaining to Henderson Lakes Wetland.

NORTH LAKE AREA WETLAND

PHYSIOGRAPHIC SETTING

LM 296

Setting

North Lake Area Wetland is situated adjacent to the western shoreline of Green Bay in Delta County, Michigan. The community of Ford River, Michigan, is 2.5 miles northeast of the wetland, and North Lake lies 0.5 mile to the west. North Lake Area Wetland is a Lacustrine System occupying a low, partially wooded site within Menominee State Forest (U.S.G.S. quadrangle map, Escanaba, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974).

Topography

The total relief of North Lake Area Wetland is less than 10 feet. Wetland elevations range from 580 to 588 feet above sea level, lake level to 8 feet above the approximate mean elevation of Lake Michigan. The wetland lies on a Lacustrine plain within the Green Bay-Lake Winnebago-Rock River Lowland. This plain slopes gently to the east. Much of the area is poorly drained and is covered by large inland wetlands. Drumlins are also common in the area. The Great Lakes Basin Commission (1975) describes the shoreline near North Lake Area Wetland as an erodible low plain which is subject to lake flooding. Topography at higher elevations in this region is generally rolling.

Surficial Geology

The surficial geology for North Lake Area Wetland is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in North Lake Area Wetland is Tawas muck, which has a shallow (4 inches) surface layer of grayish-brown mucky peat underlain by black muck, dark gray muck, and sand. Tawas muck was formed from woody organic material. It has high available water capacity in the organic layers and low natural fertility. Tawas muck is found in level or depressional areas on lake plains (Berndt, 1967).

Hydrology

There are no streams flowing through North Lake Area Wetland (U.S.G.S. quadrangle map, Escanaba, Michigan, 1958). Groundwater levels are at or near the surface of the wetland most of the year (Berndt, 1967). The literature search provided no site-specific data pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in North Lake Area Wetland.

Climate

The closest weather station providing climatic data for North Lake Area Wetland is located in Escanaba, Michigan. In 1975, the average monthly temperature was 42.7°F, the average daily low for January was 12.2°F and the average daily high in July was 76.2°F. The average annual precipitation is 28.01 inches, with a mean monthly precipitation of 1.27 inches in January and 3.42 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a half months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

A partially submerged sandbar lies between Round Island and the wetland (U.S.G.S. quadrangle map, Escanaba, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974).

BIOTIC SETTING

LM 296

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of North Lake Area Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in North Lake Area Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in North Lake Area Wetland.

Reptiles and Amphibians

Appendix C-12 contains general information on reptiles and amphibians of Lake Section 12, but care should be exercised in the interpretation of the relevance of these studies to North Lake Area Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Appendix D-29 contains general information on wetland birds of Lake Section 12, but care should be exercised in the interpretation of the relevance of these studies to North Lake Area Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting North Lake Area Wetland.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in North Lake Area Wetland by the literature search. The bald eagle (Haliaeetus leucocephalus) is an uncommon summer resident of the northern Green Bay area.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland.

CULTURAL SETTING

LM 296

Population

North Lake Area Wetland is located in Ford River Township of Delta County, Michigan. The county is sparsely populated, having a density of 31 persons per square mile. Table 12-12 indicates that both the county and the township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that rapid population growth is expected to continue in Delta County.

Table 12-12. Population Data for the Vicinity of North Lake Area Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Delta County	39,358	9.6	45,953
Ford River Township	2,389	35.6	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within North Lake Area Wetland is primarily rural open space, although residences are located on the southeast periphery of the wetland. The surrounding area is in rural open space uses inland from the wetland, but residential development extends along the Green Bay shore. A primary highway lies landward of the wetland, and an access road crosses through the wetland (Central Upper Peninsula Planning and Development Regional Commission, 1978; Michigan Shorelands Management Unit aerial photograph, 1976).

Since there is almost continuous residential development along the shoreline in this area and a road provides easy access to the wetland, developmental pressure is assumed to be moderate to high.

Recreation

North Lake Area Wetland is located within the Menominee State Forest. Although there are no areas specifically designated for recreational use near the wetland, all state forest lands are open to camping unless otherwise posted. Hunting and fishing are also major uses of state forest lands (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Mineral, Energy, and Forest Resources

North Lake Wetland lies within an area underlain by limestone and dolomites, but there are no quarrying operations in the vicinity (Gere, 1977). There are no oil, gas, or coal resources in the wetland (Michigan Geological Survey, 1977; Smith, 1915).

North Lake Area Wetland is within Menominee State Forest. State forest lands in the coastal area are within a "water influence zone", in which water quality, water use, and aesthetic surroundings are the principal management concerns. Cover treatments are designed to maintain or enhance the status of these management concerns, and timber harvesting within this area is conducted accordingly (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of North Lake Area Wetland (U.S.G.S. quadrangle map, Escanaba, Michigan, 1958).

Pollution Sources

There are no NPDES permit holders adjacent to North Lake Area Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of North Lake Area Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 296

The literature search identified no on-going or impending research projects pertaining to North Lake Area Wetland.

FORD RIVER AREA WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LM 297-298

Setting

The Ford River Area Wetland Complex, comprised of Ford River Township Wetland and Ford River Delta Wetland, is adjacent to the western shoreline of Green Bay in Menominee County, Michigan. Ford River Township Wetland lies 0.3 mile southwest of the community of Ford River; Ford River Delta Wetland lies 0.1 mile south of Ford River (U.S.G.S. quadrangle map, Escanaba, Michigan, 1958).

Ford River Township Wetland and Ford River Delta Wetland are included in a single wetland complex because they are located close to one another and were probably connected before man-made alterations occurred. Part of Ford River Delta Wetland has been drained and filled for construction of a boat ramp and a parking lot. A boat canal has been dredged into the shoreline approximately 1,000 feet north of this wetland (U.S.G.S. quadrangle map, Escanaba, Michigan, 1950; Michigan Shorelands Management Unit aerial photograph, 1974).

A gently arcing bay is formed north of the wetland complex, between the mouth of Ford River and Fishery Point. The shoreline of this shallow bay is paralleled by coastal beach ridges. Ford River Township Wetland is a Lacustrine System occupying a low, wooded site. Ford River Delta Wetland is a Riverine System occupying a low, partially wooded site on the arcuate delta of the Ford River (U.S.G.S. quadrangle map, Escanaba, Michigan, 1958).

Topography

Ford River Township Wetland has a total relief of 10 feet, with elevations ranging from 580 to 590 feet above sea level (lake level to 10 feet above the approximate mean elevation of Lake Michigan). The total relief of Ford River Delta Wetland is slightly less, with elevations ranging from lake level to approximately 588 feet above sea level. The wetland complex lies on a Lacustrine plain within the Green Bay-Lake Winnebago-Rock River Lowland. This plain slopes gently to the east. Much of the area is poorly drained and covered by large inland wetlands. Drumlins are also common a few miles inland from the wetland complex. The Great Lakes Basin Commission (1975) describes the shoreline near these wetlands as an erodible low plain which is subject to lake flooding. Topography at higher elevations in this region is generally rolling.

Surficial Geology

The surficial geology of Ford River Township Wetland and Ford River Delta Wetland is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in Ford River Township Wetland is Tawas muck, which has a shallow (4 inches) surface layer of grayish-brown mucky peat underlain by black muck, dark gray muck, and sand. Tawas muck was formed from woody organic material. It has high available water capacity in the organic layers and low natural fertility. Tawas muck is found in level or depressional areas on lake plains (Berndt, 1967).

Ford River Delta Wetland has Marsh soils and Roscommon mucky sand. Marsh soils range from sand to clay loam. These soils are wet most of the year and are found on inland lake borders and areas bordering Lake Michigan. Roscommon mucky sand has a surface layer consisting of black muck underlain by sand. This soil has little available water capacity, rapid permeability, and low natural fertility. Roscommon soils formed from sandy material and are found on poorly drained lake plains. Roscommon mucky sand is found on the east bank of Ford River Delta Wetland where some non-soil areas, which may be dumps or landfills, are located. Marsh soil is present on the west bank of the wetland (Berndt, 1967).

Hydrology

There are no streams flowing through Ford River Township Wetland, but the Ford River flows through Ford River Delta Wetland. Hydrologic data sampled upstream from the wetland at Hyde are available in U. S. Geological Survey, (1977). The water quality of the Ford River is considered to be excellent, with natural conditions existing in all reaches of the river. There are no known sources of pollution in the Ford River Basin (Great Lakes Basin Commission, 1975).

The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Ford River Township Wetland and Ford River Delta Wetland.

Climate

The closest weather station providing climatic data for Ford River Township Wetland is located in Escanaba, Michigan. In 1975, the average monthly temperature was 42.7°F, the average daily low for January was 12.2°F and the average daily high in July was 76.2°F. The average annual precipitation is 28.01 inches, with a mean monthly precipitation of 1.27 inches in January and 3.42 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a half months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of the Ford River Area Wetland Complex (U.S.G.S. quadrangle map, Escanaba, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974).

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of the Ford River Area Wetland Complex.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in the Ford River Area Wetland Complex.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in the Ford River Area Wetland Complex.

Reptiles and Amphibians

Appendix C-12 contains general information on reptiles and amphibians of Lake Section 12, but care should be exercised in the interpretation of the relevance of these studies to Ford River Township and Ford River Delta Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in these wetlands.

Avifauna

The Ford River Area Wetland Complex has been designated by the Michigan Shorelands Management Unit, as a High Priority Environmental Area owing to heavy use by waterfowl. Table 12-13 indicates the seasonal use of the wetlands by dabbling ducks, American coots (Fulica americana), terns, shore birds, and wading birds. Waterfowl Spring Migration Surveys (1977) from the Michigan Department of Natural Resources indicate that geese and diving ducks (e.g., common goldeneye, Bucephala clangula and bufflehead, B. albeola) in the open water segment also use the wetlands.

Table 12-13. Seasonal Bird Use of the Ford River Area Wetland Complex^a

Species	Spring	Summer	Fall	Winter	Use
dabbling ducks	x	x	x		nesting; feeding; staging area; migration stopover
American coots	x	x			nesting
terns	x	x	x		nesting; feeding; staging area; migration stopover
shore birds	x	x	x		nesting; feeding; staging area; migration stopover
wading birds	x	x	x		nesting; feeding; resting

^a Michigan Department of Natural Resources, Shorelands Management Unit (1974)

Scharf et al. (1977) visited Ford River Delta Wetland in late June and mid-July. An estimated 12 to 15 pairs of black terns (Chlidonias nigra) were observed nesting in sedges at the southern edge of the delta; least bitterns (Ixobrychus exilis) and short-billed marsh wrens (Cistothorus platensis) were also observed.

Appendix D-29 contains general information on wetland birds of Lake Section 12, but care should be exercised in the interpretation of the relevance of these studies to Ford River Township Wetland and Ford River Delta Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing these wetlands.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting the two wetlands comprising the Ford River Area Wetland Complex.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan

Endangered and Threatened Species Program, 1976) were documented in the Ford River Area Wetland Complex by the literature search. The bald eagle (Haliaeetus leucocephalus) is an uncommon summer resident of the northern Green Bay area.

Health

Site-specific information indicates that the environmental quality of the Ford River Area Wetland Complex is good for utilization by waterfowl. The Michigan Department of Natural Resources has designated this complex as a High Priority Environmental Area.

CULTURAL SETTING

LM 297-298

Population

The Ford River Area Wetland Complex is located in Ford River Township of Delta County, Michigan. The county is sparsely populated, having a density of 31 persons per square mile. Table 12-14 indicates that both the county and the township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that rapid population growth is expected to continue in Delta County.

Table 12-14. Population Data for the Vicinity of the Ford River Area Wetland Complex

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Delta County	39,358	9.6	45,953
Ford River Township	2,389	35.6	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Ford River Township Wetland is rural open space. Land use within Ford River Delta Wetland is rural open space, mixed with residential and commercial development. An area used for radio communications is present in the southeastern portion of the wetland. The area surrounding Ford River Township Wetland is primarily rural open space, with some residential development along Lake Michigan northeast and southwest of the wetland. Ford River Delta Wetland is surrounded primarily by residential development, with a limited amount of commercial development and open space. A primary highway crosses through both of the wetlands in the Ford River Area Wetland Complex. Pilings and dredged

channels are located at the mouth of the Ford River. Part of Ford River Delta Wetland has been drained and filled for construction of a boat ramp and a parking lot (U.S.G.S. quadrangle map, Escanaba, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974; Central Upper Peninsula Planning and Development Regional Commission, 1978; Michigan Shorelands Management Unit aerial photograph, 1974). Ford River Township Wetland is under private ownership. The portion of Ford River Delta Wetland situated on the deltaic islands is under state ownership. The remainder of the wetland is privately owned, and much of this has been divided into small tracts (Rockford Map Publishers, Inc., 1976).

The mouth of the Ford River has been nominated as a coastal management Area of Particular Concern (Central Upper Peninsula Planning and Development Regional Commission, 1978). The shoreline location of Ford River Township Wetland, the presence of residential development, and relative proximity to the town of Ford River suggest that the wetland may experience moderate to high development pressures. Since Ford River Delta Wetland is largely under the ownership of the Michigan Department of Natural Resources, it should be subject to low developmental pressures.

Recreation

There are no known state or federal recreational facilities in the vicinity of the Ford River Area Wetland Complex.

Mineral, Energy, and Forest Resources

Ford River Township Wetland and Ford River Delta Wetland are situated within an area underlain by limestone and dolomites, but there are no quarrying operations in the vicinity (Gere, 1977). There are no known oil, gas, or coal resources in the wetlands (Michigan Geological Survey, 1977; Smith, 1915).

Ford River Township Wetland is wooded, and Ford River Delta Wetland is partially wooded (U.S.G.S. quadrangle map, Escanaba, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974). It was not determined through the literature search whether these areas are used for wood production.

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Ford River Township Wetland or Ford River Delta Wetland (U.S.G.S. quadrangle map, Escanaba, Michigan, 1958).

Pollution Sources

There are no NPDES permit holders adjacent to either Ford River Township Wetland or Ford River Delta Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Ford River Township Wetland and Ford River Delta Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 297-298

The literature search identified no on-going or impending research projects pertaining to the Ford River Area Wetland Complex.

PORTAGE MARSH

PHYSIOGRAPHIC SETTING

LM 299

Setting

Portage Marsh is located adjacent to the western shoreline of Green Bay, 1.4 miles south of the city of Escanaba, Michigan, in Delta County. The wetland extends northward from Fishery Point to the Escanaba Airport and includes Portage Point, a bay mouth bar, and the shoreline of Portage Bay. Portage Marsh is a Lacustrine System occupying a low, partially wooded site (U.S.G.S. quadrangle map, Escanaba, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974). The Michigan Wildlife Division (Martz, 1976) classified this area as Type 4 (inland deep fresh marshes) and Type 7 (wooded swamps) wetland under the Circular 39 classification system (Shaw and Fredine, 1956).

Topography

The total relief of Portage Marsh is 20 feet. Wetland elevations range from 580 to 600 feet above sea level (lake level to 20 feet above the approximate mean elevation of Lake Michigan). Portage Marsh lies on a Lacustrine plain within the Green Bay-Lake Winnebago-Rock River Lowland. This plain slopes gently to the east. Much of the area is poorly drained and is covered by large inland wetlands. Drumlins are also common a few miles inland from the wetland. The Great Lakes Basin Commission (1975) describes the shoreline near Portage Marsh as an erodible low plain. Topography at higher elevations in this region is generally rolling.

Surficial Geology

The surficial geology of Portage Marsh is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

There are four major soils found in Portage Marsh: Tawas muck, Roscommon mucky sand, Marsh, and Eastport sand. Roscommon mucky sand and Tawas muck are found inland in Portage Marsh, while Marsh soil is found on the shore side of Route 35. Eastport sand is present in a thin strip along the shore of Portage Bay (Berndt, 1967).

Marsh soil ranges from sand to clay loam; it is wet most of the year and is generally found on inland lake borders and areas bordering Lake Michigan. Eastport sand has been altered by shifting wind, which has prevented the formation of a distinct soil profile. This soil is alkaline and the surface layer consists of dark-gray sand which includes organic matter. The dark-gray sand is underlain by loose light-brown sand or fine sand. Eastport sand is well drained (Berndt, 1967).

Tawas muck has a shallow (4 inch) surface layer of grayish-brown mucky peat underlain by black muck, dark gray muck, and sand. This soil is formed from woody organic material. Tawas muck has high available water capacity in the organic layers and low natural fertility. It is generally found in level or depressional areas on lake plains. Roscommon mucky sand has a surface layer consisting of black muck underlain by sand. This soil has little available water capacity, rapid permeability, and low natural fertility. Roscommon soils are formed from sandy material and are found on poorly drained lake plains (Berndt, 1967).

Hydrology

Portage Creek flows through Portage Marsh. The part of the creek that flows through Portage Marsh has been channelized, and there is an elevational change of 15 feet in the creek as it travels through the wetland. Portage Marsh appears to be influenced by water levels of Lake Michigan. During periods of low water, Portage Bay becomes landlocked and several areas of open water are all that remains of the bay. Additional wetland is exposed when this occurs. Portage Creek is intermittent during low water periods (U.S.G.S. quadrangle map, Escanaba, Michigan, 1958; Berndt, 1968).

Stream discharge measurements for Portage Creek were taken at a point near the northern edge of Portage Marsh. The rate of discharge on October 17, 1975, was 3.37 cubic feet per second and on May 13, 1976, was 21.1 cubic feet per second. The drainage area of Portage Creek is 20.3 square miles (U.S. Geological Survey, 1977).

The literature search provided no site-specific data pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Portage Marsh.

Climate

The closest weather station providing climatic data for Portage Marsh is located in Escanaba, Michigan. In 1975, the average monthly temperature was 42.7°F, the average daily low for January was 12.2°F and the average daily high in July was 76.2°F. The average annual precipitation is 28.01 inches, with a mean monthly precipitation of 1.27 inches in January and 3.42 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a half months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Portage Marsh (U.S.G.S. quadrangle map, Escanaba, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974).

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Portage Marsh.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Portage Marsh.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Portage Marsh.

Reptiles and Amphibians

Appendix C-12 contains general information on reptiles and amphibians of Lake Section 12, but care should be exercised in the interpretation of the relevance of these studies to Portage Marsh. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food source, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Portage Marsh is included in the Mississippi Flyway Waterfowl Habitat Reconnaissance (Martz, 1976). This study is a cooperative effort between the Michigan Department of Natural Resources and the U.S. Fish and Wildlife Service, designed to identify high quality waterfowl habitat that is inadequately protected. Table 12-15 presents waterfowl breeding activity estimates of Portage Marsh. The figures are extremely high and indicate that this wetland is probably the most productive coastal waterfowl area on the Upper Peninsula of Michigan. Jaworski and Raphael (1978) have calculated that for four duck species the average number of nesting pairs per square mile is 169; the average number of wetland acres per nesting pair is 3.8; and the average number of duck broods per square mile is 116.0.

Breeding ducks of Portage Marsh include the mallard (Anas platyrhynchos), black duck (A. rubripes), gadwall (A. strepera), pintail (A. acuta), green-winged teal (A. crecca), blue-winged teal (A. discors), northern shoveler (A. clypeata), American wigeon (A. americana), wood duck (Aix sponsa), redhead

(Aythya americana), and ring-necked duck (A. collaris). The American coot (Fulica americana) is the most abundant breeding game bird.

Scharf et al. (1977) studied the avifauna of Portage Marsh, east of State Route 35. This wetland area, which has been greatly reduced in size by high water levels, is one of the few large cattail stands along the north shore of Green Bay. An estimated two or three pairs of green herons (Butorides striatus), at least 43 pairs of black terns (Chlidonias nigra), and four colonies (a total of 84 nests) of common terns (Sterna hirundo) were counted nesting here. Probable breeding birds of Portage Marsh include the least bittern (Ixobrychus exilis), Virginia rail (Rallus limicola), common gallinule (Gallinula chloropus), killdeer (Charadrius vociferus), belted kingfisher (Megaceeryle alcyon), tree swallow (Iridoprocne bicolor), purple martin (Progne subis), short-billed marsh wren (Cistothorus platensis), yellow-headed blackbird (X. xanthocephalus), red-winged blackbird (Agelaius phoeniceus) and song sparrow (Melospiza melodia). Other birds that visit the area but do not nest there include the great blue heron (Ardea herodias), semipalmated sandpiper (Calidris pusillus), herring gull (Larus argentatus), ring-billed gull (L. delawarensis), and Caspian tern (Sterna caspia).

Table 12-15 also includes estimates of migratory waterfowl use of Portage Marsh. Nine species of dabbling ducks, five species of diving ducks, and the American coot stop over for an average of five weeks. The black duck, common goldeneye (Bucephala clangula), and bufflehead (B. albeola) remain the longest (i.e., an average of 10 to 12 weeks). Peak waterfowl populations occur in the fall. Waterfowl Spring Migration Survey Data Sheets from the Michigan Wildlife Division (1977) recorded Canada geese (Branta canadensis) using the wetland during late April.

A portion of Portage Marsh is owned and managed by the Michigan Department of Natural Resources. Agency activities in the wetland include making artificial islands to improve waterfowl habitat, and waterfowl banding in the late summer. Duck hunters use the wetland in the fall (Scharf et al., 1977).

Appendix D-29 contains general information on wetland birds of Lake Section 12, but care should be exercised in the interpretation of the relevance of these studies to Portage Marsh. The literature search provided no site-specific information pertaining to commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Portage Marsh.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan

Table 12-15. Estimated Waterfowl Breeding Activity and Migratory Use
Of Portage Marsh^a

Waterfowl species	Breeding		Migration		
	average density (pairs/sq. mi.)	average young produced/wetland acre	average peak population	average fall population	average duration (weeks)
mallard	375	.4	300	300	6
black duck	75	.1	--	--	10
gadwall	75	.1	100	100	4
pintail	30	.1	--	--	4
green-winged teal	45	.1	200	200	3
blue-winged teal	450	.5	400	400	2
northern shoveler	75	.1	--	--	4
American wigeon	150	.2	100	1000	4
wood duck	150	.2	--	--	2
Total dabbling ducks	1425	2.2	130	130	5
redhead	45	.1	--	--	4
canvasback	--	--	--	--	4
scaup spp.	--	--	--	--	4
ring-necked duck	30	.1	--	--	4
common goldeneye/ bufflehead	--	--	--	--	12
Total diving ducks	75	.1	200	200	6
American coot	5000	8	10,000	10,000	5
Total waterfowl	6500	10	11,500	11,500	5

^aMartz (1976)

Endangered and Threatened Species Program, 1976) were documented in Portage Marsh by the literature search.

The peregrine falcon (Falco peregrinus), which is on the federal list, historically nested in Portage Point, but no active nests exist. Shorelands Inventory Data Sheets from the Michigan Department of Natural Resources indicate that the habitat of Portage Marsh is suitable for the bald eagle (Haliaeetus leucocephalus). The bald eagle is an uncommon summer resident of the Northern Green Bay area.

Health

Site-specific information indicates that the environmental quality of Portage Marsh is very good for utilization by breeding waterfowl. However, a sewage disposal plant is located north of Portage Marsh and may have some effect on its health.

CULTURAL SETTING

LM 299

Population

Portage Marsh is located on the southern border of the city of Escanaba in Escanaba Township of Delta County, Michigan. The county is sparsely populated, having a density of 31 persons per square mile. Table 12-16 indicates that Delta County and Escanaba Township experienced a rapid rate of population growth between 1970 and 1975. The city of Escanaba, however, experienced a moderate decline in population during the same time period. Projections for 1990 indicate that rapid population growth is expected to continue in Delta County.

Table 12-16. Population Data for the Vicinity of Portage Marsh

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Delta County	39,358	9.6	45,953
Escanaba Township	2,651	36.1	--
City of Escanaba	14,708	-4.3	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Portage Marsh is primarily rural open space, mixed with residential development along the roads within the wetland and along the Lake

Michigan shore. The surrounding area is primarily rural open space, with shoreline residential development extending to the northeast into the city of Escanaba. The Escanaba airport is located immediately north of the wetland. A sewage treatment plant is located to the north of Portage Marsh. A primary highway and several access roads cross through the wetland and a cemetery is located nearby. A short drainage ditch has been dug into the northern part of the wetland near the point at which Highway 35 turns northward (U.S.G.S. quadrangle map, Escanaba, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974; Central Upper Peninsula Planning and Development Regional Commission, 1978; Michigan Shorelands Management Unit aerial photograph, 1974). A small portion of the wetland north of Portage Bay and south of Escanaba is under state ownership, but the remainder is privately owned (Rockford Map Publishers, Inc., 1976).

Portage Bay has been nominated as a coastal management Area of Particular Concern (Central Upper Peninsula Planning and Development Regional Commission, 1978). Martz (1976) indicates that Portage Marsh is threatened by private development within the next five years.

Recreation

There are no known state or federal recreational facilities in Portage Marsh.

Mineral, Energy, and Forest Resources

Portage Marsh is situated within an area underlain by limestone and dolomites, but there are no quarrying operations in the vicinity (Gere, 1977). There are no known oil, gas, or coal resources in the wetland (Michigan Geological Survey, 1977; Smith, 1915).

Portage Marsh is partially wooded (U.S.G.S. quadrangle map, Escanaba, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974). It was not determined through the literature search whether these area is used for wood production.

Public Utilities and Facilities

A sewage disposal plant is situated to the north of Portage Marsh (U.S.G.S. quadrangle map, Escanaba, Michigan, 1958).

Pollution Sources

There are no NPDES permit holders adjacent to Portage Marsh (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Portage Marsh, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 299

The literature search identified no on-going or impending research projects pertaining to Portage Marsh.

ESCANABA CITY WETLAND

PHYSIOGRAPHIC SETTING

LM 300

Setting

Escanaba City Wetland is located on the western shoreline of Little Bay de Noc in Delta County, Michigan. The wetland lies adjacent both to the city of Escanaba and to the lakeshore. Escanaba City Wetland is situated between two sandbars: Sand Point, which lies offshore from Escanaba to the north of the wetland, and Portage Point, south of the wetland. The wetland is a Lacustrine System occupying a low, non-wooded site (U.S.G.S. quadrangle map, Escanaba, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1975).

Topography

The total relief of Escanaba City Wetland is 10 feet. Wetland elevations range from 580 to 590 feet above sea level (lake level to 10 feet above the approximate mean Lake Michigan elevation). The wetland lies on a lacustrine plain within the Green Bay-Lake Winnebago-Rock River Lowland. This plain slopes gently to the east. Much of the area is poorly drained and is covered by large inland wetlands. The Great Lakes Basin Commission (1975) describes the shoreline near Escanaba City Wetland as an artificial fill area. Topography at higher elevations in this region is generally rolling.

Surficial Geology

The surficial geology of Escanaba City Wetland is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in Escanaba City Wetland is Marsh. Marsh soils range from sand to clay loam; they are wet most of the year and are found on inland lake borders and areas bordering Lake Michigan. Marsh soil does not support trees (Berndt, 1967).

Hydrology

An unnamed stream flows through Escanaba City Wetland, undergoing an elevational change of approximately three feet as it travels through the wetland. The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Escanaba City Wetland.

Climate

The closest weather station providing climatic data for Escanaba City Wetland is located in Escanaba, Michigan. In 1975, the average monthly temperature was 42.7°F, the average daily low for January was 12.2°F and the average daily high in July was 76.2°F. The average annual precipitation is 28.01 inches, with a mean monthly precipitation of 1.27 inches in January and 3.42 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a half months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Escanaba City Wetland (U.S.G.S. quadrangle map, Escanaba, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974).

BIOTIC SETTING

LM 300

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Escanaba City Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Escanaba City Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Escanaba City Wetland.

Reptiles and Amphibians

Appendix C-12 contains general information on reptiles and amphibians of Lake Section 12, but care should be exercised in the interpretation of the relevance of these studies to Escanaba City Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Escanaba City Wetland is included in the Mississippi Flyway Waterfowl Habitat Reconnaissance (Martz, 1976). This study is a cooperative effort between the Michigan Department of Natural Resources and the U.S. Fish and Wildlife Service, designed to identify high quality waterfowl habitat that is inadequately protected. Escanaba City Wetland functions as important habitat for waterfowl nesting and migration.

Little Bay de Noc is known to be an important concentration area for waterfowl, especially during low water years (Martz, 1976). Jaworski and Raphael (1978) suggest that the bay is suitable for resting waterfowl because it is protected from the westerly winds and therefore from wave action. The authors also report that, between 1910 and 1958, the wetland area of Little Bay de Noc was reduced by 50%; the effect of this loss on the wetland bird community has not been documented.

Appendix D-29 contains general information on wetland birds of Lake Section 12, but care should be exercised in the interpretation of the relevance of these studies to Escanaba City Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Escanaba City Wetland.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Escanaba City Wetland by the literature search. The bald eagle (Haliaeetus leucocephalus) is an uncommon summer resident of the northern Green Bay area.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland.

Population

Escanaba City Wetland is adjacent to the city of Escanaba in Escanaba Township of Delta County, Michigan. The county is sparsely populated and has a density of 31 persons per square mile. Table 12-17 indicates that Delta County and Escanaba Township experienced a rapid rate of population growth between 1970 and 1975, but the city of Escanaba experienced a moderate rate of population decline during the same time period. Projections for 1990 indicate that rapid population growth is expected to continue in Delta County.

Table 12-17. Population Data for the Vicinity of Escanaba City Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Delta County	39,358	9.6	45,953
Escanaba Township	2,651	36.1	--
City of Escanaba	14,708	-4.3	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Escanaba City Wetland is urban open space, and the area inland from the wetland is characterized by residential and commercial development. Roads lie adjacent to the west side of the wetland, and schools, churches, and gravel pits are located nearby (U.S.G.S. quadrangle map, Escanaba, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974; Central Upper Peninsula Planning and Development Regional Commission, 1978; Michigan Shorelands Management Unit aerial photograph, 1974). The wetland is under private ownership (Central Upper Peninsula Planning and Development Regional Commission, 1978), and its proximity to the city of Escanaba suggests that it may be subject to moderate to high development pressures.

Recreation

There are no known state or federal recreational facilities in the vicinity of Escanaba City Wetland.

Mineral, Energy, and Forest Resources

Escanaba City Wetland is situated within an area underlain by limestone and dolomites, but there are no quarrying operations in the vicinity (Gere, 1977). There are no known oil, gas, or coal resources in the wetland (Michigan Geological Survey, 1977; Smith, 1915), nor are there any significant forest resources.

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Escanaba City Wetland (U.S.G.S. quadrangle map, Escanaba, Michigan, 1958).

Pollution Sources

There are no NPDES permit holders adjacent to Escanaba City Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Escanaba City Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 300

The literature search identified no on-going or impending research projects pertaining to Escanaba City Wetland.

Table 12-18. Data Gaps - Lake Section 12

Data Gap*		Wetland Number	286	287	288	289-293	294	295	296	297-298	299	300	
Physiographic Setting	Setting												
	Topography												
	Surficial Geology												
	Soils												
	Hydrology	Water Level Fluctuations	*	*	*	*	*	*	*	*	*	*	*
		Groundwater	*	*	*	*	*	*	*	*	*	*	*
		Water Quality	*	*	*	*	*	*	*	*	*	*	*
		Depth	*	*	*	*	*	*	*	*	*	*	*
		Seasonal Changes	*	*	*	*	*	*	*	*	*	*	*
	Climate	Climate											
Special Features													
Vegetation	Major Species Distribution	*	*	*	*	*	*	*	*	*	*	*	
	Major Species Composition	*	*	*	*	*	*	*	*	*	*	*	
	Density/Productivity	*	*	*	*	*	*	*	*	*	*	*	
	Relationship to Water Levels	*	*	*	*	*	*	*	*	*	*	*	
	Fish	Major species	*	*	*	*	*	*	*	*	*	*	*
		Species Composition	*	*	*	*	*	*	*	*	*	*	*
		Seasonal Distribution	*	*	*	*	*	*	*	*	*	*	*
		Spawning and Hatching Areas	*	*	*	*	*	*	*	*	*	*	*
		Commercial/Recreational Use	*	*	*	*	*	*	*	*	*	*	*
		Life Histories	*	*	*	*	*	*	*	*	*	*	*
Food Sources		*	*	*	*	*	*	*	*	*	*	*	
Invertebrates	Species Composition	*	*	*	*	*	*	*	*	*	*	*	
	Seasonal Distribution	*	*	*	*	*	*	*	*	*	*	*	
	Density/Productivity	*	*	*	*	*	*	*	*	*	*	*	
	Food Sources	*	*	*	*	*	*	*	*	*	*	*	
Amphibians/Reptiles	Relationship to Water Levels	*	*	*	*	*	*	*	*	*	*	*	
	Major Species	*	*	*	*	*	*	*	*	*	*	*	
	Seasonal Distribution	*	*	*	*	*	*	*	*	*	*	*	
	Density/Productivity	*	*	*	*	*	*	*	*	*	*	*	
	Recreational/Commercial Use	*	*	*	*	*	*	*	*	*	*	*	
Avifauna	Life Histories	*	*	*	*	*	*	*	*	*	*	*	
	Food Sources	*	*	*	*	*	*	*	*	*	*	*	
	Relationship to Water Levels	*	*	*	*	*	*	*	*	*	*	*	
	Major Species	*	*	*	*	*	*	*	*	*	*	*	
	Seasonal Distribution	*	*	*	*	*	*	*	*	*	*	*	
	Density/Productivity	*	*	*	*	*	*	*	*	*	*	*	
	Recreational/Commercial Use	*	*	*	*	*	*	*	*	*	*	*	
Mammals	Life Histories	*	*	*	*	*	*	*	*	*	*	*	
	Food Sources	*	*	*	*	*	*	*	*	*	*	*	
	Relationship to Water Levels	*	*	*	*	*	*	*	*	*	*	*	
	Major Species	*	*	*	*	*	*	*	*	*	*	*	
	Seasonal Distribution	*	*	*	*	*	*	*	*	*	*	*	
	Density/Productivity	*	*	*	*	*	*	*	*	*	*	*	
Cultural Setting	Recreational/Commercial Use	*	*	*	*	*	*	*	*	*	*	*	
	Life Histories	*	*	*	*	*	*	*	*	*	*	*	
	Food Sources	*	*	*	*	*	*	*	*	*	*	*	
	Relationship to Water Levels	*	*	*	*	*	*	*	*	*	*	*	
	Endangered Species	*	*	*	*	*	*	*	*	*	*	*	
	Health	*	*	*	*	*	*	*	*	*	*	*	
	Population												
	Land Use and Ownership												
	Recreation												
	Mineral, Energy, Forest Resource												
Public Utilities/Facilities													
Point Pollution Sources													
Non-Point Pollution Sources	*	*	*	*	*	*	*	*	*	*	*		
Historic Features	*	*	*	*	*	*	*	*	*	*	*		
Archaeologic Features	*	*	*	*	*	*	*	*	*	*	*		

LAKE SECTION 13

INTRODUCTION

Lake Section 13 extends along the Lake Michigan shoreline from the City of Escanaba, Michigan, to just east of the Delta County-Schoolcraft County border near Point aux Barques. Both Little Bay de Noc and Big Bay de Noc are situated within the lake section. The topography of this region is generally flat along the shoreline. Inland topography ranges from flat to rolling and hilly. Large wetlands occupy low inland sites within this region. The predominant shore types along Lake Section 13 are erodible and non-erodible low plains. Erodeable and non-erodible high bluffs and non-erodible low bluffs are also present within the lake section (Great Lakes Basin Commission, 1975).

Figures 13-1 and 13-2 show the approximate location of the 46 wetlands in Lake Section 13. Latitude, longitude, acreage, and classification for each of these wetlands are presented in Table 13-1. Lake Section 13 includes Delta and Schoolcraft Counties, both of which are sparsely populated. The majority of the wetlands in Lake Section 13 have elevations ranging between 580 and 590 feet above sea level (lake level to ten feet above the approximate mean elevation of Lake Michigan). These wetlands are lake-influenced. Thirty-eight of the wetlands in Lake Section 13 are Lacustrine Systems. The remaining wetlands include six Palustrine Systems, one Riverine System, and one Lacustrine-Palustrine System.

Information related to the physiographic and cultural features of the 46 wetlands is summarized in the individual wetland narratives presented in this chapter. Published sources lack site-specific information on the biotic characteristics of most of these wetlands.

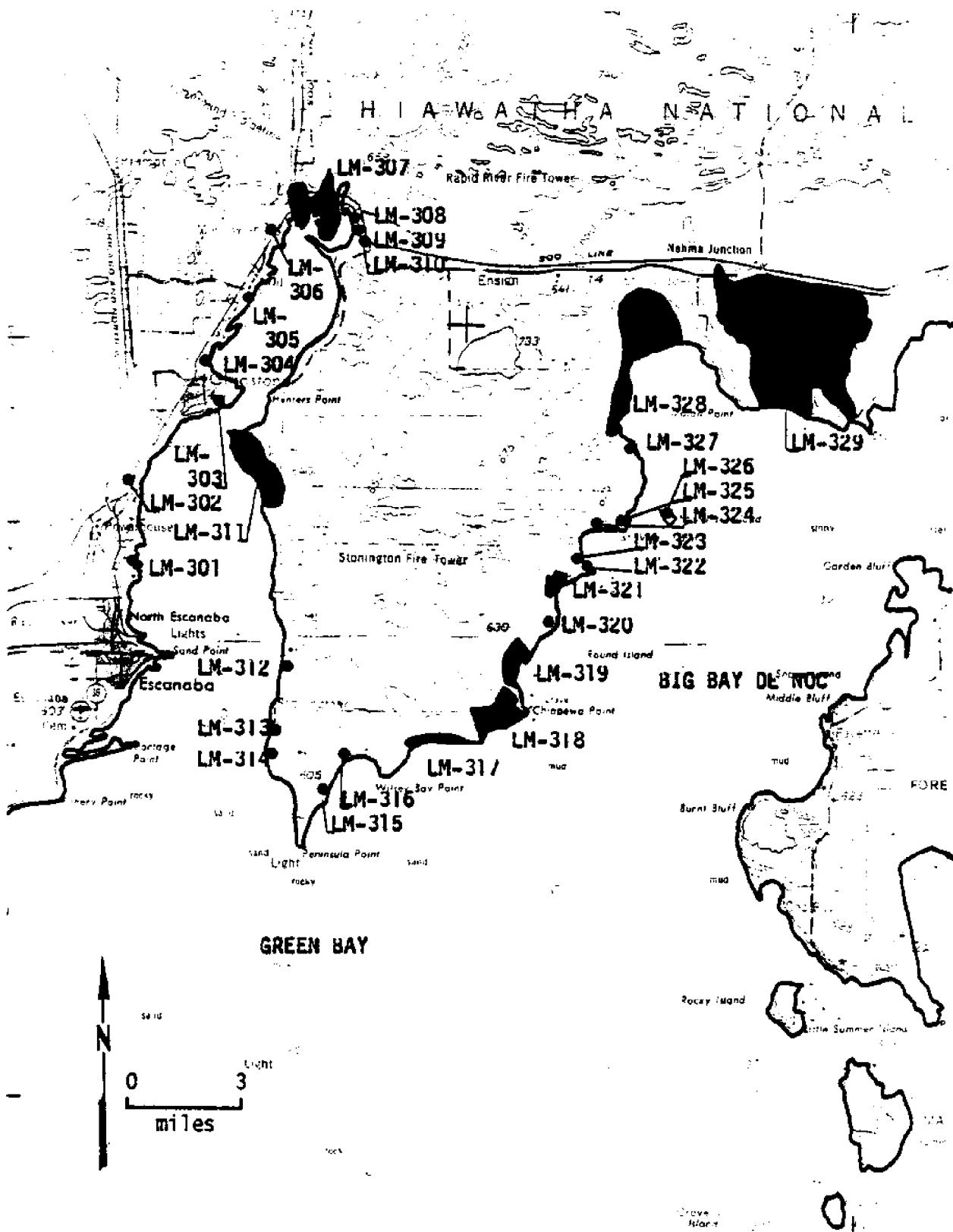


Figure 13-1. Lake Section 13 - Big Bay De Noc Area

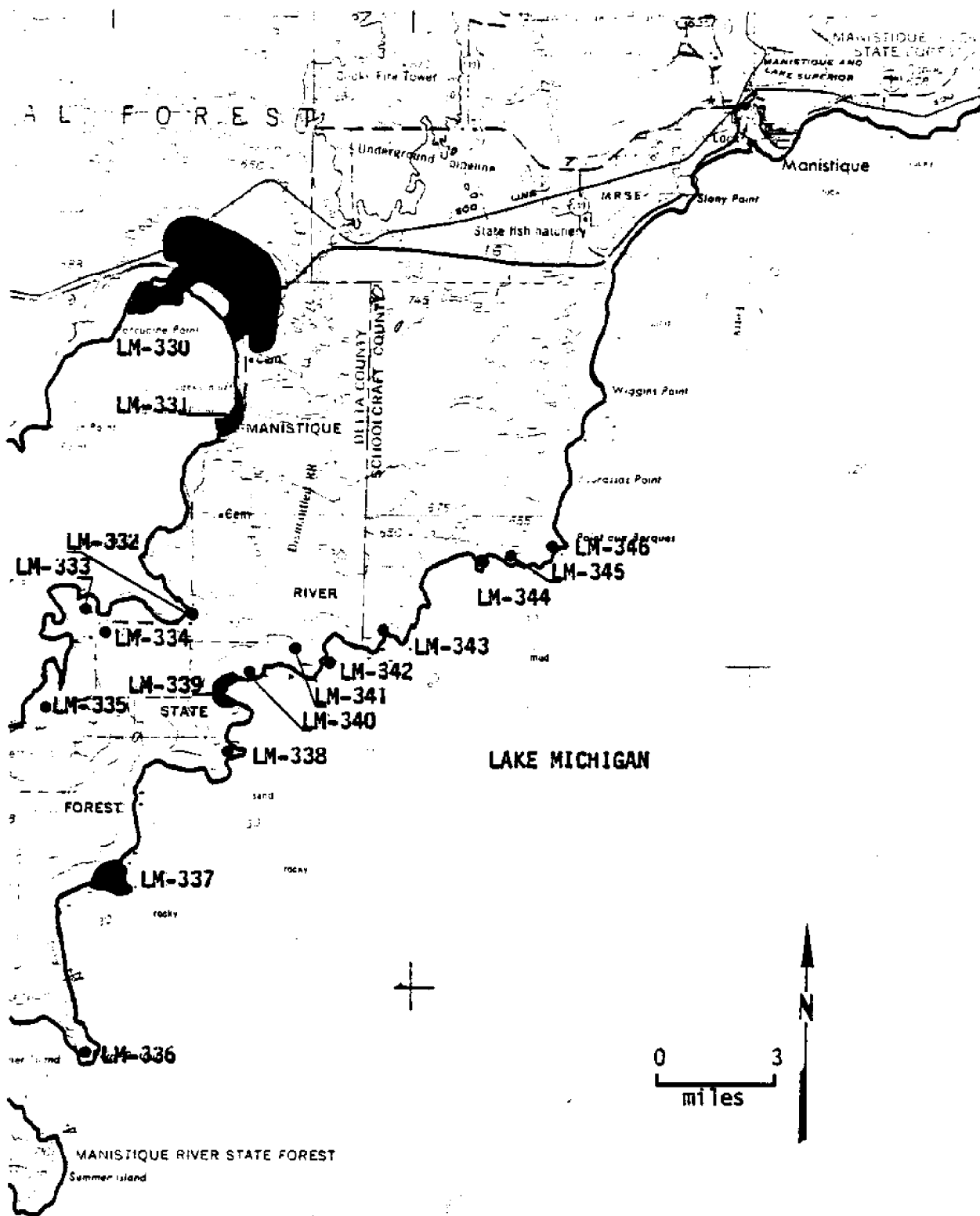


Figure 13-2. Lake Section 13 - South Manistique River State Forest Area

Table 13-1. Location, Acreage, and Classification of Wetlands
in Lake Section 13

Wetland Number	Wetland	Latitude	Longitude	Acreage	Classification ^a
301	Escanaba River Wetland	45°47'30"	87°04'20"	29	R
302	Escanaba Township Wetland	45°47'50"	87°03'30"	29	P
303	Saunders Point Wetland	45°50'40"	87°00'20"	19	L
304	Kipling Wetland	45°51'50"	87°01'00"	5	L
305	Days River Wetlands	45°53'40"	86°59'00"	58	L
	WHITEFISH RIVER AREA WETLAND COMPLEX				
306	Masonville Wetland	45°54'30"	86°58'50"	48	L
307	Rapid River Wetland	45°55'10"	86°57'20"	496	L
308	Whitefish River Wetland #1	45°54'35"	86°56'35"	19	L
309	Whitefish River Wetland #2	45°54'45"	86°56'35"	29	L
310	Whitefish River Wetland #3	45°54'50"	86°56'25"	49	L
311	Squaw Point Wetland	45°48'50"	86°58'40"	729	L,P
312	Trinity Church Wetland	45°43'50"	86°58'10"	39	P
	DEEPWATER POINT WETLAND COMPLEX				
313	Deepwater Point Wetland #1	45°42'50"	86°58'50"	136	L
314	Deepwater Point Wetland #2	45°42'10"	86°58'40"	129	L
315	Peninsula Point Wetland	45°41'20"	86°57'10"	58	L
316	Wilsey Bay Wetland	45°42'10"	86°56'10"	10	L
317	Wedens Bay Wetland	45°42'40"	86°54'00"	49	L
	GRANSKOG CREEK WETLAND COMPLEX				
318	Chippewa Point Wetland	45°43'40"	86°51'00"	330	L
319	Granskog Creek Wetland	45°44'40"	86°53'00"	399	L
	SAND BAY WETLAND COMPLEX				
320	Sand Bay Wetland #1	45°45'30"	86°49'30"	78	P
321	Sand Bay Wetland #2	45°46'30"	86°49'40"	103	P
	MARTIN BAY WETLAND COMPLEX				
322	Martin Bay Wetland #1	45°46'40"	86°48'10"	22	L
323	Martin Creek Wetland	45°47'30"	86°48'40"	156	L
324	Martin Bay Wetland #2	45°47'50"	86°47'50"	321	L
325	St. Vital Point Wetland	45°47'50"	86°47'00"	15	L
326	St. Vital Island Wetland	45°48'00"	86°45'30"	19	L
	OGONTZ BAY WETLAND COMPLEX				
327	Ogontz Bay Wetland #1	45°49'20"	86°46'30"	19	L
328	Ogontz Bay Wetland #2	45°50'30"	86°45'40"	1740	L
329	Sturgeon River Wetland	45°52'20"	86°40'20"	6697	L
	UPPER BIG BAY DE NOC WETLAND COMPLEX				
330	Upper Big Bay De Noc Wetland	45°55'20"	86°33'00"	9331	L
331	Jacks Bluff Wetland	45°50'50"	86°31'50"	224	L
332	Garden Bay Wetland	45°46'15"	86°33'20"	39	L
	PUFFY BAY WETLAND COMPLEX				
333	Puffy Bay Wetland #1	45°46'15"	86°35'50"	10	L
334	Puffy Bay Wetland #2	45°46'20"	86°36'20"	10	L
335	South River Bay Wetland	45°44'10"	86°37'50"	112	L
336	Point Detour Wetland	45°37'10"	86°37'10"	19	P

-continued-

Table 13-1. (concluded)

Wetland Number	Wetland	Latitude	Longitude	Acreage	Classification ^a
337	Sucker Lake Wetland	45°40'44"	86°35'40"	292	L
	PORTAGE BAY AREA WETLAND COMPLEX				
338	Portage Bay Wetland #1	45°43'40"	86°42'10"	165	L
339	Portage Bay Wetland #2	45°45'00"	86°32'00"	660	L
340	Halfmoon Lake Wetland	45°45'20"	86°29'50"	243	L
341	Delta County Border Wetland	45°45'50"	86°29'00"	107	P
	POINT O'KEEFE AREA WETLAND COMPLEX				
342	Point O'Keefe Wetland	45°45'50"	86°27'00"	49	L
343	Trail Creek Wetland	45°46'10"	86°26'00"	58	L
	LITTLE HARBOR AREA WETLAND COMPLEX				
344	Cole Point Wetland	45°47'30"	86°23'40"	22	L
345	Little Harbor Wetland	45°47'35"	86°22'40"	97	L
346	Pillows Point Wetland	45°47'35"	86°24'00"	19	L

^aP=palustrine
L=lacustrine
R=riverine

ESCANABA RIVER WETLAND

PHYSIOGRAPHIC SETTING

LM 301

Setting

Escanaba River Wetland is situated on two small islands in the Escanaba River, in Delta County, Michigan. The river flows into Little Bay de Noc, and the wetland is located just upstream from the river mouth, roughly 0.3 mile from the lakeshore and 0.4 mile from the city of Escanaba, Michigan. The mouth of the Escanaba River has been considerably altered by industrial development and boat docking facilities.

Although the wetland is located more than 1,000 feet from the shoreline, it is included in this study because it is contiguous to the Escanaba River, which is a lake-level water body. Escanaba River Wetland is a Lower Perennial Riverine System occupying a low site. The northern portion of the wetland is wooded (U.S.G.S. quadrangle map, Gladstone, Michigan, 1958; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

Topography

The total relief of Escanaba River Wetland is slight; elevations range from 580 to approximately 585 feet above sea level, lake level to 5 feet above the approximate mean elevation of Lake Michigan. The wetland lies on a narrow lacustrine plain which is largely covered by wetlands. A bluffline, reaching heights of 90 feet, lies just over a mile inland from the wetland. This bluffline generally marks the eastern boundary of a till plain known as the Alger Hill-land. The Great Lakes Basin Commission (1975) describes the shoreline near this wetland as an erodible low plain which is subject to lake flooding.

Surficial Geology

The surficial geology of Escanaba River Wetland is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

There are two soil types found in Escanaba River Wetland, Marsh and Alluvial land. Both are found on the northern island of Escanaba River Wetland and Marsh soil is found on the southern island. Marsh soils range from sand to clay loam. These soils are wet most of the year and are generally found on inland lake borders and areas bordering Lake Michigan. Alluvial land ranges from sand to loam and usually has a surface layer of black muck underlain by

sand. Shallow organic soils and areas of poorly drained mineral soil may also be included. Alluvial land has low to moderate available water capacity and low to medium natural fertility. This land is poorly drained, with slow or ponded runoff, and is found on level flood plains along major streams (Berndt, 1977).

Hydrology

The Escanaba River flows through Escanaba River Wetland. The stream bed of this river is mostly bedrock and rock-rubble with some sand and gravel. Its banks are primarily sand and muck. Hydrologic data are available for the Escanaba River upstream from the wetland (Marquette County) in Hendrickson et al. (1973). Water quality of the river is generally considered to be good (Great Lakes Basin Commission, 1975).

The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Escanaba River Wetland.

Climate

The closest weather station providing climatic data for Escanaba River Wetland is located in Escanaba, Michigan. In 1975, the average monthly temperature was 42.7°F, the average daily low for January was 12.2°F and the average daily high in July was 76.2°F. The average annual precipitation is 28.01 inches, with a mean monthly precipitation of 1.27 inches in January and 3.42 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a half months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Escanaba River Wetland (U.S.G.S. quadrangle map, Gladstone, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974).

BIOTIC SETTING

LM 301

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Escanaba River Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Escanaba River Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Escanaba River Wetland.

Reptiles and Amphibians

Appendix C-13 contains general information on reptiles and amphibians of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Escanaba River Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Little Bay de Noc is an important concentration area for migratory waterfowl, especially during low water years (Martz, 1976). The bay is suitable for resting waterfowl because it is protected from westerly winds and therefore from wave action. Between 1910 and 1958, the wetland area of Little Bay de Noc was reduced by fifty per cent; the effect of this loss on the wetland bird community has not been documented (Jaworski and Raphael, 1978).

Appendix D-30 contains general information on wetland birds of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Escanaba River Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Escanaba River Wetland.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Escanaba River Wetland by the literature search. The bald eagle (Haliaeetus leucocephalus) is an uncommon summer visitant in the Little Bay de Noc area, but no active nests exist near the shoreline (S. Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication).

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland. However, two NPDES permit holders discharge into the Escanaba River and may have some effect on the health of the wetland.

CULTURAL SETTING

LM 301

Population

Escanaba River Wetland is located in Escanaba Township of Delta County, Michigan. The county is sparsely populated and has a density of 31 persons per square mile. Table 13-2 indicates that Delta County and Escanaba Township experienced a rapid rate of population growth between 1970 and 1975, and projections for 1990 indicate that rapid population growth is expected to continue in Delta County.

Table 13-2. Population Data for the Vicinity of Escanaba River Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Delta County	39,358	9.6	45,953
Escanaba Township	2,651	36.1	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Escanaba River Wetland is urban open space. The area across the Escanaba River from the wetland is primarily in residential uses, while the area immediately abutting the wetland to the north and east is within the Pioneer Trail Park, a county public park. Rural open space uses predominate further inland. A primary highway is located to the west of Escanaba River Wetland, and a spillway lies in the river upstream from the wetland. Boat docks, railroad tracks, storage tanks, gravel pits, and a drive-in theater are located nearby (U.S.G.S. quadrangle map, Gladstone, Michigan, 1958; Michigan shorelands Management Unit aerial photograph, 1974; Central Upper Peninsula Planning and Development Regional Commission, 1978; Michigan Shorelands Management Unit aerial photograph, 1974). The wetland is under private ownership (Central Upper Peninsula Planning and Development Regional Commission, 1978). Although the wetland is in close proximity to industrial and

residential areas, the problems inherent in developing this low-lying wetland suggest that Escanaba River Wetland is subject to low to moderate developmental pressures.

Recreation

Pioneer Trail Park, lying to the north and east of Escanaba River Wetland, is a Delta County park. Included within the park are a campground with approximately 30 sites, several picnic areas, a pavilion, baseball fields, and a small system of trails extending east of the park that are maintained by the Michigan Department of Natural Resources (Escanaba Recreation Supervisor, personal communication).

Mineral, Energy, and Forest Resources

Escanaba River Wetland is situated within an area underlain by limestone and dolomites. An active dolomite quarry exists northwest of the wetland (Gere, 1977), and two active sand and gravel pits are located west of the wetland, just across the Escanaba River (Michigan Department of State Highways and Transportation aerial photographs, 1973).

Escanaba River Wetland is wooded (U.S.G.S. quadrangle map, Gladstone, Michigan, 1958; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978). It was not determined through the literature search whether this wooded area is used for commercial production.

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Escanaba River Wetland (U.S.G.S. quadrangle map, Gladstone, Michigan, 1958).

Pollution Sources

There are two NPDES permit holders upstream from Escanaba River Wetland that discharge into the river. The Escanaba Paper Company discharges sanitary wastes and cooling water. The American Cyanamid Company discharges cooling water into the Escanaba River, in addition to its unnamed discharges into a four-acre diked impoundment (Michigan Water Quality Division, 1978). The influences of these point sources on Escanaba River Wetland is unknown. No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Escanaba River Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Pebbles and Black, 1976).

RESEARCH PROJECTS

LM 301

The literature search identified no on-going or impending research projects pertaining to Escanaba River Wetland.

ESCANABA TOWNSHIP WETLAND

PHYSIOGRAPHIC SETTING

LM 302

Setting

Escanaba Township Wetland is located 250 feet from the western shoreline of Little Bay de Noc in Delta County, Michigan, 1.8 miles southwest of the city of Gladstone. Escanaba Township Wetland is separated from the lakeshore by a four-lane highway. Escanaba Township Wetland is a Palustrine System occupying a low, wooded site (U.S.G.S. quadrangle map, Gladstone, Michigan, 1958).

Topography

The total relief of Escanaba Township Wetland is 10 feet; wetland elevations range from 600 to 610 feet above sea level, 20 to 30 feet above the approximate mean elevation of Lake Michigan. The wetland lies at the base of a steep bluff which marks the eastern boundary of a till plain known as the Alger Hill-land. The area inland from the wetland is hilly, and large wetlands occupy low sites in this region. The Great Lakes Basin Commission (1975) describes the shoreline near this wetland as an erodible high bluff.

Surficial Geology

The surficial geology of Escanaba Township Wetland is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil series in Escanaba Township Wetland is Carbondale, Lupton, and Rifle soils. Carbondale, Lupton, and Rifle soils have a surface layer which ranges from muck to peat. These soils formed from decomposed herbaceous and woody material and are very poorly drained, with high water storage capacities (Berndt, 1977).

Hydrology

There are no streams flowing through Escanaba Township Wetland. The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Escanaba Township Wetland.

Climate

The closest weather station providing climatic data for Escanaba Township Wetland is located in Escanaba, Michigan. In 1975, the average monthly temperature was 42.7°F, the average daily low for January was 12.2°F and the average daily high in July was 76.2°F. The average annual precipitation is

28.01 inches, with a mean monthly precipitation of 1.27 inches in January and 3.42 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a half months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Escanaba Township Wetland (U.S.G.S. quadrangle map, Gladstone, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974).

BIOTIC SETTING

LM 302

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Escanaba Township Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Escanaba Township Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Escanaba Township Wetland.

Reptiles and Amphibians

Appendix C-13 contains general information on reptiles and amphibians of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Escanaba Township Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Little Bay de Noc is known to be an important concentration area for migratory waterfowl, especially during low water years (Martz, 1976). The bay

is suitable for resting waterfowl because it is protected from westerly winds and therefore from wave action. Between 1910 and 1958, the wetland area of Little Bay de Noc was reduced by fifty per cent; the effect of this loss on the wetland bird community has not been documented (Jaworski and Raphael, 1978).

Appendix D-30 contains general information on wetland birds of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Escanaba Township Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Escanaba Township Wetland.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Escanaba Township Wetland by the literature search. The bald eagle (Haliaeetus leucocephalus) is an uncommon summer visitant in the Little Bay de Noc area, but no active nests exist near the shoreline (S. Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication).

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland.

CULTURAL SETTING

LM 302

Population

Escanaba Township Wetland is located in Escanaba Township of Delta County, Michigan. The county is sparsely populated and has a density of 31 persons per square mile. Table 13-3 indicates that Delta County and Escanaba Township experienced a rapid rate of population growth between 1970 and 1975, and projections for 1990 indicate that rapid population growth is expected to continue in Delta County.

Table 13-3. Population Data for the Vicinity of Escanaba Township Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Delta County	39,358	9.6	45,953
Escanaba Township	2,651	36.1	--

^a U.S. Bureau of the Census (1977)

^b Wisconsin, State Bureau of Program Management (1975)

Land Use and Ownership

Land use within Escanaba Township Wetland is rural open space. The area immediately east of the wetland is residential, while the area west of the wetland is within a country club development. The portion of this development abutting the northern half of the wetland is used as a golf course, while that portion adjacent to the southern half is in residential use. A primary highway and a rail line lie between the wetland and the lakeshore (U.S.G.S. quadrangle map, Gladstone, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974; Central Upper Peninsula Planning and Development Regional Commission, 1978; Michigan Shorelands Management Unit aerial photograph, 1974). The Wetland is under private ownership (Rockford Map Publishers, Inc., 1976).

Escanaba Township Wetland may be subject to moderate developmental pressures owing to its location among extensive recreational and residential development. Presently the wetland serves as a border between the golf course and housing on the shoreline.

Recreation

There are no known state or federal recreational facilities in the vicinity of Escanaba Township Wetland. However, a privately owned golf course abuts the northern half of the wetland.

Mineral, Energy, and Forest Resources

Escanaba Township Wetland is situated within an area underlain by limestone and dolomites, and there is an active quarrying operation west of the wetland (Gere, 1977). There are no known oil, gas, or coal resources in or near the wetland (Michigan Geological Survey 1977). Escanaba Township Wetland is wooded (U.S.G.S. quadrangle map, Gladstone, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974). It was not determined through the literature search whether the area is used for commercial wood production.

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Escanaba Township Wetland (U.S.G.S. quadrangle map, Gladstone, Michigan, 1958).

Pollution Sources

There are no NPDES permit holders adjacent to Escanaba Township Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Escanaba Township Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Pebbles and Black, 1976).

RESEARCH PROJECTS

LM 302

The literature search identified no on-going or impending research projects pertaining to Escanaba Township Wetland.

SAUNDERS POINT WETLAND

PHYSIOGRAPHIC SETTING

LM 303

Setting

Saunders Point Wetland is located on a bay-side bar which lies on the western side of Little Bay de Noc in Delta County, Michigan. The wetland is adjacent to both the city of Gladstone, Michigan, and the Lake Michigan shoreline. A bluffline, 110 feet high, lies 1.2 miles inland from Saunders Point Wetland. Portions of the wetland have been filled. Saunders Point Wetland is a Lacustrine System occupying a low, partially wooded site (U.S.G.S. quadrangle map, Gladstone, Michigan, 1958).

Topography

The total relief of Saunders Point Wetland is less than 10 feet. Wetland elevations range from 580 to approximately 585 feet above sea level (lake level to 5 feet above the approximate mean elevation of Lake Michigan). A steep bluffline lying to the west of the wetland generally marks the eastern boundary of a till plain known as the Alger Hill-land. The rolling-to-hilly area located inland from the wetland is dissected by the Escanaba River, and large wetlands occupy low sites in the region. The Great Lakes Basin Commission (1975) describes the shoreline near this wetland as an erodible low plain.

Surficial Geology

The surficial geology of Saunders Point Wetland is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

Roscommon mucky sand, Eastport-Roscommon mucky sand, and Grayling Sand are the three soil types found in Saunders Point Wetland. Roscommon mucky sand is found along the shore. Eastport-Roscommon sands are found inland, and Grayling sand is found in the northern part of the wetland (Berndt, 1977).

Roscommon mucky sand has a surface layer consisting of black muck underlain by sand. This soil, formed from sandy material, has little available water capacity, rapid permeability, and low natural fertility. Eastport-Roscommon sand is found on beach ridges and low, stabilized dunes; it has a surface layer of black, partially decomposed leaf litter underlain by sand and has the same fertility and water holding characteristics as Roscommon mucky sand. Grayling sand has a surface layer of black and grayish-brown sand underlain with friable sand. This soil has low available water capacity, low natural fertility, and rapid permeability (Berndt, 1977).

Hydrology

There are no streams flowing through Saunders Point Wetland (U.S.G.S. quadrangle map, Gladstone, Michigan, 1958). The literature search provided no site-specific data pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Saunders Point Wetland.

Climate

The closest weather station providing climatic data for Saunders Point Wetland is located in Escanaba, Michigan. In 1975, the average monthly temperature was 42.7°F, the average daily low for January was 12.2°F and the average daily high in July was 76.2°F. The average annual precipitation is 28.01 inches, with a mean monthly precipitation of 1.27 inches in January and 3.42 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a half months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

Squaw Point, a bay-side bar, extends toward the wetland from the opposite shoreline of Little Bay de Noc (U.S.G.S. quadrangle map, Gladstone, Michigan, 1958; Michigan Department of State Highways and Transportation aerial photograph, 1973).

BIOTIC SETTING

LM 303

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Saunders Point Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Saunders Point Wetland.

Invertebrates

Modlin et al. (1973) provide information on the species composition, distribution and biomass of the water mites (Acari) in the Great Lakes. Appendix B-4 lists the aquatic Acari found in littoral habitat of the Great Lakes which included Little Bay de Noc. Piona rotunda was the most abundant species in plankton collections from Little Bay de Noc. These organisms may occur in Saunders Point Wetland owing to its location contiguous to the bay.

The literature search produced no site-specific information pertaining to seasonal distribution, density and productivity, major food sources or relationship to water levels of the invertebrates present in Saunders Point Wetland.

Reptiles and Amphibians

Appendix C-13 contains general information on reptiles and amphibians of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Saunders Point Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Scharf et al. (1977) report a small number of black terns (Chlidonias nigra) nesting in cattail stands on Saunders Point. Herring gulls (Larus argentatus) are often observed resting in the wetland area. However, Little Bay de Noc is known to be an important concentration area for migratory waterfowl, especially during low water years (Martz, 1976). The bay is suitable for resting waterfowl because it is protected from westerly winds and therefore from wave action. Between 1910 and 1958, the wetland area of Little Bay de Noc was reduced by fifty per cent; the effect of this loss on the wetland bird community has not been documented (Jaworski and Raphael, 1978).

Appendix D-30 contains general information on wetland birds of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Saunders Point Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Saunders Point Wetland.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Saunders Point Wetland by the literature search. The bald eagle (Haliaeetus leucocephalus) is an uncommon summer visitant in the Little Bay de Noc area, but no active nests exist near the shoreline (S. Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication).

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland. However, a sewage disposal plant is located near the wetland and may have some effect on its health.

CULTURAL SETTING

LM 303

Population

Saunders Point Wetland is adjacent to the city of Gladstone in Escanaba Township of Delta County, Michigan. The county is sparsely populated and has a density of 31 persons per square mile. Table 13-4 indicates that, between 1970 and 1975, Delta County and Escanaba Township experienced a rapid rate of population growth. The city of Gladstone experienced a slow rate of population decline during the same time period. Projections for 1990 indicate that rapid population growth is expected to continue in Delta County.

Table 13-4. Population Data for the Vicinity of Saunders Point Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Delta County	39,358	9.6	45,953
Escanaba Township	2,651	36.1	--
City of Gladstone	5,156	-1.5	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Saunders Point Wetland is primarily urban open space. The wetland lies largely within Wilderness Park, a Gladstone municipal park. There is an apartment complex on the western periphery of the wetland, and the northern edge of the wetland extends into an area of single family residences. With the exception of a sewage treatment facility to the southwest and oil storage tanks, the area surrounding the wetland is predominantly residential. Saunders Point Wetland is primarily under local governmental ownership, with areas of private ownership on the northern and western edges of the wetland (Central Upper Peninsula Planning and Development Regional Commission, 1978). Although Saunders Point Wetland is located within an urban area, its position largely within Wilderness Park suggests that it is subject to low developmental pressure.

Recreation

Primary uses of Wilderness Park, in which much of the wetland lies, include fishing, camping, and swimming at the park beach (Wilderness Park Office, personal communication).

Mineral, Energy, and Forest Resources

Saunders Point Wetland is within an area underlain by limestone and dolomites, but there are no quarrying operations in the vicinity (Gere, 1977). There are no known oil, gas, or coal resources in or near the wetland (Michigan Geological Survey 1977; Smith, 1915).

Although Saunders Point Wetland is partially wooded (U.S.G.S. quadrangle map, Gladstone, Michigan, 1958; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978), its location largely within a city park precludes commercial exploitation of the forest resource.

Public Utilities and Facilities

There is a sewage disposal plant located to the southwest of Saunders Point Wetland (U.S.G.S. quadrangle map, Gladstone, Michigan, 1958).

Pollution Sources

There are no NPDES permit holders adjacent to Saunders Point Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Saunders Point Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 303

The literature search identified no on-going or impending research projects pertaining to Saunders Point Wetland.

KIPLING WETLAND

PHYSIOGRAPHIC SETTING

LM 304

Setting

Kipling Wetland is located on the western shoreline of Little Bay de Noc in Delta County, Michigan, 0.7 mile north of the city of Gladstone. A steep bluffline, 110 feet high, is located just over 0.5 mile inland from the wetland. Kipling Wetland is a low, non-wooded Lacustrine System, and fluctuations in the level of Lake Michigan probably alter the size of the wetland (U.S.G.S. quadrangle map, Gladstone, Michigan, 1958).

Topography

The total relief of Kipling Wetland is very slight. Wetland elevations range from 580 to approximately 583 feet above sea level (lake level to 3 feet above the approximate mean elevation of Lake Michigan). The wetland lies on a narrow lacustrine plain. A steep bluffline, located to the west of the wetland, generally marks the eastern boundary of a till plain known as the Alger Hill-land. The rolling-to-hilly area located inland from the wetland is dissected by the Escanaba River, and large wetlands occupy low sites in the region. The Great Lakes Basin Commission (1975) describes the shoreline near Kipling Wetland as an erodible low plain.

Surficial Geology

The surficial geology of Kipling Wetland is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in Kipling Wetland is Au Gres loamy sand, gravelly subsoil variant. The surface layer of this Au Gres variant consists of dark grayish-brown loamy sand underlain with brown, stratified coarse sand and fine gravel. This soil has low natural fertility, low available water capacity, and rapid permeability (Berndt, 1977).

Hydrology

There are no streams flowing through Kipling Wetland (U.S.G.S. quadrangle map, Gladstone, Michigan, 1958). The literature search provided no site-specific data pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Kipling Wetland.

Climate

The closest weather station providing climatic data for Kipling Wetland is located in Escanaba, Michigan. In 1975, the average monthly temperature was 42.7°F, the average daily low for January was 12.2°F and the average daily high in July was 76.2°F. The average annual precipitation is 28.01 inches, with a mean monthly precipitation of 1.27 inches in January and 3.42 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a half months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Kipling Wetland (U.S.G.S. quadrangle map, Gladstone, Michigan, 1958; Michigan Department of State Highways and Transportation aerial photograph, 1973; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

BIOTIC SETTING

LM 304

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Kipling Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Kipling Wetland.

Invertebrates

Modlin et al. (1973) provide information on the species composition, distribution and biomass of the water mites (Acari) in the Great Lakes. Appendix B-4 lists the aquatic Acari found in littoral habitat of the Great Lakes which included Little Bay de Noc. Piona rotunda was the most abundant species in plankton collections from Little Bay de Noc. These organisms may occur in Kipling Wetland owing to its location contiguous to the bay.

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Kipling Wetland.

Reptiles and Amphibians

Appendix C-13 contains general information on reptiles and amphibians of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Kipling Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Little Bay de Noc is an important concentration area for migratory waterfowl, especially during low water years (Martz, 1976). The bay is suitable for resting waterfowl because it is protected from westerly winds and therefore from wave action. Between 1910 and 1958, the wetland area of Little Bay de Noc was reduced by fifty per cent; the effect of this loss on the wetland bird community has not been documented (Jaworski and Raphael, 1978).

Appendix D-30 contains general information on wetland birds of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Kipling Wetland.

The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Kipling Wetland.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Kipling Wetland by the literature search. The bald eagle (Haliaeetus leucocephalus) is an uncommon summer visitant in the Little Bay de Noc area, but no active nests exist near the shoreline (S. Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication).

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland.

Population

Kipling Wetland is located in Brampton Township of Delta County, Michigan. The county is sparsely populated, having a density of 31 persons per square mile. Table 13-5 indicates that Delta County and Brampton Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that rapid population growth is expected to continue in Delta County.

Table 13-5. Population Data for the Vicinity of Kipling Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Delta County	39,358	9.6	45,953
Brampton Township	962	30.5	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Kipling Wetland has been partially developed as a residential area. The wetland continues to exist in areas between the houses. A mixture of industrial and residential uses, interspersed with urban open space uses, surrounds the wetland. A primary highway lies adjacent to the western side of the wetland, and oil storage tanks are located nearby. Kipling Wetland is under private ownership (U.S.G.S. quadrangle map, Gladstone, Michigan, 1958; Michigan Department of State Highways and Transportation aerial photograph, 1973; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978; Central Upper Peninsula Planning and Development Regional Commission, 1978).

The location of residential development within the wetland and its proximity to the city of Gladstone suggests that it is subject to high developmental pressure.

Recreation

There are no known state or federal recreational facilities in the vicinity of Kipling Wetland.

Mineral, Energy, and Forest Resources

Kipling Wetland is within an area underlain by limestone and dolomites, but there are no quarrying operations in the vicinity (Gere, 1977). There are two active sand and gravel operations approximately 0.5 mile northeast of the wetland (Michigan State Highways and Transportation aerial photograph, 1973). No oil, gas, or coal resources are present in or near the wetland (Michigan Geological Survey 1977; Smith, 1915). There are no significant forest resources in the wetland (U.S.G.S. quadrangle map, Gladstone, Michigan, 1958; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Kipling Wetland (U.S.G.S. quadrangle map, Gladstone, Michigan, 1958).

Pollution Sources

There are no NPDES permit holders adjacent to Kipling Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Kipling Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 304

The literature search identified no on-going or impending research projects pertaining to Kipling Wetland.

DAYS RIVER WETLAND

PHYSIOGRAPHIC SETTING

LM 305

Setting

Days River Wetland is located at the mouth of the Days River, on the western shoreline of Little Bay de Noc in Delta County, Michigan, 1.8 miles southwest of the city of Rapid River, Michigan. A steep bluffline, over 100 feet high, lies to the west of the wetland. Days River cuts through this bluffline before it reaches Little Bay de Noc. An arcuate delta has formed at the river mouth, and abandoned meanders are present within Days River Wetland. Days River Wetland is a Lacustrine System; it occupies a low, partially wooded site within the Hiawatha National Forest (U.S.G.S. quadrangle map, Rapid River, Michigan, 1958; Michigan Department of State Highways and Transportation aerial photographs, 1973).

Topography

Days River Wetland has a total relief of 10 feet; wetland elevations range from 580 to 590 feet above sea level, zero to 10 feet above the approximate mean elevation of Lake Michigan. The wetland lies on a narrow lacustrine plain. A steep bluffline, located to the west of the wetland, generally marks the eastern boundary of a till plain known as the Alger Hill-land. This area is rolling to hilly, and large wetlands occupy low sites in the region.

Surficial Geology

The surficial geology of Days River Wetland is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments, consisting of fine-grained products of glacial erosion, are found along the shore of Little Bay de Noc (Martin, 1957; Dorr and Eschman, 1970).

Soils

Marsh soil is found on the north bank of Days River Wetland and Alluvial land is found on the south bank. Alluvial land ranges from sand to loam and usually has a surface layer of black muck underlain by sand; shallow organic soils and areas of poorly drained mineral soil may also be included in this soil type. Alluvial land has low to moderate available water capacity and low to medium natural fertility. It is poorly drained, with slow or ponded runoff, and is found on level flood plains along major streams. Marsh soil ranges from sand to clay loam. These soils are wet most of the year and are found on inland lake borders and areas bordering Lake Michigan (Berndt, 1977).

Hydrology

The Days River flows through Days River Wetland (U.S.G.S. quadrangle map, Rapid River, Michigan, 1958). The river has a drainage area of 70 square miles. Stream discharge data were collected on July 23, 1976. The discharge was 5.5

feet per second (U.S. Geological Survey, 1977). The water quality of the Days River is excellent, since there are no known sources of pollution in the river basin (Great Lakes Basin Commission, 1975).

The literature search provided no site-specific data pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Days River Wetland.

Climate

The closest weather station providing climatic data for Days River Wetland is located in Escanaba, Michigan. In 1975, the average monthly temperature was 42.7°F, the average daily low for January was 12.2°F and the average daily high in July was 76.2°F. The average annual precipitation is 28.01 inches, with a mean monthly precipitation of 1.27 inches in January and 3.42 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a half months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

The Days River delta contains small islands and abandoned meanders (U.S.G.S. quadrangle map, Rapid River, Michigan, 1958; Michigan Department of State Highways and Transportation aerial photograph, 1973).

BIOTIC SETTING

LM 305

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Days River Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Days River Wetland.

Invertebrates

Modlin et al. (1973) provide information on the species composition, distribution and biomass of the water mites (Acari) in the Great Lakes. Appendix B-4 lists the aquatic Acari found in littoral habitat of the Great Lakes which included Little Bay de Noc. Piona rotunda was the most abundant species in plankton collections from Little Bay de Noc. These organisms may occur in Days River Wetland owing to its location contiguous to the bay.

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Days River Wetland.

Reptiles and Amphibians

Appendix C-13 contains general information on reptiles and amphibians of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Days River Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Little Bay de Noc is an important concentration area for migratory waterfowl, especially during low water years (Martz, 1976). The bay is suitable for resting waterfowl because it is protected from westerly winds and therefore from wave action. Between 1910 and 1958, the wetland area of Little Bay de Noc was reduced by fifty per cent; the effect of this loss on the wetland bird community has not been documented (Jaworski and Raphael, 1978).

Appendix D-30 contains general information on wetland birds of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Days River Wetland.

The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Days River Wetland.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Days River Wetland by the literature search. The bald eagle (Haliaeetus leucocephalus) is an uncommon summer visitant in the Little Bay de Noc area, but no active nests exist near the shoreline (S. Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication).

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland.

CULTURAL SETTING

LM 305

Population

Days River Wetland is located in Brampton Township of Delta County, Michigan. The county is sparsely populated, having a density of 31 persons per square mile. Table 13-6 indicates that Delta County and Brampton Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that rapid population growth is expected to continue in Delta County.

Table 13-6. Population Data for the Vicinity of Days River Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Delta County	39,358	9.6	45,953
Brampton Township	962	30.5	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Days River Wetland is primarily rural open space. A few residences are located in the southern portion of the wetland. The area surrounding the wetland is characterized by rural open space, with scattered residential development to the southwest and the northeast and limited agricultural open space uses inland. A primary highway is located to the west of Days River Wetland, and an access road is located to the north (Central Upper Peninsula Planning and Development Regional Commission, 1978; Michigan Department of State Highways and Transportation aerial photograph, 1973). The portion of the wetland south of the Days River is under private ownership, while the segment north of the river is under state ownership (Rockford Map Publishers, Inc., 1976; Central Upper Peninsula Planning and Development Regional Commission, 1978).

Since residences already exist within the portion of the wetland under private ownership, developmental pressures on that portion of the wetland appear to be moderate. State ownership of the northern portion of the wetland suggests that this portion is subject to low developmental pressure.

Recreation

Although Days River Wetland lies within the Hiawatha National Forest, there are no specifically designated recreation areas in or near the wetland (U.S. Forest Service, 1978).

Mineral, Energy, and Forest Resources

Days River Wetland is within an area underlain by limestone and dolomites, but there are no quarrying operations in the vicinity (Gere, 1977). No oil, gas, or coal resources are present in or near the wetland (Michigan Geological Survey 1977; Smith, 1915).

Days River Wetland is a partially wooded area within the Hiawatha National Forest. Specific information on the commercial value of forest resources and operations for harvesting these resources is not available for Days River Wetland. However, any harvest of timber would be subject to Forest Service policy that actions affecting a wetland require interdisciplinary review (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978; U.S. Forest Service, 1978).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Days River Wetland (U.S.G.S. quadrangle map, Rapid River, Michigan, 1958).

Pollution Sources

There are no NPDES permit holders adjacent to Days River Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Days River Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 305

The literature search identified no on-going or impending research projects pertaining to Days River Wetland.

WHITEFISH RIVER AREA WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LM 306-310

Setting

The Whitefish River Area Wetland Complex is comprised of Masonville Wetland, Rapid River Wetland, and Whitefish River Wetlands #1-#3. The complex is located adjacent to the Lake Michigan shoreline at the head of Little Bay de Noc near the mouths of the Tacoosh River, the Rapid River, and the Whitefish River, in Delta County, Michigan. Rapid River Wetland is adjacent to the city of Rapid River, and part of the city appears to have been built on drained portions of this wetland. Masonville Wetland lies 0.6 mile southwest of the city of Rapid River, and Whitefish River Wetlands #1-#3 are located 1.1 miles southeast of the city, within the river course. All of these wetlands are Lacustrine Systems and occupy low, non-wooded sites within the Hiawatha National Forest (U.S.G.S. quadrangle map, Rapid River, Michigan, 1958).

Topography

The elevations and total relief of individual wetlands in the Whitefish River area Wetland Complex are listed in Table 13-7.

Table 13-7. Elevations and Total Relief of Individual Wetlands in the Whitefish River Area Wetland Complex

	Minimum elevation (feet) ^a	Maximum elevation (feet) ^a	Total relief (feet)
Masonville Wetland	580	590	10
Rapid River Wetland	580	595	15
Whitefish River Wetlands #1-#3	580	583	3

^a Elevations measured in feet above sea level; the approximate mean elevation of Lake Michigan is 580 feet above sea level.

Surficial Geology

The surficial geology of Masonville Wetland is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970). The surficial geology of Rapid River Wetland and Whitefish River Wetlands #1-#3 consists of rock at or near the surface (Martin, 1957).

Soils

There are five soil types found in the wetlands of the Whitefish River Area Wetland Complex. Marsh and Chippeny muck are found in Masonville Wetland. Rapid River Wetland has Alluvial land on the Tacoosh River and Rapid River deltas; Cathro and Tacoosh mucks are found on the banks of the upper Tacoosh River, and Nahma loam is found on the upper part of Rapid River in the wetland. Whitefish River Wetlands #1-#3 consist of Marsh soil (Berndt, 1977).

Alluvial land ranges from sand to loam and usually has a surface layer of black muck underlain by sand. Shallow organic soils and areas of poorly drained mineral soil may also be included in this soil type. Alluvial land has low or moderate available water capacity and low to medium natural fertility. This soil is poorly drained, with slow or ponded runoff, and is found on level flood plains along major streams. Marsh soils range from sand to clay loam; they are wet most of the year and are found on inland lake borders and areas bordering Lake Michigan. Cathro and Tacoosh mucks consist of organic soils underlain by loam. These soils have low natural fertility and are wet, although permeability is rapid in the upper strata (Berndt, 1977).

Nahma loam has a surface layer of black muck over black loam underlain by greenish-gray, friable loam and weathered limestone. Nahma loam is a poorly drained soil having moderate available water capacity and medium natural fertility. Chippeny muck has a surface layer of black muck underlain by dark gray muck and dark grayish-brown silty clay loam over limestone. This soil is very poorly drained and has high available water capacity and low natural fertility. Chippeny muck formed from organic material derived from woody plants (Berndt, 1977).

Hydrology

There are no streams flowing through Masonville Wetland. The Tacoosh River flows through the western half of Rapid River Wetland, and the Rapid River flows through the eastern half of the wetland. The Tacoosh River has a drainage area of 60 square miles and an elevational change of approximately 10 feet as it travels through Rapid River Wetland. The discharge rate for the Tacoosh River, based upon measurements taken on July 23, 1976, is 0.58 cubic feet per second (U.S. Geological Survey, 1977). The Rapid River has a drainage area of 140 square miles and an elevational change of two or three feet as it travels through Rapid River Wetland. The discharge rate for Rapid River, taken on April 14, 1976, was 889.0 cubic feet per second (U.S. Geological Survey, 1977). Whitefish River Wetlands #1-#3 are situated at the mouth of the Whitefish River. There is little elevational change in the river as it flows through the wetlands (U.S.G.S. quadrangle map, Rapid River, Michigan, 1958).

The water quality of the Whitefish River is considered to be excellent, since there are no known sources of pollution in the river basin. The Rapid River has one reach (not specified) having substandard water quality caused by high coliform densities (Great Lakes Basin Commission, 1975).

The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water

quality, depth, or seasonal changes in the wetlands of the Whitefish River Area Wetland Complex.

Climate

The closest weather station providing climatic data for the Whitefish River Area Wetland Complex is located in Escanaba, Michigan. In 1975, the average monthly temperature was 42.7°F, the average daily low for January was 12.2°F and the average daily high in July was 76.2°F. The average annual precipitation is 28.01 inches, with a mean monthly precipitation of 1.27 inches in January and 3.42 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a half months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

Natural special features in the vicinity of the Whitefish River Area Wetland Complex include three bay head deltas, a bay head sand bar, and abandoned river meanders. Steep coastal bluffs are also found in the area (U.S.G.S. quadrangle map, Rapid River, Michigan, 1958; Michigan Department of State Highways and Transportation aerial photograph, 1973).

BIOTIC SETTING

LM 306-310

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of the Whitefish River Area Wetland Complex.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in the Whitefish River Area Wetland Complex.

Invertebrates

Modlin et al. (1973) provide information on the species composition, distribution and biomass of the water mites (Acari) in the Great Lakes. Appendix B-4 lists the aquatic Acari found in littoral habitat of the Great Lakes which included Little Bay de Noc. Piona rotunda was the most abundant species in plankton collections from Little Bay de Noc. These organisms may occur in the wetlands of this complex owing to its location contiguous to the bay.

The literature search produced no site-specific information pertaining to seasonal distribution, density and productivity, major food sources or

relationship to water levels of the invertebrates present in the five wetlands comprising the Whitefish River Area Wetland Complex.

Reptiles and Amphibians

Appendix C-13 contains general information on reptiles and amphibians of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to the Whitefish River Area Wetland Complex. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in these wetlands.

Avifauna

Scharf et al. (1977) visited Rapid River Wetland in late June of 1976 and reported about 15 pairs of black terns (Chlidonias nigra) nesting in sedges and bulrushes near the mouth of the Rapid River.

Little Bay de Noc is an important concentration area for migratory waterfowl, especially during low water years (Martz, 1976). The bay is suitable for resting waterfowl because it is protected from westerly winds and therefore from wave action. Between 1910 and 1958, the wetland area of Little Bay de Noc was reduced by fifty per cent; the effect of this loss on the wetland bird community has not been documented (Jaworski and Raphael, 1978).

A wetland area of 160 acres, located on the Whitefish River just north of Rapid River Wetland and Whitefish River Wetlands #1-#3, is included in the Mississippi Flyway Habitat Reconnaissance (Martz, 1976). This study is a cooperative effort between the Michigan Department of Natural Resources and the U.S. Fish and Wildlife Service designed to identify high quality waterfowl habitat that is inadequately protected. This wetland functions as important habitat for breeding and migratory waterfowl.

Appendix D-30 contains general information on wetland birds of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to the Whitefish River Area Wetland Complex.

The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing these wetlands.

Mammals

The five wetlands of the Whitefish River Area Wetland Complex are considered exceptional habitat for muskrat (Ondatra zibethicus) (Jaworski and Raphael, 1978).

The literature search provided no site-specific data pertaining to other major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship

to water levels of the mammals inhabiting the five wetlands comprising the Whitefish River Area Wetland Complex.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in the Whitefish River Area Wetland Complex by the literature search. The bald eagle (Haliaeetus leucocephalus) is an uncommon summer visitant in the Little Bay de Noc area, but no active nests exist near the shoreline (S. Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication).

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland. However, an NPDES permit holder discharges process wastes to the groundwater and several sand and gravel operations are present in the area; these factors may have some effect on the health of the wetland.

CULTURAL SETTING

LM 306-310

Population

The Whitefish River Area Wetland Complex is located in Masonville Township of Delta County, Michigan. The county is sparsely populated, having a density of 31 persons per square mile. Table 13-8 indicates that Delta County and Masonville Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that rapid population growth is expected to continue in Delta County.

Table 13-8. Population Data for the Vicinity of the Whitefish River Area Wetland Complex

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Delta County	39,358	9.6	45,953
Masonville Township	1,754	24.5	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within the Whitefish River Area Wetland Complex is predominantly rural open space, although a few residences are located within the boundaries of Masonville Wetland and Rapid River Wetland. The area surrounding Masonville Wetland is rural open space, with scattered residential areas. The surroundings of Rapid River Wetland include a mixture of agricultural and other rural open space uses, as well as residential, commercial, and industrial development (the town of Rapid River). Land use in the area surrounding the Whitefish River inlet, in which Whitefish River Wetlands #1-#3 are located, is primarily shoreline residential. Rail lines, access roads, and a primary highway lie in or near all of the wetlands in this complex. A landing field lies to the north of Rapid River Wetland, and sand and gravel pits are located near Masonville Wetland and Rapid River Wetland (U.S.G.S. quadrangle map, Rapid River, Michigan, 1958; Michigan Department of State Highways and Transportation aerial photograph, 1973; Central Upper Peninsula Planning and Development Regional Commission, 1978; Michigan Department of State Highways and Transportation aerial photograph, 1973).

A portion of the northern segment of Rapid River Wetland is under federal ownership, and the small point extending into Little Bay de Noc directly south of the city of Rapid River is under state ownership. The remainder of the wetland is privately owned. Masonville Wetland and Whitefish River Wetlands #1-#3 are also privately owned (Rockford Map Publishers, Inc., 1976).

The presence of residential development in Masonville Wetland suggests that developmental pressures may be moderate to high. Developmental pressures for Rapid River Wetland also appear to be moderate to high owing to the close proximity of the wetland to the city of Rapid River. Developmental pressures for Whitefish River Wetlands #1-#3 appear to be low.

Recreation

The Whitefish River Area Wetland Complex lies within the Hiawatha National Forest. Although there are no specifically designated recreation areas in or near the wetlands, the Whitefish River is used for canoeing (U.S. Forest Service, 1978).

Mineral, Energy, and Forest Resources

The wetlands of the Whitefish River Area Wetland Complex are within an area underlain by limestone and dolomites, but there are no quarrying operations in the vicinity (Gere, 1977). A number of active sand and gravel operations are present in the area, including one located just west of Masonville Wetland and several operations lying north of Rapid River Wetland within the Rapid River floodplain (Michigan Department of State Highways and Transportation aerial photograph, 1973). Whitefish River Wetlands #1-#3 are near the northwestern edge of an area of shale outcroppings, but there are no active shale operations in the area (Gere, 1977). No oil, gas, or coal resources are present in or near the wetlands (Michigan Geological Survey, 1977; Smith, 1915). There are no significant forest resources in any of the wetlands (U.S.G.S. quadrangle map, Rapid River, Michigan, 1958; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of the five wetlands in the Whitefish River Area Wetland Complex (U.S.G.S. quadrangle map, Rapid River, Michigan, 1958).

Pollution Sources

The Rapid River Cheese Company is located close to Rapid River Wetland (T40N, R21W, Sec. 20, SE 1/4 of SW 1/4). This company, an NPDES permit holder, discharges process wastes to the groundwater. There are no NPDES permit holders adjacent to Masonville Wetland or Whitefish Rier Wetlands #1-#3 (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of the five wetlands in the Whitefish River Area Wetland Complex (Peebles and Black, 1976), but the Michigan Coastal Zone inventory indicates that two archaeological sites (20-DE-12, 20-DE-16) are present in the vicinity of the wetlands. Information concerning the field research and exact location of these sites can be obtained from the Michigan History Division.

RESEARCH PROJECTS

LM 306-310

The literature search identified no on-going or impending research projects pertaining to the Whitefish River Area Wetland Complex.

SQUAW POINT WETLAND

PHYSIOGRAPHIC SETTING

LM 311

Setting

Squaw Point Wetland is located adjacent to the eastern side of Little Bay de Noc in Delta County, Michigan, approximately 0.8 mile southeast of the city of Gladstone. The wetland extends from the northern bank of Squaw Creek northward to Squaw Point. The shoreline south of Squaw Point slopes gently, and offshore depths are shallow. Fluctuations in the level of Lake Michigan probably alter the size of Squaw Point Wetland. The wetland includes both Lacustrine and Palustrine areas; it occupies a raised, wooded site within the Hiawatha National Forest (U.S.G.S. quadrangle maps, Gladstone, Michigan, 1958, and Rapid River, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

Topography

The total relief of Squaw Point Wetland is 30 feet. Wetland elevations range from 580 to 610 feet above sea level, 0 to 30 feet above the approximate mean elevation of Lake Michigan. The wetland lies on a lacustrine plain which is bordered to the east and south by a till plain. Topography of the till plain is rolling to hilly, and large inland wetlands occupy low sites in this region. The northernmost portion of Squaw Point Wetland lies on a bay-side bar; this area is low and subject to lake influences.

Surficial Geology

The surficial geology of Squaw Point Wetland is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

There are seven soil types found in Squaw Point Wetland. Alluvial land is found near the open water in Squaw Point Wetland. Eastport sand is found along the Little Bay de Noc shore, while Tawas muck is present in the northern part of the wetland and close to the shore. Roscommon mucky sand is found in patches in the northern part of the wetland and to the south of areas containing Tawas muck. Au Gres and Rubicon sands and Kinross mucky sand are present north of Squaw Creek (Berndt, 1977).

Roscommon mucky sand, formed from sandy material, has a surface layer consisting of black muck underlain by sand. This soil has little available water capacity, rapid permeability, and low natural fertility. Tawas muck has a shallow surface layer of grayish-brown mucky peat underlain by black muck, dark gray muck, and sand; it has high available water capacity in the organic layers and low natural fertility. Eastport sand has been altered by shifting wind,

which has prevented the formation of a distinct soil profile. This soil is alkaline, and the surface layer consists of dark-gray sand, including organic matter, underlain by loose light-brown sand or fine sand. Eastport sand is well drained (Berndt, 1977).

Au Gres sand has a surface layer of very dark gray sand underlain by light brownish-gray sand, friable dark-brown sand, and brown sand. This soil has a very low available water capacity, low natural fertility, and rapid permeability. Au Gres sand is a somewhat poorly drained soil that formed from sandy material. Rubicon sand has a very shallow surface layer (one inch) of black sand, with a subsurface ranging from brown friable sand to brown loose sand. This soil may also contain areas of Au Gres and Roscommon soils. Rubicon sand has very low available water capacity and low natural fertility, and is well drained. Kinross mucky sand has a surface layer of black muck underlain by grayish-brown sand. This soil has very low available water capacity and low natural fertility, and is poorly drained (Berndt, 1977).

Alluvial land ranges from sand to loam, and usually has a surface layer of black muck and a subsurface of sand. Shallow organic soils and areas of poorly drained mineral soil may also be included in this soil type. Alluvial land has low or moderate available water capacity and low to medium natural fertility. This soil is poorly drained, with slow or ponded runoff, and is found on level flood plains along major streams (Berndt, 1977).

Hydrology

An elongated pond is located in the east-central part of Squaw Point Wetland. No streams flow through the wetland (U.S.G.S. quadrangle map, Rapid River, Michigan, 1958). The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Squaw Point Wetland.

Climate

The closest weather station providing climatic data for Squaw Point Wetland is located in Escanaba, Michigan. In 1975, the average monthly temperature was 42.7°F, the average daily low for January was 12.2°F and the average daily high in July was 76.2°F. The average annual precipitation is 28.01 inches, with a mean monthly precipitation of 1.27 inches in January and 3.42 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a half months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Squaw Point Wetland (U.S.G.S. quadrangle map, Rapid River, Michigan 1958; Michigan Shorelands Management Unit aerial photograph, 1974).

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Squaw Point Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Squaw Point Wetland.

Invertebrates

Modlin et al. (1973) provide information on the species composition, distribution and biomass of the water mites (Acari) in the Great Lakes. Appendix B-4 lists the aquatic Acari found in littoral habitat of the Great Lakes which included Little Bay de Noc. Piona rotunda was the most abundant species in plankton collections from Little Bay de Noc. These organisms may occur in Squaw Point Wetland owing to its location contiguous to the bay.

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in this wetland.

Reptiles and Amphibians

Appendix C-13 contains general information on reptiles and amphibians of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Squaw Point Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food source, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Little Bay de Noc is an important concentration area for migratory waterfowl, especially during low water years (Martz, 1976). The bay is suitable for resting waterfowl because it is protected from the westerly winds and therefore from wave action. Between 1910 and 1958, the wetland area of Little Bay de Noc was reduced by fifty per cent; the effect of this loss on the wetland bird community has not been documented (Jaworski and Raphael, 1978).

Appendix D-30 contains general information on wetland birds of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Squaw Point Wetland. The literature search provided no

site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Squaw Point Wetland.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Squaw Point Wetland by the literature search. The bald eagle (Haliaeetus leucocephalus) is an uncommon summer visitant in the Little Bay de Noc area, but no active nests exist near the shoreline (S. Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication).

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland.

CULTURAL SETTING

LM 311

Population

Squaw Point Wetland is located in Bay de Noc Township of Delta County, Michigan. The county is sparsely populated, having a density of 31 persons per square mile. Table 13-9 indicates that Delta County and Bay de Noc Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that rapid population growth is expected to continue in Delta County.

Table 13-9. Population Data for the Vicinity of Squaw Point Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Delta County	39,358	9.6	45,953
Bay de Noc Township	348	11.5	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Squaw Point Wetland is rural open space. Two areas of shoreline residential development lie on Little Bay de Noc west of the central portion of the wetland. The remainder of the surrounding area is primarily in rural open space uses. A lighthouse is located at the end of Squaw Point, and Bay de Noc Cemetery lies to the east of the wetland (U.S.G.S. quadrangle map, Rapid River, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974; Central Upper Peninsula Planning and Development Regional Commission, 1978). The wetland is under mixed private and federal ownership (Rockford Map Publishers, Inc., 1976)

Developmental pressures on the privately-owned portions of the wetland on Little Bay de Noc appear to be moderate, owing to the attractiveness of the area for shoreline residential development. The portion of the wetland further inland and the area under federal ownership appear to be under low developmental pressures.

Recreation

Although Squaw Point Wetland lies within the Hiawatha National Forest, there are no specifically designated recreational areas in or near the wetland (U.S. Forest Service, 1978).

Mineral, Energy, and Forest Resources

Squaw Point Wetland is within an area underlain by limestone and dolomites, but there are no quarrying operations in the vicinity of the wetland. Similarly, there are no operations utilizing the known shale outcroppings that exist in this area (Gere, 1977). There are no oil, gas, or coal resources in or near the wetland (Michigan Geological Survey 1977; Smith, 1915).

Squaw Point Wetland is a wooded wetland situated within the Hiawatha National Forest. Specific information on the commercial value of forest resources and operations for harvesting these resources is not available for the wetland. However, any harvest of timber would be subject to Forest Service policy that actions affecting a wetland require interdisciplinary review (U.S.

Forest Service, 1978; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Squaw Point Wetland (U.S.G.S. quadrangle maps, Gladstone, Michigan, 1958, and Rapid River, Michigan, 1958).

Pollution Sources

There are no NPDES permit holders adjacent to Squaw Point Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Squaw Point Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 311

The literature search identified no on-going or impending research projects pertaining to Squaw Point Wetland.

TRINITY CHURCH WETLAND

PHYSIOGRAPHIC SETTING

LM 312

Setting

Trinity Church Wetland is located 0.2 mile from the eastern shoreline of Little Bay de Noc in Delta County, Michigan, four miles southeast of the city of Escanaba. Trinity Church Wetland is situated four miles north of Peninsula Point, which separates Little Bay de Noc and Big Bay de Noc. The wetland is included in the Hiawatha National Forest. Trinity Church Wetland is a Palustrine System; it occupies a raised, wooded site behind a steep bluff which rises to 30 feet above the lakeshore (U.S.G.S. quadrangle map, Peninsula Point, Michigan, 1958).

Topography

The total relief of Trinity Church Wetland is approximately 5 feet; wetland elevations range from 613 to 618 feet above sea level, 33 to 38 feet above the approximate mean elevation of Lake Michigan. The wetland is located on a lacustrine plain which forms a south-facing peninsula protruding into Green Bay. Large inland wetlands occupy low sites within this region. The Great Lakes Basin Commission (1975) describes the shoreline near this wetland as a non-erodible low bluff.

Surficial Geology

The surficial geology of Trinity Church Wetland consists of rock at or near the surface (Martin, 1957).

Soils

The soil type in Trinity Church Wetland is Nahma loam, which has a surface layer of black muck over black loam, underlain by greenish-gray, friable loam and weathered limestone. Nahma loam is poorly drained and has moderate available water capacity and medium natural fertility. It is formed in loamy material on till plains (Berndt, 1977).

Hydrology

There are no streams flowing through Trinity Church Wetland (U.S.G.S. quadrangle map, Peninsula Point, Michigan, 1958). The literature search provided no site-specific data pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Trinity Church Wetland.

Climate

The closest weather station providing climatic data for Trinity Church Wetland is located in Escanaba, Michigan. In 1975, the average monthly

temperature was 42.7⁰F, the average daily low for January was 12.2⁰F and the average daily high in July was 76.2⁰F. The average annual precipitation is 28.01 inches, with a mean monthly precipitation of 1.27 inches in January and 3.42 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a half months long, with the last killing frost (28⁰F) in 1975 occurring on April 21 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

Trinity Church lies between the wetland and the shoreline, and a steep bluff parallels the shoreline (U.S.G.S. quadrangle map, Peninsula Point, Michigan, 1958.)

BIOTIC SETTING

LM 312

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Trinity Church Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Trinity Church Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Trinity Church Wetland.

Reptiles and Amphibians

Appendix C-13 contains general information on reptiles and amphibians of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Trinity Church Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Little Bay de Noc is an important concentration area for migratory waterfowl, especially during low water years (Martz, 1976). The bay is suitable for resting waterfowl because it is protected from the westerly winds and

therefore from wave action. Between 1910 and 1958, the wetland area of Little Bay de Noc was reduced by fifty per cent; the effect of this loss on the wetland bird community has not been documented (Jaworski and Raphael, 1978).

Appendix D-30 contains general information on wetland birds of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Trinity Church Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Trinity Church Wetland.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Trinity Church Wetland by the literature search. The bald eagle (Haliaeetus leucocephalus) is an uncommon summer visitant in the Little Bay de Noc area, but no active nests exist near the shoreline (S. Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication).

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland.

CULTURAL SETTING

LM 312

Population

Trinity Church Wetland is located in Bay de Noc Township of Delta County, Michigan. The county is sparsely populated, having a density of 31 persons per square mile. Table 13-10 indicates that Delta County and Bay de Noc Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that rapid population growth is expected to continue in Delta County.

Table 13-10. Population Data for the Vicinity of Trinity Church Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Delta County	39,358	9.6	45,953
Bay de Noc Township	348	11.5	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Trinity Church Wetland is in agricultural and other rural open space uses. The surrounding area is primarily in agricultural and other rural open space uses, with occasional residential development along Little Bay de Noc (Central Upper Peninsula Planning and Development Regional Commission, 1978). The wetland is under private ownership (Rockford Map Publishers, Inc., 1976), and development pressures are likely to be moderate.

Recreation

Although Trinity Church Wetland lies within the Hiawatha National Forest, there are no specifically designated recreational areas in or near the wetland (U.S. Forest Service, 1978).

Mineral, Energy, and Forest Resources

Trinity Church Wetland is within an area underlain by limestone and dolomites. An active dolomite quarry is located in the southern portion of the peninsula, but the exact location of the quarry is unknown (Gere, 1977). There are no known oil, gas, or coal resources in or near the wetland (Michigan Geological Survey 1977; Smith, 1915).

Trinity Church Wetland is a wooded wetland contained within the Hiawatha National Forest. Specific information on the commercial value of forest resources and operations for harvesting these resources is not available for the wetland. However, any harvest of timber would be subject to Forest Service policy that actions affecting a wetland require interdisciplinary review (U.S. Forest Service, 1978; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Trinity Church Wetland (U.S.G.S. quadrangle map, Peninsula Point, Michigan, 1958).

Pollution Sources

There are no NPDES permit holders adjacent to Trinity Church Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Trinity Church Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 312

The literature search identified no on-going or impending research projects pertaining to Trinity Church Wetland.

DEEPWATER POINT WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LM 313-314

Setting

The Deepwater Point Wetland Complex, comprised of Deepwater Point Wetlands #1 and #2, is located on the eastern side of Little Bay de Noc in Delta County, Michigan, approximately four miles southeast of the city of Escanaba. Deepwater Point Wetland #1 is adjacent to the lakeshore, and Deepwater Point Wetland #2 is 0.1 mile inland. The wetlands are situated on Deepwater Point, which lies just north of Peninsula Point, the southernmost tip of the peninsula separating Little Bay de Noc and Big Bay de Noc. Low coastal beach ridges lie within Deepwater Point Wetland #2. Both wetlands are low, heavily wooded, Lacustrine Systems situated within the Hiawatha National Forest (U.S.G.S. quadrangle map, Peninsula Point, Michigan, 1958; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

Topography

The total relief of Deepwater Point Wetland #1 is ten feet; wetland elevations range from 580 to 590 feet above sea level, 0 to 10 feet above the approximate mean elevation of Lake Michigan. The total relief of Deepwater Point Wetland #2 is approximately eight feet, with elevations ranging from roughly 582 to 590 feet above sea level. Both wetlands are located on a lacustrine plain which forms a south-facing peninsula protruding into Green Bay. Large inland wetlands occupy low sites within this region. The Great Lakes Basin Commission (1975) describes the shoreline near the wetlands as a non-erodible low bluff.

Surficial Geology

The surficial geology of Deepwater Point Wetlands #1 and #2 consists of rock at or near the surface (Martin, 1957).

Soils

There are four soils found in the Deepwater Point Wetland Complex. Tawas muck and Cathro and Tacoosh mucks are found inland, and Alpena gravelly sandy loam is along the shore of Deepwater Point Wetland #1. Deepwater Point Wetland #2 is mostly comprised of Cathro and Tacoosh mucks inland and Nahma loam along the shore (Berndt, 1977).

The surface layer of Alpena gravelly sandy loam is very dark. This soil has low available water capacity, low natural fertility, and rapid permeability, and is generally found on low beach ridges. Tawas muck has a shallow (four inch) surface layer of grayish-brown mucky peat underlain by black muck, dark gray muck, and sand. Tawas muck has high available water capacity in the organic layers and low natural fertility; it is generally found on level or depressional areas on lake plains. Nahma loam has a surface layer of black muck

over black loam underlain by greenish-gray, friable loam and weathered limestone. This soil is poorly drained and has moderate available water capacity and medium natural fertility. Nahma loam formed in loamy material on till plains. Cathro and Tacoosh mucks consist of organic soils underlain by loam. These soils have low natural fertility and are wet, although permeability is rapid in the upper strata (Berndt, 1977).

Hydrology

There are no streams flowing through Deepwater Point Wetlands #1 and #2 (U.S.G.S. quadrangle map, Peninsula Point, Michigan, 1958). The literature search provided no site-specific data pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Deepwater Point Wetlands #1 and #2.

Climate

The closest weather station providing climatic data for the Deepwater Point Wetland Complex is located in Escanaba, Michigan. In 1975, the average monthly temperature was 42.7°F, the average daily low for January was 12.2°F and the average daily high in July was 76.2°F. The average annual precipitation is 28.01 inches, with a mean monthly precipitation of 1.27 inches in January and 3.42 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a half months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of the Deepwater Point Wetland Complex (U.S.G.S. quadrangle map, Peninsula Point, Michigan, 1958.)

BIOTIC SETTING

LM 313-314

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Deepwater Point Wetlands #1 and #2.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Deepwater Point Wetlands #1 and #2.

Invertebrates

Modlin et al. (1973) provide information on the species composition, distribution and biomass of the water mites (Acari) in the Great Lakes. Appendix B-4 lists the aquatic Acari found in littoral habitat of the Great Lakes which included Little Bay de Noc. Piona rotunda was the most abundant species in plankton collections from Little Bay de Noc. These organisms may occur in the Deepwater Point Wetland Complex owing to its location contiguous to the bay.

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in these wetlands.

Reptiles and Amphibians

Appendix C-13 contains general information on reptiles and amphibians of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Deepwater Point Wetlands #1 and #2. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in these wetlands.

Avifauna

Little Bay de Noc is an important concentration area for migratory waterfowl, especially during low water years (Martz, 1976). The bay is suitable for resting waterfowl because it is protected from westerly winds and therefore from wave action. Between 1910 and 1958, the wetland area of Little Bay de Noc was reduced by fifty per cent; the effect of this loss on the wetland bird community has not been documented (Jaworski and Raphael, 1978).

Appendix D-30 contains general information on wetland birds of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Deepwater Point Wetlands #1 and #2.

The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing these wetlands.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting the two wetlands comprising the Deepwater Point Wetland Complex.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in the Deepwater Point Wetland Complex by the literature search. The bald eagle (Haliaeetus leucocephalus) is an uncommon summer visitant in the Little Bay de Noc area, but no active nests exist near the shoreline (S. Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication).

Health

The available information is not sufficient to allow an evaluation of the environmental quality of these wetlands.

CULTURAL SETTING

LM 313-314

Population

Deepwater Point Wetlands #1 and #2 are located in Bay de Noc Township of Delta County, Michigan. The county is sparsely populated, having a density of 31 persons per square mile. Table 13-11 indicates that Delta County and Bay de Noc Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that rapid population growth is expected to continue in Delta County.

Table 13-11. Population Data for the Vicinity of Deepwater Point Wetlands #1 and #2

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Delta County	39,358	9.6	45,953
Bay de Noc Township	348	11.5	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Deepwater Point Wetlands #1 and #2 is rural open space. The surrounding area is primarily in agricultural and other rural open space uses, with a strip of shoreline residential development in the Dutchman Point area. An access road lies adjacent to Deepwater Point Wetlands #1 and #2, and a cemetery lies to the north of Deepwater Point Wetland #1 (U.S.G.S. quadrangle

map, Peninsula Point, Michigan, 1958; Central Upper Peninsula Planning and Development Regional Commission, 1978). The wetlands are under private ownership (Rockford Map Publishers, Inc., 1976). The location of the wetlands near the shoreline and the presence of a shoreline access road suggest that Deepwater Point Wetlands #1 and #2 are subject to low to moderate developmental pressures.

Recreation

Although Deepwater Point Wetlands #1 and #2 are within the Hiawatha National Forest, there are no specifically designated recreational areas in or near the wetlands (U.S. Forest Service, 1978).

Mineral, Energy, and Forest Resources

Deepwater Point Wetlands #1 and #2 are within an area underlain by limestone and dolomites. An active dolomite quarry is located in the southern portion of this peninsula, but the exact location of the quarry is not known (Gere, 1977). There are no known oil, gas, or coal resources in or near the wetlands (Michigan Geological Survey 1977; Smith, 1915).

Deepwater Point Wetlands #1 and #2 are wooded areas within the Hiawatha National Forest (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978). Specific information on the commercial value of forest resources and operations for harvesting these resources is not available for Deepwater Point Wetlands #1 and #2. However, any harvest of timber would be subject to Forest Service policy that actions affecting a wetland require interdisciplinary review (U.S. Forest Service, 1978).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Deepwater Point Wetlands #1 and #2 (U.S.G.S. quadrangle map, Peninsula Point, Michigan, 1958).

Pollution Sources

There are no NPDES permit holders adjacent to Deepwater Point Wetlands #1 and #2 (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Deepwater Point Wetlands #1 and #2, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 313-314

The literature search identified no on-going or impending research projects pertaining to Deepwater Point Wetlands #1 and #2.

PENINSULA POINT WETLAND

PHYSIOGRAPHIC SETTING

LM 315

Setting

Peninsula Point Wetland is located 250 feet from the Lake Michigan shoreline one mile north of Peninsula Point in Delta County, Michigan, five miles southeast of the city of Escanaba. Peninsula Point is the southernmost extension of land on the peninsula that separates Little Bay de Noc and Big Bay de Noc. The shoreline along the southern half of the wetland forms a gentle concave arc and is paralleled by coastal beach ridges. Peninsula Point Wetland is a low Lacustrine System; it occupies a wooded site within the Hiawatha National Forest (U.S.G.S. quadrangle map, Peninsula Point, Michigan, 1958).

Topography

The total relief of Peninsula Point Wetland is 10 feet; wetland elevations range from 580 to 590 feet above sea level, 0 to 10 feet above the approximate mean elevation of Lake Michigan. The wetland is located on a lacustrine plain which forms a peninsula protruding southward into Green Bay. Large inland wetlands occupy low sites within this region. The Great Lakes Basin Commission (1975) describes the shoreline near Peninsula Point Wetland as an erodible low plain.

Surficial Geology

The surficial geology of Peninsula Point Wetland consists of rock at or near the surface (Martin, 1957).

Soils

The soil type in Peninsula Point Wetland is Eastport-Roscommon sand, which has a surface layer of black, partially decomposed leaf litter underlain by sand. Eastport-Roscommon sand has little available water capacity, rapid permeability, and low natural fertility (Berndt, 1977).

Hydrology

There are no rivers flowing through Peninsula Point Wetland (U.S.G.S. quadrangle map, Peninsula Point, Michigan, 1958). The literature search provided no site-specific data pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Peninsula Point Wetland.

Climate

The closest weather station providing climatic data for Peninsula Point Wetland is located in Escanaba, Michigan. In 1975, the average monthly temperature was 42.7^oF, the average daily low for January was 12.2^oF and the

average daily high in July was 76.2°F. The average annual precipitation is 28.01 inches, with a mean monthly precipitation of 1.27 inches in January and 3.42 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a half months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

Beach ridges lie within Peninsula Point Wetland, and a small bay mouth bar is situated to the north (U.S.G.S. quadrangle map, Peninsula Point, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974).

BIOTIC SETTING

LM 315

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Peninsula Point Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Peninsula Point Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Peninsula Point Wetland.

Reptiles and Amphibians

Appendix C-13 contains general information on reptiles and amphibians of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Peninsula Point Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food source, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Big Bay de Noc is an important concentration area for migratory waterfowl, especially during low water years (Martz, 1976). The bay is suitable for resting waterfowl because it is protected from westerly winds and therefore from wave action.

Appendix D-30 contains general information on wetland birds of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Peninsula Point Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Peninsula Point Wetland.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Peninsula Point Wetland by the literature search. The bald eagle (Haliaeetus leucocephalus) is an uncommon resident of the Big Bay de Noc vicinity, but no active nests exist near the shoreline (S. Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication). The osprey (Pandion haliaetus), threatened in Wisconsin, nests in the Big Bay de Noc area. Postupalsky (1977) identified three pairs of ospreys in the area in 1971, but reports that the breeding population is decreasing in numbers.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland.

CULTURAL SETTING

LM 315

Population

Peninsula Point Wetland is located in Bay de Noc Township of Delta County, Michigan. The county is sparsely populated, having a density of 31 persons per square mile. Table 13-12 indicates that Delta County and Bay de Noc Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that rapid population growth is expected to continue in Delta County.

Table 13-12. Population Data for the Vicinity of Peninsula Point Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Delta County	39,358	9.6	45,953
Bay de Noc Township	348	11.5	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Peninsula Point Wetland is rural open space. The surrounding area is primarily in agricultural and other rural open space uses, with shoreline residential development to the east of the wetland. An access road lies between the wetland and Big Bay de Noc (U.S.G.S. quadrangle map, Peninsula Point, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974; Central Upper Peninsula Planning and Development Regional Commission, 1978; Michigan Shorelands Management Unit aerial photograph, 1974). The extreme southern portion of the wetland is under federal ownership, and the remainder is under private ownership (Rockford Map Publishers, Inc., 1976). The presence of an access road as well as shoreline residences immediately east of the wetland suggests that developmental pressures on Peninsula Point Wetland are moderate.

Recreation

Peninsula Point Wetland is within the Hiawatha National Forest. The southern portion of the wetland also lies within the Point Peninsula recreational area. This area is largely undeveloped and is used primarily for picnicking (U.S. Forest Service, 1978).

Mineral, Energy, and Forest Resources

Peninsula Point Wetland is within an area underlain by limestone and dolomites. An active dolomite quarry is located in the southern portion of the peninsula, but the exact location of the quarry was not determined (Gere, 1977). There are no known oil, gas, or coal resources in or near the wetland (Michigan Geological Survey 1977; Smith, 1915).

Peninsula Point Wetland is a wooded area within the Hiawatha National Forest. Specific information on the commercial value of forest resources and operations for harvesting these resources is not available for the wetland.

However, any harvest of timber would be subject to Forest Service policy that actions affecting a wetland require interdisciplinary review (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978; U.S. Forest Service, 1978).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Peninsula Point Wetland (U.S.G.S. quadrangle map, Peninsula Point, Michigan, 1958).

Pollution Sources

There are no NPDES permit holders adjacent to Peninsula Point Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Peninsula Point Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 315

The literature search identified no on-going or impending research projects pertaining to Peninsula Point Wetland.

WILSEY BAY WETLAND

PHYSIOGRAPHIC SETTING

LM 316

Setting

Wilsey Bay Wetland is located west of the mouth of Wilsey Bay Creek in Delta County, Michigan. The wetland lies 100 feet inland from Green Bay and six miles southeast of the city of Escanaba. Wilsey Bay is northeast of Peninsula Point. A small beach ridge system parallels the shoreline of Wilsey Bay, and the wetland lies within these beach ridges. The presence of standing timber indicates that these are relatively mature coastal beach ridges. An access road is located along the shoreline of Wilsey Bay, separating the wetland from the lakeshore. Wilsey Bay Wetland is a Lacustrine System; it occupies a low, wooded site within the Hiawatha National Forest (U.S.G.S. quadrangle map, Peninsula Point, Michigan, 1958; Michigan Shorelands Management Unit aerial photographs, 1974).

Topography

The total relief of Wilsey Bay Wetland is approximately two feet; wetland elevations range from 580 to 582 feet above sea level, 0 to two feet above the approximate mean elevation of Lake Michigan. Wilsey Bay Wetland is located on a lacustrine plain which forms a peninsula protruding southward into Green Bay. Large inland wetlands occupy low sites within this region. The Great Lakes Basin Commission (1975) describes the shoreline near Wilsey Bay Wetland as a non-erodible low plain.

Surficial Geology

The surficial geology of Wilsey Bay Wetland consists of rock at or near the surface (Martin, 1957).

Soils

The soil type in Wilsey Bay Wetland is Eastport-Roscommon sand, which is generally found on beach ridges and stabilized dunes. This soil has a surface layer of black, partially decomposed leaf litter underlain by sand; it has little available water capacity, rapid permeability, and low natural fertility (Berndt, 1977).

Hydrology

There are no streams flowing through Wilsey Bay Wetland (U.S.G.S. quadrangle map, Peninsula Point, Michigan, 1958). The literature search provided no site-specific data pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Wilsey Bay Wetland.

Climate

The closest weather station providing climatic data for Wilsey Bay Wetland is located in Escanaba, Michigan. In 1975, the average monthly temperature was 42.7°F, the average daily low for January was 12.2°F and the average daily high in July was 76.2°F. The average annual precipitation is 28.01 inches, with a mean monthly precipitation of 1.27 inches in January and 3.42 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a half months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Wilsey Bay Wetland (U.S.G.S. quadrangle map, Peninsula Point, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974).

BIOTIC SETTING

LM 316

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Wilsey Bay Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Wilsey Bay Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Wilsey Bay Wetland.

Reptiles and Amphibians

Appendix C-13 contains general information on reptiles and amphibians of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Wilsey Bay Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Big Bay de Noc is an important concentration area for migratory waterfowl, especially during low water years (Martz, 1976). The bay is suitable for resting waterfowl because it is protected from westerly winds and therefore from wave action.

Appendix D-30 contains general information on wetland birds of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Wilsey Bay Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Wilsey Bay Wetland.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976; were documented in Wilsey Bay Wetland by the literature search. The bald eagle (Haliaeetus leucocephalus) is an uncommon resident of the Big Bay de Noc vicinity, but no active nests exist near the shoreline (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication). The osprey (Pandion haliaetus) nests in the Big Bay de Noc area. Postupalsky (1977) identified three pairs of ospreys in the area in 1971, but reports that the breeding population is decreasing in numbers.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland.

CULTURAL SETTING

LM 316

Population

Wilsey Bay Wetland is located in Bay de Noc Township of Delta County, Michigan. The county is sparsely populated, having a density of 31 persons per square mile. Table 13-13 indicates that Delta County and Bay de Noc Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that rapid population growth is expected to continue in Delta County.

Table 13-13. Population Data for the Vicinity of Wilsey Bay Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Delta County	39,358	9.6	45,953
Bay de Noc Township	348	11.5	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Wilsey Bay Wetland is rural wooded space. The surrounding area is primarily in rural open space uses, with scattered shoreline residential development along Wilsey Bay. An access road is located lakeward of Wilsey Bay Wetland (U.S.G.S. quadrangle map, Peninsula Point, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974; Central Upper Peninsula Planning and Development Regional Commission, 1978; Michigan Shorelands Management Unit aerial photograph, 1974). The wetland is under federal ownership (Rockford Map Publishers, Inc., 1976), and development pressures are likely to be low.

Recreation

Although Wilsey Bay Wetland is within the Hiawatha National Forest, there are no specifically designated recreation areas in or near the wetland (U.S. Forest Service, 1978).

Mineral, Energy, and Forest Resources

Wilsey Bay Wetland is within an area underlain by limestone and dolomites. An active dolomite quarry is located in the southern portion of the peninsula, but the exact location of the quarry was not determined (Gere, 1977). There are no known oil, gas, or coal resources within or near the wetland (Michigan Geological Survey 1977; Smith, 1915).

Wilsey Bay Wetland is a wooded area within the Hiawatha National Forest (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978). Any harvest of timber would be subject to the Forest Service policy that actions affecting a wetland require interdisciplinary review (U.S. Forest Service, 1978).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Wilsey Bay Wetland (U.S.G.S. quadrangle map, Peninsula Point, Michigan, 1958).

Pollution Sources

There are no NPDES permit holders adjacent to Wilsey Bay Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Wilsey Bay Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 316

The literature search identified no on-going or impending research projects pertaining to Wilsey Bay Wetland.

WEDENS BAY WETLAND

PHYSIOGRAPHIC SETTING

LM 317

Setting

Wedens Bay Wetland is located on the western shoreline of Big Bay de Noc in Delta County, Michigan, seven miles southeast of the city of Escanaba. Wedens Bay is located between Wilsey Bay Point and Chippewa Point and is included within the Hiawatha National Forest. The wetland is situated within a series of coastal beach ridges which parallel the shoreline of Wedens Bay. The presence of standing timber indicates that these are relatively mature coastal beach ridges. Wedens Bay Wetland is a Lacustrine System and occupies a low, partially wooded site (U.S.G.S. quadrangle map, Peninsula Point, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974).

Topography

The total relief of Wedens Bay Wetland is very slight; wetland elevations range from 580 to approximately 582 feet above sea level, 0 to two feet above the approximate mean elevation of Lake Michigan. The wetland is located on a lacustrine plain which forms a peninsula protruding southward into Green Bay. Large inland wetlands occupy low sites within this region. The Great Lakes Basin Commission (1975) describes the shoreline near Wedens Bay Wetland as an erodible low plain.

Surficial Geology

The surficial geology of Wedens Bay Wetland consists of rock at or near the surface (Martin, 1957).

Soils

The soil type in Wedens Bay Wetland is Eastport-Roscommon sand, which is generally found on beach ridges and stabilized dunes. This soil has a surface layer of black, partially decomposed leaf litter underlain by sand; it has little available water capacity, rapid permeability, and low natural fertility (Berndt, 1977).

Hydrology

An unnamed stream borders the western part of Wedens Bay Wetland. This perennial stream originates in a wetland 0.3 mile north of Wedens Bay Wetland. There is little, if any, elevational change in this stream as it flows from Wedens Bay Wetland to the bay (U.S.G.S. quadrangle map, Peninsula Point, Michigan, 1958). The literature search provided no site-specific data pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Wedens Bay Wetland.

Climate

The closest weather station providing climatic data for Wedens Bay Wetland is located in Escanaba, Michigan. In 1975, the average monthly temperature was 42.7°F, the average daily low for January was 12.2°F and the average daily high in July was 76.2°F. The average annual precipitation is 28.01 inches, with a mean monthly precipitation of 1.27 inches in January and 3.42 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a half months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are present in Wedens Bay Wetland (U.S.G.S. quadrangle map, Peninsula Point, Michigan, 1958).

BIOTIC SETTING

LM 317

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Wedens Bay Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Wedens Bay Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Wedens Bay Wetland.

Reptiles and Amphibians

Appendix C-13 contains general information on reptiles and amphibians of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Wedens Bay Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Big Bay de Noc is an important concentration area for migratory waterfowl, especially during low water years (Martz, 1976). The bay is suitable for resting waterfowl because it is protected from westerly winds and therefore from wave action.

Appendix D-30 contains general information on wetland birds of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Wedens Bay Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Wedens Bay Wetland.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Wedens Bay Wetland by the literature search. The bald eagle (Haliaeetus leucocephalus) is an uncommon resident of the Big Bay de Noc vicinity, but no active nests exist near the shoreline (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication). The osprey (Pandion haliaetus) nests in the Big Bay de Noc area. Postupalsky (1977) identified three pairs of ospreys in the area in 1971, but reports that the breeding population is decreasing in numbers.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland.

CULTURAL SETTING

LM 317

Population

Wedens Bay Wetland is located in Bay de Noc Township of Delta County, Michigan. The county is sparsely populated, having a density of 31 persons per square mile. Table 13-14 indicates that Delta County and Bay de Noc Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that rapid population growth is expected to continue in Delta County.

Table 13-14. Population Data for the Vicinity of Wedens Bay Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Delta County	39,358	9.6	45,953
Bay de Noc Township	348	11.5	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Wedens Bay Wetland and the surrounding area is rural wooded space (Central Upper Peninsula Planning and Development Regional Commission, 1978; Michigan Shorelands Management Unit aerial photograph, 1974). The wetland is under federal ownership (Rockford Map Publishers, Inc., 1976), and development pressures are likely to be low.

Recreation

Although Wedens Bay Wetland is within the Hiawatha National Forest, there are no specifically designated recreation areas in or near the wetland (U.S. Forest Service, 1978).

Mineral, Energy, and Forest Resources

Wedens Bay Wetland lies within an area underlain by limestone and dolomites. An active dolomite quarry is located in the southern portion of the peninsula, but the exact location of the quarry was not determined (Gere, 1977). There are no known oil, gas, or coal resources within or near the wetland (Michigan Geological Survey 1977; Smith, 1915).

Wedens Bay Wetland is a partially wooded area within the Hiawatha National Forest (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978). Any harvest of timber would be subject to the Forest Service policy that actions affecting a wetland require interdisciplinary review (U.S. Forest Service, 1978).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Wedens Bay Wetland (U.S.G.S. quadrangle map, Peninsula Point, Michigan, 1958).

Pollution Sources

There are no NPDES permit holders adjacent to Wedens Bay Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Wedens Bay Wetland (Peebles and Black, 1976), but the Michigan Coastal Zone inventory indicates that one archaeological site (20-DE-5) is present in the vicinity of the wetland. Further information regarding the field research and exact location of this site can be obtained from the Michigan History Division.

RESEARCH PROJECTS

LM 317

The literature search identified no on-going or impending research projects pertaining to Wedens Bay Wetland.

GRANSKOG CREEK WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LM 318-319

Setting

The Granskog Creek Wetland Complex, comprised of Chippewa Point Wetland and Granskog Creek Wetland, is located adjacent to the western shoreline of Big Bay de Noc in Delta County, Michigan, nine miles east of the city of Escanaba. Chippewa Point Wetland and Granskog Creek Wetland are grouped into a wetland complex because they were probably a single system at one time. An access road now separates the wetlands.

Chippewa Point is an east-facing headland which lies between Chippewa Point Wetland and Granskog Creek Wetland. Sandbars extend lakeward from this point. Both of the wetlands are Lacustrine Systems occupying low, partially wooded sites within the Hiawatha National Forest (U.S.G.S. quadrangle maps, Peninsula Point, Michigan, 1958, and Rapid River, Michigan, 1958; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

Topography

Chippewa Point Wetland has a total relief of 18 feet, with elevations ranging from 580 to 598 feet above sea level (lake level to 18 feet above the approximate mean elevation of Lake Michigan). The total relief of Granskog Creek Wetland is 12 feet, with elevations ranging from 580 to 592 feet above sea level. The wetland complex is located on a lacustrine plain which forms a peninsula protruding into Green Bay. Large inland wetlands occupy low sites within this region. The Great Lakes Basin Commission (1975) describes the shoreline near Granskog Creek Wetland Complex as an erodible low plain.

Surficial Geology

The surficial geology of both Granskog Creek Wetland and Chippewa Point Wetland consists of rock at or near the surface (Martin, 1957).

Soils

Five soil types are found in the Granskog Creek Wetland Complex. Eastport-Roscommon sand is found along the shore of Chippewa Point Wetland and Granskog Creek Wetland. Tawas muck and Nahma loam are found inland in Chippewa Point Wetland. Marsh soil is found in the southern part of Granskog Creek Wetland and Tawas muck is the dominant soil type inland (Berndt, 1977).

Marsh soils range from sand to clay loam; they are wet most of the year and are generally found on inland lake borders and areas bordering Lake Michigan. Marsh soil does not support trees. Alluvial land ranges from sand to loam and usually has a surface layer of black muck underlain by sand. Shallow organic soils may also be included in this soil type. Alluvial land has low available

water capacity and low or medium natural fertility. It is poorly drained, with slow or ponded runoff, and is generally found on level flood plains along major streams. Tawas muck has a surface layer of grayish-brown mucky peat underlain by black muck, dark gray muck, and sand. Tawas muck has high available water capacity in the organic layers and low natural fertility; it is generally found on level or depressional areas on lake plains (Berndt, 1977).

Nahma loam has a surface layer of black muck over black loam underlain by greenish-gray, friable loam and weathered limestone. This soil is poorly drained and has moderate available water capacity and medium natural fertility. Nahma soils formed in loamy material on till plains. Eastport-Roscommon sand is generally found on beach ridges and stabilized dunes. This soil has a surface layer of black, partially decomposed leaf litter underlain by sand. Eastport-Roscommon sand has little available water capacity, rapid permeability, and low natural fertility (Berndt, 1977).

Hydrology

Granskog Creek flows through Granskog Creek Wetland. There is an elevational change of four feet in the creek as it travels through the wetland. No streams flow through Chippewa Point Wetland. Indian Town Lake is adjacent to both wetlands (U.S.G.S. quadrangle maps, Rapid River, Michigan, 1958; Peninsula Point, Michigan, 1958).

The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in these wetlands.

Climate

The closest weather station providing climatic data for the Granskog Creek Wetland Complex is located in Fayette, Michigan. In 1975, the average monthly temperature was 43.4°F, the average daily low for January was 14.2°F and the average daily high in July was 76.3°F. The average annual precipitation is 30.04 inches, with a mean monthly precipitation of 1.63 inches in January and 3.25 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a half months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

A small tombolo is developing offshore from Indian Town Lake, and large rocks lie offshore as well (U.S.G.S. quadrangle maps, Peninsula Point, Michigan, 1958, and Rapid River, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974).

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of the Granskog Creek Wetland Complex.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in the Granskog Creek Wetland Complex.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in the Granskog Creek Wetland Complex.

Reptiles and Amphibians

Appendix C-13 contains general information on reptiles and amphibians of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to the Granskog Creek Wetland Complex. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in these wetlands.

Avifauna

Big Bay de Noc is an important concentration area for migratory waterfowl, especially during low water years (Martz, 1976). The bay is suitable for resting waterfowl because it is protected from westerly winds and therefore from wave action.

Appendix D-30 contains general information on wetland birds of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Chippewa Point Wetland and Granskog Creek Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing these wetlands.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting the two wetlands comprising the Granskog Creek Wetland Complex.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in the Granskog Creek Wetland Complex by the literature search. The bald eagle (*Haliaeetus leucocephalus*) is an uncommon resident of the Big Bay de Noc vicinity, but no active nests exist near the shoreline (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication). The osprey (*Pandion haliaetus*) nests in the Big Bay de Noc area. Postupalsky (1977) identified three pairs of ospreys in the area in 1971, but reports that the breeding population is decreasing in numbers.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of these wetlands.

CULTURAL SETTING

LM 318-319

Population

The Granskog Creek Wetland Complex is located in Bay de Noc Township of Delta County, Michigan. The county is sparsely populated, having a density of 31 persons per square mile. Table 13-15 indicates that Delta County and Bay de Noc Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that rapid population growth is expected to continue in Delta County.

Table 13-15. Population Data for the Vicinity of the Granskog Creek Wetland Complex

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Delta County	39,358	9.6	45,953
Bay de Noc Township	348	11.5	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Chippewa Point Wetland and Granskog Creek Wetland is rural open space. The surrounding area is in rural open space uses with some shoreline residential development northeast of Granskog Creek Wetland. Drainage ditches have been dug into the southern portion of Granskog Creek Wetland, and a boat dock lies offshore from this wetland. An access road lies between Chippewa Point Wetland and Granskog Creek Wetland (U.S.G.S. quadrangle maps, Peninsula Point, Michigan, 1958, and Rapid River, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974; Central Upper Peninsula Planning and Development Regional Commission, 1978; Michigan Shorelands Management Unit aerial photograph, 1973). Both wetlands are under mixed private and federal ownership (Rockford Map Publishers, Inc., 1976). Since the wetlands are situated within the Hiawatha National Forest and are in part federally owned, developmental pressures on the wetlands are assumed to be low.

Recreation

Although Chippewa Point Wetland and Granskog Creek Wetland are within the Hiawatha National Forest, there are no specifically designated recreation areas in or near the wetland (U.S. Forest Service, 1978).

Mineral, Energy, and Forest Resources

Chippewa Point Wetland and Granskog Creek Wetland are within an area underlain by limestone and dolomites, but there are no quarrying operations in the vicinity. The area also has known clay resources, but there are no operations currently exploiting this resource (Gere, 1977). There are no known oil, gas, or coal resources in or near the wetlands (Michigan Geological Survey 1977; Smith, 1915).

Chippewa Point and Granskog Creek Wetland are partially wooded areas within the Hiawatha National Forest (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978). Any harvest of timber would be subject to the Forest Service policy that actions affecting a wetland require interdisciplinary review (U.S. Forest Service, 1978).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Chippewa Point Wetland and Granskog Creek Wetland (U.S.G.S. quadrangle maps, Peninsula Point, Michigan, 1958; Rapid River, Michigan, 1958).

Pollution Sources

There are no NPDES permit holders adjacent to Granskog Creek Wetland or Chippewa Point Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Granskog Creek Wetland and Chippewa Point Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 318-319

The literature search identified no on-going or impending research projects pertaining to the Granskog Creek Wetland Complex.

SAND BAY WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LM 320-321

Setting

The Sand Bay Wetland Complex, comprised of Sand Bay Wetlands #1 and #2, is located along Sand Bay on the west side of Big Bay de Noc in Delta County, Michigan, approximately nine miles east of the city of Escanaba. Sand Bay Wetlands #1 and #2 are situated 0.1 and 0.2 mile from the lakeshore, respectively. Low coastal beach ridges are present within Sand Bay Wetland #2. Both wetlands are Palustrine Systems occupying low, wooded sites within the Hiawatha National Forest (U.S.G.S. quadrangle map, Rapid River, Michigan, 1958; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

Topography

Sand Bay Wetland #1 has a total relief of 10 feet, with elevations ranging from 585 to 595 feet above sea level, 5 to 15 feet above the approximate mean elevation of Lake Michigan. Sand Bay Wetland #2 has a total relief of 15 feet with elevations ranging from 585 to 600 feet above sea level. The wetlands are located on a lacustrine plain which forms a peninsula protruding into Green Bay. Large inland wetlands occupy low sites within this region. The Great Lakes Basin Commission (1975) describes the shoreline near Sand Bay as an erodible low plain.

Surficial Geology

The surficial geology of Sand Bay Wetlands #1 and #2 consists of rock at or near the surface. These rock formations are found on the lower portion of Peninsula Point.

Soils

There are three soil types found in Sand Bay Wetlands #1 and #2. Tawas muck is found in Sand Bay Wetland #1. Eastport-Roscommon sands are found in the eastern part of Sand Bay Wetland #2, while Carbondale, Lupton, and Rifle soils are located in the western portion of the wetland (Berndt, 1977).

Tawas muck has a surface layer of grayish-brown mucky peat underlain by black muck, dark gray muck, and sand. This soil, formed from organic material, has high available water capacity in the organic layers and low natural fertility, and it is generally found on level or depressional areas on lake plains. Eastport-Roscommon sand has a surface layer of black, partially decomposed leaf litter underlain by sand. This soil has little available water capacity, rapid permeability, and low natural fertility. It is generally found

on beach ridges and stabilized dunes. Carbondale, Lupton, and Rifle soils have a surface layer which ranges from muck to peat. These soils formed from decomposed herbaceous and woody material and are very poorly drained; they have high water storage capacities (Berndt, 1977).

Hydrology

There are no streams flowing through Sand Bay Wetlands #1 and #2 (U.S.G.S. quadrangle map, Rapid River, Michigan, 1958). The literature search provided no site-specific data pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in these wetlands.

Climate

The closest weather station providing climatic data for the Sand Bay Wetland Complex is located in Fayette, Michigan. In 1975, the average monthly temperature was 43.4°F; the average daily low for January was 14.2°F and the average daily high in July was 76.3°F. The average annual precipitation is 30.04 inches, with a mean monthly precipitation of 1.63 inches in January and 3.25 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a half months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Sand Bay Wetlands #1 and #2 (U.S.G.S. quadrangle map, Rapid River, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974).

BIOTIC SETTING

LM 320-321

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Sand Bay Wetlands #1 and #2.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Sand Bay Wetlands #1 and #2.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Sand Bay Wetlands #1 and #2.

Reptiles and Amphibians

Appendix C-13 contains general information on reptiles and amphibians of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Sand Bay Wetlands #1 and #2. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in these wetlands.

Avifauna

Big Bay de Noc is an important concentration area for migratory waterfowl, especially during fall migration. Jaworski and Raphael (1977) suggest that the bay is used by resting waterfowl because it is protected from westerly winds and therefore from wave action.

Appendix D-30 contains general information on wetland birds of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Sand Bay Wetlands #1 and #2. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing these wetlands.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting the two wetlands comprising the Sand Bay Wetland Complex.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in the Sand Bay Wetland Complex by the literature search. The bald eagle (Haliaeetus leucocephalus) is an uncommon resident of the Big Bay de Noc area, but no active nests exist near the shoreline (S. Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication). The osprey (Pandion haliaetus) nests in the Big Bay de Noc area. Postupalsky (1977) identified three pairs of ospreys in the area in 1971, but reports that the breeding population is decreasing in numbers.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of these wetlands.

CULTURAL SETTING

LM 320-321

Population

Sand Bay Wetlands #1 and #2 are located in Bay de Noc Township of Delta County, Michigan. The county is sparsely populated, having a density of 31 persons per square mile. Table 13-16 indicates that Delta County and Bay de Noc Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that rapid population growth is expected to continue in Delta County.

Table 13-16. Population Data for the Vicinity of Sand Bay Wetlands #1 and #2

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Delta County	39,358	9.6	45,953
Bay de Noc Township	348	11.5	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Sand Bay Wetlands #1 and #2 is rural open space. The area surrounding the wetlands is primarily in rural open space uses, with shoreline residences scattered to the east of both wetlands. Indian Town Cemetery lies to the south of Sand Bay Wetland #1. A shoreline access road lies adjacent to both Sand Bay Wetlands #1 and #2 (U.S.G.S. quadrangle map, Rapid River, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974; Central Upper Peninsula Planning and Development Regional Commission, 1978; Michigan Shorelands Management Unit aerial photograph, 1974). The wetlands are under private ownership (Rockford Map Publishers, Inc., 1976). The relative lack of developed areas in the vicinity of the wetlands suggests that developmental pressures are low.

Recreation

Although Sand Bay Wetlands #1 and #2 are within the Hiawatha National Forest, there are no specifically designated recreation areas in or near the wetlands (U.S. Forest Service, 1978).

Mineral, Energy, and Forest Resources

Sand Bay Wetlands #1 and #2 are situated within an area underlain by limestone and dolomites, but there are no quarrying operations in the vicinity. The area also has known clay resources, but there are no operations currently exploiting this resource (Gere, 1977). There are no known oil, gas, or coal resources in or near the wetlands (Michigan Geological Survey 1977; Smith, 1915).

Sand Bay Wetlands #1 and #2 are wooded sites within the Hiawatha National Forest (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978; U.S.G.S. quadrangle map, Rapid River, Michigan, 1958). Any harvest of timber would be subject to the Forest Service policy that actions affecting a wetland require interdisciplinary review (U.S. Forest Service, 1978).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Sand Bay Wetlands #1 and #2 (U.S.G.S. quadrangle map, Rapid River, Michigan, 1958).

Pollution Sources

There are no NPDES permit holders adjacent to Sand Bay Wetlands #1 and #2 (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Sand Bay Wetlands #1 and #2, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 320-321

The literature search identified no on-going or impending research projects pertaining to Sand Bay Wetlands #1 and #2.

MARTIN BAY WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LM 322-325

Setting

The Martin Bay Wetland Complex, comprised of Martin Bay Wetlands #1 and #2, Martin Creek Wetland, and St. Vital Point Wetland, is located adjacent to the western shoreline of Big Bay de Noc in Delta County, Michigan. Martin Creek Wetland and Martin Bay Wetland #2 are located 11.5 miles southwest of the city of Rapid River. Martin Bay Wetland #1 and St. Vital Point Wetland lie approximately twelve miles southwest of Rapid River (U.S.G.S. quadrangle map, Rapid River, Michigan, 1958).

Martin Bay Wetland #1 lies on a bay mouth bar which is located at the southern extent of Martin Bay. Martin Bay Wetland #2 lies to the northeast of Martin Creek Wetland, and St. Vital Point Wetland lies at the northern end of Martin Bay. All of the wetlands in this complex are Lacustrine Systems and occupy low sites within the Hiawatha National Forest. Martin Bay Wetland #2 is completely wooded; the rest of the wetlands in this complex are partially wooded. Portions of St. Vital Point Wetland have recently been cleared (U.S.G.S. quadrangle map, Rapid River, Michigan, 1958; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

Topography

The elevations and total relief of the individual wetlands in the Martin Bay Wetland Complex are listed in Table 13-17.

Table 13-17. Elevations and Total Relief of Individual Wetlands in the Martin Bay Wetland Complex

	Minimum elevation (feet) ^a	Maximum elevation (feet) ^a	Total relief (feet)
Martin Bay Wetland #1	580	583	3
Martin Creek Wetland	580	590	10
Martin Bay Wetland #2	580	605	25
St. Vital Point Wetland	580	583	3

^a Elevations measured in feet above sea level; the approximate mean elevation of Lake Michigan is 580 feet above sea level.

The Martin Bay Wetland Complex lies on a Lacustrine plain which forms a peninsula protruding into Green Bay. Large inland wetlands occupy low sites

within this region. The Great Lakes Basin Commission (1975) describes the Martin Bay shoreline as a non-erodible low plain.

Surficial Geology

The surficial geology of Martin Bay Wetlands #1 and #2, Martin Creek Wetland, and St. Vital Point Wetland is characterized by dunes, swales, sand ridges, and recessional bars and beaches on glacial lake beds (Martin, 1957; Dorr and Eschman, 1970).

Soils

There are six soil types found in the Martin Bay Wetland Complex: Eastport-Roscommon sands, Ruse silt loam, Roscommon mucky sand, Nahma loam, Tawas muck, and Cathro and Tacoosh mucks. Table 13-18 lists the soil types present in the individual wetlands.

Table 13-18. Soil Types for the Wetlands in the Martin Bay Wetland Complex^a

Wetland	Soil type
Martin Bay Wetland #1	Eastport-Roscommon sands
Martin Creek Wetland	Eastport-Roscommon sand, Tawas muck, Roscommon mucky sand
Martin Bay Wetland #2	Ruse silt loam, Nahma loam, Cathro, and Tacoosh mucks
St. Vital Point Wetland	Nahma loam

^a Berndt (1977)

Tawas muck has a surface layer of grayish-brown mucky peat underlain by black muck, dark gray muck, and sand. This soil, formed from organic material, has high available water capacity in the organic layers and low natural fertility, and is generally found on level or depressional areas on lake plains. Eastport-Roscommon sand has a surface layer of black, partially decomposed leaf litter underlain by sand. This soil has little available water capacity, rapid permeability, and low natural fertility, and is generally found on beach ridges and stabilized dunes. Nahma loam has a surface layer of black muck over black loam underlain by greenish-gray, friable loam and weathered limestone. This soil is poorly drained and has moderate available water capacity and medium natural fertility. Nahma soils formed in loamy materials on till plains (Berndt, 1977).

Roscommon mucky sand has a surface layer consisting of black muck underlain by sand. This soil has little available water capacity, rapid permeability, and low natural fertility. Cathro and Tacoosh mucks consist of organic soils underlain by loam; they have low natural fertility and are wet, although

permeability is rapid in the upper strata. Ruse silt loam has a surface layer of black silt loam underlain by olive-gray silt loam and pale-olive sandy loam. In some areas, there may be as much as 12 inches of muck on the surface. Ruse silt loam is poorly drained and has moderate available water capacity and medium natural fertility (Berndt, 1977).

Hydrology

Martin Creek flows through the middle of Martin Creek Wetland. This creek is approximately 1.5 miles long, and has an elevational change of 10 feet as it flows into Big Bay de Noc. There are no streams flowing through Martin Bay Wetlands #1 and #2 or St. Vital Point Wetland (U.S.G.S. quadrangle map, Rapid River, Michigan, 1958).

The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in the four wetlands of the Martin Bay Wetland Complex.

Climate

The closest weather station providing climatic data for the Martin Bay Wetland Complex is located in Fayette, Michigan. In 1975, the average monthly temperature was 43.4°F, the average daily low for January was 14.2°F and the average daily high in July was 76.3°F. The average annual precipitation is 30.04 inches, with a mean monthly precipitation of 1.63 inches in January and 3.25 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a half months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

Martin Bay Wetland #1 lies on a bay mouth bar marking the southern extent of Martin Bay (U.S.G.S. quadrangle map, Rapid River, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974).

BIOTIC SETTING

LM 322-325

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of the Martin Bay Wetland Complex.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in the Martin Bay Wetland Complex.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in the Martin Bay Wetland Complex.

Reptiles and Amphibians

Appendix C-13 contains general information on reptiles and amphibians of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to the Martin Bay Wetland Complex. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in these wetlands.

Avifauna

Big Bay de Noc is an important concentration area for migratory waterfowl, especially during fall migration. Jaworski and Raphael (1977) suggest that the bay is used by resting waterfowl because it is protected from the westerly winds and therefore from wave action.

Appendix D-30 contains general information on wetland birds of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to the Martin Bay Wetland Complex. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing these wetlands.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting the four wetlands comprising the Martin Bay Wetland Complex.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in the Martin

Bay Wetland Complex by the literature search. The bald eagle (Haliaeetus leucocephalus) is an uncommon resident of the Big Bay de Noc area, but no active nests exist near the shoreline (S. Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication). The osprey (Pandion haliaetus) nests in the Big Bay de Noc area. Postupalsky (1977) identified three pairs of ospreys in the area in 1971, but reports that the breeding population is decreasing in numbers.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of these wetlands.

CULTURAL SETTING

LM 322-325

Population

The Martin Bay Wetland Complex located in Bay de Noc Township of Delta County, Michigan. The county is sparsely populated, having a density of 31 persons per square mile. Table 13-19 indicates that Delta County and Bay de Noc Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that rapid population growth is expected to continue in Delta County.

Table 13-19. Population Data for the Vicinity of the Martin Bay Wetland Complex

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Delta County	39,358	9.6	45,953
Bay de Noc Township	348	11.5	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within the four wetlands in the Martin Bay Wetland Complex and most of the surrounding area is rural wooded space. An access road lies adjacent to Martin Bay Wetland #2 (U.S.G.S. quadrangle map, Rapid River, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974; Central Upper Peninsula Planning and Development Regional Commission, 1978; Michigan Shorelands Management Unit aerial photograph, 1974). Martin Bay Wetland #1 is under private ownership, while the remaining wetlands are under mixed private and federal ownership (Rockford Map Publishers, Inc., 1976).

Federal ownership of much of the wetland area and the lack of any developed areas near the wetlands suggest that developmental pressures are low.

Recreation

Although the Martin Bay Wetland Complex is within the Hiawatha National Forest, there are no specifically designated recreation areas in or near the wetlands (U.S. Forest Service, 1978).

Mineral, Energy, and Forest Resources

The Martin Bay Wetland Complex is situated within an area underlain by limestone, dolomites, and clay, but there are no operations in the vicinity of the wetland complex exploiting any of these resources (Gere, 1977). There are no known oil, gas, or coal resources in or near the wetland complex (Michigan Geological Survey 1977; Smith, 1915).

The four wetlands of the Martin Bay Wetland Complex are wooded and are contained within the Hiawatha National Forest. Portions of St. Vital Point Wetland appear to have been recently clearcut (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978). However, any harvest of timber would be subject to the Forest Service policy that actions affecting a wetland require interdisciplinary review (U.S. Forest Service, 1978).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of the four wetlands comprising the Martin Bay Wetland Complex (U.S.G.S. quadrangle map, Rapid River, Michigan, 1958).

Pollution Sources

There are no NPDES permit holders adjacent to the four wetlands comprising the Martin Bay Wetland Complex (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of the four wetlands of the Martin Bay Wetland Complex (Peebles and Black, 1976), but the Michigan Coastal Zone inventory indicates that one archaeological site (20-DE-14) is present in the vicinity of the wetlands. Further information regarding the field research and exact location of this site can be obtained from the Michigan History Division.

RESEARCH PROJECTS

LM 322-325

The literature search identified no on-going or impending research projects pertaining to the Martin Bay Wetland Complex.

ST. VITAL ISLAND WETLAND

PHYSIOGRAPHIC SETTING

LM 326

Setting

St. Vital Island Wetland is located on St. Vital Island, which lies near the western shoreline of Big Bay de Noc in Delta County, Michigan. The wetland is situated adjacent to the lakeshore and five miles west-southwest of the community of Nahma. St. Vital Island is very low, and much of the southern portion of the island is flooded by storms (Scharf et al., 1977). St. Vital Island Wetland is a Lacustrine System; it occupies a partially wooded site (U.S.G.S. quadrangle map, Rapid River, Michigan, 1958).

Topography

The total relief of St. Vital Island Wetland is slight; wetland elevations range from 580 to approximately 583 feet above sea level (lake level to 3 feet above the approximate mean elevation of Lake Michigan). The Great Lakes Basin Commission (1975) describes the St. Vital Island shoreline as a non-erodible low plain.

Surficial Geology

The surficial geology of St. Vital Island Wetland is not known, since it has not been mapped by the Michigan Geological Survey (Martin, 1955).

Soils

Limestone rock land is found in the center of St. Vital Island Wetland, while Marsh soil is located near the shore. Marsh soils range from sand to clay loam; they are wet most of the year and are generally found on inland lake borders and areas bordering Lake Michigan. Limestone rock land has a surface layer of fine sandy loam or loam. This soil is shallow, within ten inches of limestone bedrock. Limestone rock land has very low available water capacity. Slow runoff may cause the soil to be wet most of the year in some areas (Berndt, 1977).

Hydrology

There are no streams flowing through St. Vital Island Wetland (U.S.G.S. quadrangle map, Rapid River, Michigan, 1958). No site-specific information was located through the literature search pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in this wetland.

Climate

The closest weather station providing climatic data for St. Vital Island Wetland is located in Fayette, Michigan. In 1975, the average monthly

temperature was 43.4°F, the average daily low for January was 14.2°F and the average daily high in July was 76.3°F. The average annual precipitation is 30.04 inches, with a mean monthly precipitation of 1.63 inches in January and 3.25 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a half months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are present in St. Vital Island Wetland (U.S.G.S. quadrangle map, Rapid River, Michigan, 1958).

BIOTIC SETTING

LM 326

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of St. Vital Island Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in St. Vital Island Wetland.

Invertebrates

Modlin et al. (1973) provide information on the species composition, distribution and biomass of the water mites (Acari) in the Great Lakes. Appendix B-4 lists the aquatic Acari found in littoral habitat of the Great Lakes which included Big Bay de Noc. Piona rotunda was the most abundant species in plankton collections from Big Bay de Noc. These organisms may occur in St. Vital Island Wetland owing to its location contiguous to the bay.

The literature search produced no site-specific data pertaining to seasonal distribution, density and productivity, major food sources or relationship to water levels of the invertebrate fauna of St. Vital Island Wetland.

Reptiles and Amphibians

Appendix C-13 contains general information on reptiles and amphibians of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to St. Vital Island Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

St. Vital Island has been proposed by the Michigan Department of Natural Resources, Shorelands Management Unit (1975), as a State Environmental Area. The wetland portion of the island receives moderate use by dabbling and diving ducks for resting, and heavy use by gull species for feeding and resting.

Scharf et al. (1977) visited St. Vital Island in the summer of 1976. Great blue herons (Ardea herodias) were nesting in aspen trees (Populus spp.). Six active nests were identified (containing 3, 2, 2, 2, and 1 young, respectively; although young were present in the sixth nest, they were not counted) as well as at least two old nests. Three black-crowned night herons (N. nycticorax) were observed on the island. Two nests were found in cherry trees (Prunus spp.) in the southwestern part of the wetland; one nest was inspected and contained two eggs and one young. The black-crowned night heron is classified as "rare" in Michigan (Michigan Endangered and Threatened species program, 1976).

The same study showed that approximately 100 pairs of herring gulls (Larus argentatus) nested along the north shore of the island and could be expected to use St. Vital Island Wetland to rest or scavenge. Fifty-four young were counted and more were probably present. Two common tern (Sterna hirundo) colonies were present on the island; a large colony (about 110 pairs) existed to the northwest and a small colony (about 20 pairs) to the southeast.

Evidence of a small number of ducks nesting on the island was observed. A black duck (Anas rubripes) nest was found, and gadwall (A. strepera) and red-breasted merganser (Mergus serrator) broods were seen. Perching birds present included the starling (Sturnus vulgaris), yellow warbler (Dendroica petechia), red-winged blackbird (Agelaius phoeniceus), common grackle (Quiscalus quiscula), and song sparrow (Melospiza melodia). St. Vital Island receives light use from duck hunters in the fall (Scharf et al., 1977). The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting St. Vital Island Wetland.

Endangered Species

Two nesting colonies of common terns (Sterna hirundo) an endangered species in Michigan, were recorded on St. Vital Island in 1977. The black-crowned night heron (N. nycticorax), which is classified as "rare" in Michigan, nests in St. Vital Island Wetland (Scharf et al., 1977).

The bald eagle (Haliaeetus leucocephalus) is an uncommon resident of the Big Bay de Noc vicinity, but no active nests exist near the shoreline

(Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication). The osprey (Pandion haliaetus) nests in the Big Bay de Noc area. Postupalsky (1977) identified three pairs of ospreys in the area in 1971, but reports that the breeding population is decreasing in numbers.

No other plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in St. Vital Island Wetland by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland. However, the Michigan Department of Natural Resources has proposed St. Vital Island as a State Environmental Area.

CULTURAL SETTING

LM 326

Population

St. Vital Island is located in Big Bay de Noc and is thought to be uninhabited, with the possible exception of seasonal visitation.

Land Use and Ownership

Land use within St. Vital Island Wetland and the remainder of the island is rural open space. The wetland is under private ownership (Central Upper Peninsula Planning and Development Regional Commission, 1978). The small size of St. Vital Island, coupled with the lack of any existing development, suggests that developmental pressures on St. Vital Island Wetland are low.

Recreation

There are no known state or federal recreational facilities in the vicinity of St. Vital Island Wetland. St. Vital Island receives light use from duck hunters in the fall (Scharf et al., 1977).

Mineral, Energy, and Forest Resources

There are no known oil, gas, or coal resources in or near St. Vital Island Wetland (Michigan Geological Survey Division, 1977; Smith, 1915).

St. Vital Island Wetland is partially wooded (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978). However, this wooded area is not large enough to warrant commercial production.

Public Utilities and Facilities

There are no public utilities within 0.5 mile of St. Vital Island Wetland (U.S.G.S. quadrangle map, Rapid River, Michigan, 1958).

Pollution Sources

There are no NPDES permit holders adjacent to St. Vital Island Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of St. Vital Island Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 326

The literature search identified no on-going or impending research projects pertaining to St. Vital Island Wetland.

OGONTZ BAY WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LM 327-328

Setting

The Ogontz Bay Wetland Complex, comprised of Ogontz Bay Wetlands #1 and #2, is adjacent to the western shoreline of Big Bay de Noc in Delta County, Michigan. Ogontz Bay Wetland #1 is five miles west of the community of Nahma, Michigan, and parallels the Big Bay de Noc shoreline for a distance of approximately 0.5 mile. Ogontz Bay Wetland #2 lies 4.2 miles west-northwest of Nahma. Both of the wetlands in this complex are low, Lacustrine Systems situated within the Hiawatha National forest. Ogontz Bay Wetland #1 is non-wooded and Ogontz Bay Wetland #2 is wooded (U.S.G.S. quadrangle maps, Rapid River, Michigan, 1958, and Garden, Michigan, 1958; Michigan Department of State Highways and Transportation aerial photograph, 1973).

Topography

Elevations in the Ogontz Bay Wetland Complex range from 580 to 610 feet above sea level. The total relief of Ogontz Bay Wetland #1 is approximately three feet, with elevations ranging from 580 to 583 feet above sea level (lake level to only 3 feet above the approximate mean elevation of Lake Michigan). Ogontz Bay Wetland #2 has a total relief of 30 feet, with elevations ranging from 580 to 610 feet above sea level. The wetlands are located on a low lacustrine plain. Large inland wetlands occupy low sites within the region. The Great Lakes Basin Commission (1975) describes the shoreline near Ogontz Bay Wetlands #1 and #2 as an erodible low plain.

Surficial Geology

The surficial geology of Ogontz Bay Wetlands #1 and #2 is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in Ogontz Bay Wetland #1 is Marsh soil. Ogontz Bay Wetland #2 is predominantly Tawas muck, which is found along the northern shore of Ogontz Bay. Other soil types present in the wetland include Alluvial land, along the Ogontz River; Ruse silt loam, which is found south of the Ogontz River; and Cathro muck, which is present in the southern portion of the wetland (Berndt, 1977).

Marsh soils range from sand to clay loam. They are wet most of the year and are generally found on inland lake borders and areas bordering Lake Michigan. Alluvial land ranges from sand to loam and usually has a surface layer of black muck underlain by sand. Shallow organic soils may also be included in this soil type. Alluvial land has low available water capacity and low or medium natural

fertility. This soil type is poorly drained, with slow or ponded runoff, and is generally found on level flood plains along major streams. Tawas muck has a surface layer of grayish-brown mucky peat underlain by black muck, dark gray muck, and sand. This soil, formed from organic material, has high available water capacity in the organic layers and low natural fertility. It is generally found on level or depressional areas on lake plains (Berndt, 1977).

Ruse silt loam has a surface layer of black silt loam with olive-gray silt loam underneath, followed by pale-olive sandy loam. In some areas, there may be as much as 12 inches of muck on the surface. Ruse silt loam is poorly drained and has moderate available water capacity and medium natural fertility. Cathro muck has a surface layer of black muck followed by black mucky peat underlain by grayish-brown sandy loam. Cathro muck has very high available water capacity and low natural fertility. This soil is poorly drained and was formed from herbaceous organic material (Berndt, 1977).

Hydrology

The Big River and the Little River flow through the southern portion of Ogontz Bay Wetland #2 and have little change in elevation as they travel through the wetland. The Ogontz River borders the wetland and has a change in elevation of approximately eight feet. There are no streams present in Ogontz Bay Wetland #1 (U.S.G.S. quadrangle map, Rapid River, Michigan, 1958; Garden, Michigan, 1958).

The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Ogontz Bay Wetlands #1 and #2.

Climate

The closest weather station providing climatic data for the Ogontz Bay Wetland Complex is located in Fayette, Michigan. In 1975, the average monthly temperature was 43.4°F, the average daily low for January was 14.2°F and the average daily high in July was 76.3°F. The average annual precipitation is 30.04 inches, with a mean monthly precipitation of 1.63 inches in January and 3.25 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a half months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of the Ogontz Bay Wetland Complex (U.S.G.S. quadrangle maps, Rapid River, Michigan, 1958, and Garden, Michigan, 1958; Michigan Department of State Highways and Transportation aerial photograph, 1973).

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Ogontz Bay Wetlands #1 and #2.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Ogontz Bay Wetlands #1 and #2.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Ogontz Bay Wetlands #1 and #2.

Reptiles and Amphibians

Appendix C-13 contains general information on reptiles and amphibians of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Ogontz Bay Wetlands #1 and #2. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food source, or relationship to water levels of the reptiles and amphibians in these wetlands.

Avifauna

Scharf et al. (1977) visited Ogontz Bay Wetland #2 near the mouth of the Big River and observed a small colony of black terns (*Chlidonias nigra*). An estimated four to seven pairs were nesting in sedges about 0.3 mile from Big Bay de Noc.

Appendix D-30 contains general information on wetland birds of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Ogontz Bay Wetlands #1 and #2. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing these wetlands.

Mammals

The two wetlands of the Ogontz Bay Wetland Complex are considered exceptional habitat for muskrat (Ondatra zibethicus) (Jaworski and Raphael, 1978).

The literature search provided no site-specific data pertaining to other major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting the two wetlands comprising the Ogontz Bay Wetland Complex.

Endangered Species

The bald eagle (Haliaeetus leucocephalus) is an uncommon resident of the Big Bay de Noc vicinity, but no active nests exist near the shoreline (Postupałsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication). The osprey (Pandion haliaetus), threatened in Michigan, also nests in the Big Bay de Noc area. Postupałsky (1977) identified three pairs of ospreys in the area in 1971, but reports that the breeding population is decreasing in numbers. No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in the Ogontz Bay Wetland Complex by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of these wetlands.

CULTURAL SETTING

LM 327-328

Population

Ogontz Bay Wetlands #1 and #2 are located in Nahma and Ensign Townships of Delta County, Michigan. The county is sparsely populated, having a density of 31 persons per square mile. Table 13-20 indicates that Delta County and Nahma and Ensign Townships experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that rapid population growth is expected to continue in Delta County.

Table 13-20. Population Data for the Vicinity of Ogontz Bay Wetlands #1 and #2

	Estimated Population 1975 ^a	Estimated *Δ 1970-1975 ^a	Projected Population 1990 ^b
Delta County	39,358	9.6	45,953
Nahma Township	646	29.5	--
Ensign Township	622	23.2	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Ogontz Bay Wetlands #1 and #2 is rural open space. The area surrounding these wetlands is primarily in limited agricultural and other rural open space uses, with scattered residences around the periphery of Ogontz Bay Wetland #2 and near the mouths of the Big and Little Rivers. An access road lies landward of Ogontz Bay Wetland #1. Access roads and a secondary highway are located adjacent to Ogontz Bay Wetland #2, and there are two cemeteries west of this wetland. A boat dock, made of dredged material, has been built on the southern portion of the wetland (U.S.G.S. quadrangle maps, Rapid River, Michigan, 1958, and Garden, Michigan, 1958; Michigan Department of State Highways and Transportation aerial photograph, 1973; Central Upper Peninsula Planning and Development Regional Commission, 1978; Michigan Department of State Highways and Transportation aerial photograph, 1973). Both wetlands are under mixed private and federal ownership (Rockford Map Publishers, Inc., 1976). The portions of the wetlands under federal ownership are assumed to be under low developmental pressures and the privately owned portions are assumed to be under low to moderate developmental pressures.

Recreation

Although Ogontz Bay Wetlands #1 and #2 lie within the Hiawatha National Forest, there are no specifically designated recreation areas in or near the wetlands (U.S. Forest Service, 1978).

Mineral, Energy, and Forest Resources

Ogontz Bay Wetlands #1 and #2 are situated within an area underlain by limestone, dolomites, and clay resources. Gere (1977) identifies an active dolomite quarry in the vicinity of the town of Ogontz. There are no known oil, gas, or coal resources in or near the wetlands (Michigan Geological Survey 1977; Smith, 1915).

Ogontz Bay Wetland #1 is non-wooded, and Ogontz Bay Wetland #2 is wooded (Indiana University, Environmental Systems Application Center aerial

reconnaissance, 1978). Since the latter is situated within the Hiawatha National Forest, any harvest of timber would be subject to the Forest Service policy that actions affecting a wetland require interdisciplinary review (U.S. Forest Service, 1978).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Ogontz Bay Wetlands #1 and #2 (U.S.G.S. quadrangle maps, Rapid River, Michigan, 1958; Garden, Michigan, 1958).

Pollution Sources

There are no NPDES permit holders adjacent to Ogontz Bay Wetlands #1 and #2. No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Ogontz Bay Wetlands #1 and #2, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 327-328

The literature search identified no on-going or impending research projects pertaining to Ogontz Bay Wetlands #1 and #2.

STURGEON RIVER WETLAND

PHYSIOGRAPHIC SETTING

LM 329

Setting

Sturgeon River Wetland is adjacent to the northern shoreline of Big Bay de Noc in Delta County, Michigan, and surrounds the community of Nahma on three sides. Two small peninsulas named Indian Point and Stony Point are located on either side of the wetland along the shoreline. A series of coastal beach ridges lies to the east of the Sturgeon River, near the southeastern portion of the wetland. Sturgeon River Wetland was contiguous with larger, inland wetlands at one time; however, construction of a primary highway and a rail line has separated Sturgeon River Wetland from the others. Sturgeon River Wetland is a Lacustrine System; it occupies a low, partially wooded site in the Hiawatha National Forest (U.S.G.S. quadrangle map, Garden, Michigan, 1958; Michigan Department of State Highways and Transportation aerial photograph, 1973).

Topography

The total relief of Sturgeon River Wetland is 40 feet. Wetland elevations range from 580 to 620 feet above sea level (lake level to 40 feet above the approximate mean elevation of Lake Michigan). The wetland is located on a low lacustrine plain; large inland wetlands occupy low sites within the region. The Great Lakes Basin Commission (1975) describes the shoreline near Sturgeon River Wetland as an erodible low plain.

Surficial Geology

The surficial geology of Sturgeon River Wetland is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

There are three major soil types found in Sturgeon River Wetland. Alluvial land is found along the Sturgeon River, and Roscommon mucky sand and Tawas muck are distributed throughout the wetland (Berndt, 1977).

Alluvial land ranges from sand to loam and usually has a surface layer of black muck underlain by sand. Shallow organic soils may also be included in this soil type. Alluvial land has low available water capacity and low or medium natural fertility. It is poorly drained, with slow or ponded runoff, and is generally found on level flood plains along major streams. Tawas muck has a surface layer of grayish-brown mucky peat underlain by black muck, dark gray muck, and sand. This soil, formed from organic material, has high available water capacity in the organic layers and low natural fertility. Tawas muck is generally found on level or depressional areas on lake plains. Roscommon mucky sand has a surface layer consisting of black muck underlain by sand. This soil

has low available water capacity, rapid permeability, and low natural fertility (Berndt, 1977).

Hydrology

The Sturgeon River flows through Sturgeon River Wetland and has an elevational change of approximately four feet. Bull Run and several unnamed tributaries to the Sturgeon River also flow through the wetland. Bull Run originates at Moss Lake, which is north of the wetland; the unnamed tributaries originate in the wetland and join the Sturgeon River along its west bank. Marsh Lake and Boutlier Lake are located in Sturgeon River Wetland (U.S.G.S. quadrangle map, Garden, Michigan, 1958).

Stream flow and water quality characteristics are available for the Sturgeon River. These data may reflect conditions in the portions of the wetland adjacent to the river. The maximum recorded stream discharge is 1,500 cubic feet per second and the minimum discharge is 40 cubic feet per second; water temperatures range from 32°F to 75°F. The pH value for Sturgeon River is 7.5 to 8.0; hardness is reported to range between 70 and 100 milligrams per liter. The water quality of the Sturgeon River is generally considered to be excellent (Great Lakes Basin Commission, 1975).

The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, depth, or seasonal changes in Sturgeon River Wetland.

Climate

The closest weather station providing climatic data for Sturgeon River Wetland is located in Fayette, Michigan. In 1975, the average monthly temperature was 43.4°F, the average daily low for January was 14.2°F and the average daily high in July was 76.3°F. The average annual precipitation is 30.04 inches, with a mean monthly precipitation of 1.63 inches in January and 3.25 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a half months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

Natural special features within the wetland include abandoned river meanders, beach ridges, and bay mouth bars (U.S.G.S. quadrangle map, Garden, Michigan, 1958; Michigan Department of State Highways and Transportation aerial photographs, 1973).

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Sturgeon River Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Sturgeon River Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Sturgeon River Wetland.

Reptiles and Amphibians

Species observed by M. A. Ewert (Indiana University, Environmental Systems Application Center, personal communication) during June of 1969, 1970, and 1976 included the red-backed salamander (Plethodon c. cinerius), American toad (Bufo americanus), green frog (Rana clamitans), snapping turtle (Chelydra serpentina), wood turtle (Clemmys insculpta), painted turtle (Chrysemys picta) and eastern garter snake (Thamnophis sirtalis). Key species included the green frog, common snapping turtle, and painted turtle, as deduced from their conspicuousness and apparent abundance. The wood turtle, in contrast, may be rare within the wetland. Current observations limit distribution of the species to the points where the Sturgeon River and Bull Run enter the northern border of the wetland.

Green frogs, snapping turtles, and painted turtles occur in oxbows of the Sturgeon River and probably frequent other permanent or near-permanent lentic waters within the wetland. Snapping turtles and painted turtles nest in open sandy areas along the Sturgeon River and Bull Run. These sites include clear-cut areas, old fields, major sandbars and banks, and the shoulders of U.S. Highway 2 and the Minneapolis, St. Paul and Sault Ste. Marie Railroad. During the three years previously mentioned, nesting activity in both species of turtles was noted between June 13 and 25. Nesting probably extended later into June, at least for the painted turtle. Clutch size in snapping turtles of Nahma Township ranged from 54 to 77 eggs. Clutch size in painted turtles from the same area ranged from 8 to 13 eggs.

There has been no evidence of human predation on either species of turtle, although harvesting of snapping turtles by local residents cannot be ruled out. Wild mammals destroy most of the nests soon after they have been made. Painted turtles crossing U.S. Highway 2 are sometimes killed. The only snapping turtles (two species) observed were large, obese, and vigorous.

Between 1970 and 1976, the Sturgeon River abandoned over two continuous miles of its old channel, leaving a large lentic water area in the old channel. This probably has increased the habitat available to the two species of turtles. General information on the life histories of snapping turtles and painted turtles near the northern limits of their geographic ranges (such as the Upper Peninsula) are available in Hammer (1969), Moll (1973), Loncke and Obbard (1977), and Ernst and Barbour (1972).

Appendix C-13 contains general information on reptiles and amphibians of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Sturgeon River Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Big Bay de Noc is an important concentration area for migratory waterfowl, especially during fall migration. Jaworski and Raphael (1978) suggest that the bay is used by resting waterfowl because it is protected from wave action.

The Moss Lake area (1,080 acres), located immediately north of Sturgeon River Wetland, is included in the Mississippi Flyway habitat Reconnaissance (Martz, 1976). This study is a cooperative effort between the Michigan Department of Natural Resources and the U.S. Fish and Wildlife Service designed to identify high quality waterfowl habitat that is inadequately protected. This wetland functions as important habitat for waterfowl during breeding and migration seasons. The area is heavily used by migratory Canada geese (Branta canadensis) and nesting wood ducks (Aix sponsa). A small number of Canada geese occasionally remain to nest.

Appendix D-30 contains general information on wetland birds of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Sturgeon River Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

Sturgeon River Wetland is considered exceptional habitat for muskrat (Ondatra zibethicus) (Jaworski and Raphael, 1978).

The literature search provided no site-specific data pertaining to other major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Sturgeon River Wetland.

Endangered Species

The bald eagle (Haliaeetus leucocephalus) is an uncommon resident of the Big Bay de Noc vicinity, but no active nests exist near the shoreline (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication). The osprey (Pandion haliaetus), threatened in Michigan, nests in the Big Bay de Noc area. Postupalsky (1977) identified three pairs of ospreys in the area in 1971, but reports that the breeding population is decreasing in numbers. No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Sturgeon River Wetland by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland. However, a laundromat discharges into the groundwater and active sand and gravel operations are present, these factors may have some effect on the health of the wetland.

CULTURAL SETTING

LM 329

Population

Sturgeon River Wetland is situated in Nahma Township of Delta County, Michigan. The county is sparsely populated, having a density of 37 persons per square mile. Table 13-21 indicates that both Delta County and Nahma Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that rapid population growth is expected to continue in Delta County.

Table 13-21. Population Data for the Vicinity of Sturgeon River Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Delta County	39,358	9.6	45,953
Nahma Township	646	29.5	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Sturgeon River Wetland is rural wooded space. The surrounding area is characterized primarily by rural open space uses with limited agricultural use. An area of industrial, commercial, and residential development (the community of Nahma) is located adjacent to the southeast corner of the wetland, and occasional residences are located around the periphery of the wetland. A boat harbor has been dredged into the delta of the Sturgeon River, south of Sturgeon River Wetland and the community of Nahma, Michigan (Central Upper Peninsula Planning and Development Regional Commission, 1978; Michigan Department of State Highways and Transportation aerial photograph, 1973). The wetland is primarily under federal ownership with only occasional areas of private ownership (Rockford Map Publishers, Inc., 1976). The portion of the wetland under federal ownership is assumed to be under low developmental pressures. The area immediately north and east of Nahma and the southwestern corner of the wetland are assumed to be under moderate pressure owing to the private ownership of these areas and their proximity to the shoreline and developed areas.

Recreation

Although Sturgeon River Wetland is within the Hiawatha National Forest, there are no specifically designated recreation areas in or near the wetland (U.S. Forest Service, 1978).

Mineral, Energy, and Forest Resources

Sturgeon River Wetland is within an area underlain by limestone and dolomites, but there are no operations in the vicinity of the wetland exploiting these resources (Gere, 1977). Three active sand and gravel operations are present; two are located adjacent to the southwestern corner of the wetland and the third is situated near the northeastern corner (Michigan Department of State Highways and Transportation aerial photographs, 1973). There are no oil, gas, or coal resources in or near the wetland (Michigan Geological Survey 1977; Smith, 1915).

Sturgeon River Wetland is a wooded site within the Hiawatha National Forest (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978). Any harvest of timber would be subject to the Forest Service policy that actions affecting a wetland require interdisciplinary review (U.S. Forest Service, 1978).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Sturgeon River Wetland (U.S.G.S. quadrangle map, Garden, Michigan, 1958).

Pollution Sources

The Brandt laundromat discharges into the groundwater at the northeastern edge of Sturgeon River Wetland (T40N, R18W, Sec. 4, NE 1/4 of SW 1/4) (Michigan Water Quality Division, 1978). The type of discharge and its effect on Sturgeon

River Wetland are unknown. No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Sturgeon River Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 329

The literature search identified no on-going or impending research projects pertaining to Sturgeon River Wetland.

UPPER BIG BAY DE NOC WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LM 330-331

Setting

The Upper Big Bay de Noc Wetland Complex, comprised of Upper Big Bay de Noc Wetland and Jacks Bluff Wetland, is located adjacent to the lakeshore along the northernmost extent of Big Bay de Noc in Delta County, Michigan. Upper Big Bay de Noc Wetland surrounds the community of Garden Corners, Michigan, and Jacks Bluff Wetland lies 1.5 miles south of Garden Corners. Coastal beach ridges parallel the shoreline of Big Bay de Noc within Upper Big Bay de Noc Wetland, and Porcupine Point forms the southwesternmost extent of the wetland. A bluffline lies to the east of Upper Big Bay de Noc Wetland and continues southward to form the landward boundary of Jacks Bluff Wetland. Both of these wetlands are Lacustrine Systems occupying low, partially wooded sites within Hiawatha National Forest (U.S.G.S. quadrangle map, Garden, Michigan, 1958; Michigan Department of State Highways and Transportation aerial photograph, 1973).

Topography

Upper Big Bay de Noc Wetland has a total relief of 50 feet, with elevations ranging from 580 to 630 feet above sea level (lake level to 50 feet above the approximate mean elevation of Lake Michigan). Jacks Bluff Wetland has a total relief of 10 feet, with elevations ranging from 580 to 590 feet above sea level. Both wetlands lie on a low lacustrine plain; large inland wetlands occupy low sites within the region. The Niagara Escarpment, to the east of these wetlands, generally marks the boundary of a rolling till plain which lies on the south-facing slope of the Niagara Cuesta. The Niagara Escarpment forms the western shoreline of Garden Peninsula, which is a northern extension of Wisconsin's Door Peninsula.

Surficial Geology

The surficial geology of Upper Big Bay de Noc Wetland and Jacks Bluff Wetland is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

There are five soil types found in Upper Big Bay de Noc Wetland and Jacks Bluff Wetland. Upper Big Bay de Noc Wetland contains mostly Roscommon mucky sand and Tawas muck; Alluvial land is found along the Little Fishdam River. Roscommon mucky sand is found along the northern part of Jacks Bluff Wetland as well as in the southern portion of the wetland. Roscommon mucky sand, Carbondale, Lupton, and Rifle soils, Marsh, and Tawas muck are present throughout the remaining portions of this wetland (Berndt, 1977).

Alluvial land ranges from sand to loam and usually has a surface layer of black muck underlain by sand. Shallow organic soils may also be included in this soil type. Alluvial land has low available water capacity and low or medium natural fertility. It is poorly drained, with slow or ponded runoff, and is generally found on level flood plains along major streams. Tawas muck has a surface layer of grayish-brown mucky peat underlain by black muck, dark gray muck, and sand. This soil, formed from organic material, has high available water capacity in the organic layers and low natural fertility. It is generally found in level or depressional areas on lake plains. Roscommon mucky sand has a surface layer consisting of black muck underlain by sand. This soil has low available water capacity, rapid permeability, and low natural fertility.

Carbondale, Lupton, and Rifle soils have a surface layer which ranges from muck to peat. These soils formed from decomposed herbaceous and woody material and are very poorly drained, with high water storage capacities. Marsh soils range from sand to clay loam; they are wet most of the year and are generally found on inland lake borders and areas bordering Lake Michigan (Berndt, 1977).

Hydrology

The Fishdam River flows south through the wetland and has an elevational change of 20 feet. The Little Fishdam River originates in Warner Lake and flows north and west through Upper Big Bay de Noc Wetland before emptying into the bay. Cousineau Lake and four unnamed lakes are located near the northern shore of the bay. Valentine Creek borders the southern tip of Jacks Bluff Wetland and has little change in elevation as it flows by the wetland into the bay (U.S.G.S. quadrangle map, Garden, Michigan, 1958).

The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Upper Big Bay de Noc Wetland or Jacks Bluff Wetland.

Climate

The closest weather station providing climatic data for the Upper Big Bay de Noc Wetland Complex is located in Fayette, Michigan. In 1975, the average monthly temperature was 43.4°F, the average daily low for January was 14.2°F and the average daily high in July was 76.3°F. The average annual precipitation is 30.04 inches, with a mean monthly precipitation of 1.63 inches in January and 3.25 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a half months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

Natural special features within the wetlands include coastal beach ridges, bay mouth bars, and the Niagara Escarpment (U.S.G.S. quadrangle map, Garden, Michigan, 1958; Michigan Department of State Highways and Transportation aerial photograph, 1973).

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Upper Big Bay de Noc Wetland and Jacks Bluff Wetland.

Fish

The johnny darter (*Etheostoma nigrum*) and mottled sculpin (*Cottus bairdi*) have been recorded in the Little Fishdam River and may occur in Upper Big Bay de Noc Wetland. White sucker (*Catostomus commersoni*), longnose dace (*Rhinichthys cataractae*), log perch (*Percina caprodes*), and mottled sculpin have been found in Valentine Creek and may occur in Jacks Bluff Wetland (Taylor, 1954). A search of the literature provided no site-specific information pertaining to spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in these wetlands.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Upper Big Bay de Noc Wetland and Jacks Bluff Wetland.

Reptiles and Amphibians

Observations were made in Upper Big Bay de Noc Wetland by M. A. Ewert (Indiana University, Environmental Systems Application Center, personal communication) during June, 1976. Two nests of the snapping turtle (*Chelydra serpentina*) were located near the bridge where U.S. Highway 2 crosses the Fishdam River. Clutch sizes were 46 to 70 eggs.

General information on the life histories of snapping turtles near the northern limits of their geographic range, such as the Upper Peninsula are available in Hammer (1969), Loncke and Obbard, 1977), and Ernst and Barbour (1972). Appendix C-13 contains general information on reptiles and amphibians of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Upper Big Bay de Noc Wetland and Jacks Bluff Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in these wetlands.

Avifauna

Big Bay de Noc is an important concentration area for migratory waterfowl, especially during fall migration. Jaworski and Raphael (1978) suggest that the bay is used by resting waterfowl because it is protected from westerly winds and therefore from wave action.

Garden Peninsula is a major shore bird and common loon (Gavia immer) migration area (Jaworski and Raphael, 1978). According to Sheldon (1965), large numbers of hawks pass over the peninsula during fall migration. His report summarizes many raptor migration records, including those of Elsworth M. Harger (Game Biologist of Cusino Wildlife Experiment Station, Shingleton, Michigan), who in 1949 observed American kestrels (Falco sparverius), Cooper's hawks (Accipiter cooperii), species now threatened in Michigan, and large numbers of red-tailed hawks (Buteo jamaicensis) and broad-winged hawks (B. platypterus).

Appendix D-30 contains general information on wetland birds of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Upper Big Bay de Noc Wetland and Jacks Bluff Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing these wetlands.

Mammals

The two wetlands comprising the Upper Big Bay de Noc Wetland Complex are considered exceptional habitat for muskrat (Ondatra zibethicus) (Jaworski and Raphael, 1978).

The literature search provided no site-specific data pertaining to other major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting the Upper Big Bay de Noc Wetland Complex.

Endangered Species

The bald eagle (Haliaeetus leucocephalus) is an uncommon resident of the Big Bay de Noc vicinity (Michigan Endangered and Threatened Species Program, 1978), but no active nests exist near the shoreline (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication). The osprey (Pandion haliaetus), threatened in Michigan, nests in the Big Bay de Noc area. Postupalsky (1977) identified three pairs of ospreys in the area in 1971 but reports that breeding population is decreasing in numbers.

Jaworski and Raphael (1978) state that Garden Peninsula is an important migration route for the common loon (Gavia immer), which is classified as "rare" in Michigan, and for raptorial species. Many of these raptors are endangered, threatened, or rare species. For example, the Cooper's hawk (Accipiter cooperii), on the Michigan list of threatened species, has been recorded migrating over the peninsula during the fall (Sheldon, 1965). However, no

plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in the Upper Big Bay de Noc Wetland Complex by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of these wetlands.

CULTURAL SETTING

LM 330-331

Population

Upper Big Bay de Noc Wetland and Jacks Bluff Wetland are located in Garden Township of Delta County, Michigan. The county is sparsely populated, having a density of 31 persons per square mile. Table 13-22 indicates that Delta County and Garden Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that rapid population growth is expected to continue in Delta County.

Table 13-22. Population Data for the Vicinity of the Upper Big Bay de Noc Wetland Complex

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Delta County	39,358	9.6	45,953
Garden Township	786	10.2	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within both Upper Big Bay de Noc Wetland and Jacks Bluff Wetland is primarily rural wooded space. A few residences are located within Upper Big Bay de Noc Wetland near porcupine Point, and the settlement of Garden Corners lies largely within the wetland boundary. The area surrounding the wetlands is characterized by agricultural and other rural open space uses, with scattered shoreline residential development. Primary and secondary highways cross both of the wetlands in the Upper Big Bay de Noc Wetland Complex. A rail line and an access road cross Upper Big Bay de Noc Wetland, and a boat dock is located at the mouth of Fishdam Creek (U.S.G.S. quadrangle map, Garden, Michigan, 1958; Michigan Department of State Highways and Transportation aerial photograph, 1973; Central Upper Peninsula Planning and Development Regional Commission,

1978; Michigan Department of State Highways and Transportation aerial photograph, 1973). Upper Big Bay de Noc Wetland is under mixed federal, state, and private ownership, while Jacks Bluff Wetland is under mixed state and private ownership (Rockford Map Publishers, Inc., 1976). The portions of Upper Big Bay de Noc Wetland and Jacks Bluff Wetland which are under federal and state ownership appear to be subject to low developmental pressure. The privately owned portions, generally along the shoreline, and particularly in the area near Garden Corners, are assumed to be under moderate development pressure.

Recreation

Although the Upper Big Bay de Noc Wetland Complex lies within the Hiawatha National Forest, there are no known areas specifically designated for recreational use in or near the wetlands (U.S. Forest Service, 1978).

The Delta County Fishdam Park is located between the shoreline and the central portion of Upper Big Bay de Noc Wetland. Fishdam Park is a roadside park with a dock and boat launching facilities, and is heavily used. Overnight camping is not allowed (Delta County Highway Department, personal communication).

Mineral, Energy, and Forest Resources

Upper Big Bay de Noc Wetland and Jacks Bluff Wetland are within an area underlain by limestone and dolomites; the eastern portions of both wetlands are underlain by limestone considered to be of industrial quality. There are two quarries in the vicinity; one to the east of the wetlands and one to the west. The western portion of Upper Big Bay de Noc Wetland is within an area known to contain clay deposits, but there are no operations currently utilizing this resource (Gere, 1977). An active sand and gravel operation is present south of Jacks Bluff Wetland (Michigan Department of State Highways and Transportation aerial photograph, 1973). There are no known oil, gas, or coal resources present in the wetlands.

Upper Big Bay de Noc Wetland and Jacks Bluff Wetland are wooded sites within the Hiawatha National Forest. Any harvest of timber would be subject to Forest Service policy that actions affecting a wetland require interdisciplinary review (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978; U.S. Forest Service, 1978).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Upper Big Bay de Noc Wetland and Jacks Bluff Wetland (U.S.G.S. quadrangle map, Garden, Michigan, 1958).

Pollution Sources

There are no NPDES permit holders adjacent to Upper Big Bay de Noc Wetland and Jacks Bluff Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Upper Big Bay de Noc Wetland and Jacks Bluff Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 330-331

The literature search identified no on-going or impending research projects pertaining to Upper Big Bay de Noc Wetland and Jacks Bluff Wetland.

GARDEN BAY WETLAND

PHYSIOGRAPHIC SETTING

LM 332

Setting

Garden Bay Wetland is adjacent to the eastern shoreline of Big Bay de Noc in Delta County, Michigan, at the head of Garden Bay, and 0.2 mile south of the community of Garden, Michigan. Garden Bay Wetland is a Lacustrine System occupying a low, wooded site (U.S.G.S. quadrangle map, Garden, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974).

Topography

The total relief of Garden Bay Wetland is 10 feet. Wetland elevations range from 580 to 590 feet above sea level (lake level to 10 feet above the approximate mean elevation of Lake Michigan). The wetland lies lakeward of the Niagara Escarpment, which marks the boundary of a rolling till plain located on the south-facing slope of the Niagara Cuesta. The Niagara Escarpment forms much of the western shoreline of Garden Peninsula, which is a northern extension of Wisconsin's Door Peninsula.

Surficial Geology

The surficial geology of Garden Bay Wetland consists of rock at or near the surface (Martin, 1957).

Soils

The major soil type in Garden Bay Wetland is Alluvial land, which ranges from sand to loam and usually has a surface layer of black muck underlain by sand. Shallow organic soils may also be included in this soil type. Alluvial land has low available water capacity and low or medium natural fertility. It is poorly drained, with slow or ponded runoff, and is generally found on level flood plains (Berndt, 1977).

Hydrology

There are no streams flowing through Garden Bay Wetland; however, the wetland is adjacent to Garden Bay (U.S.G.S. quadrangle map, Garden, Michigan, 1958). The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Garden Bay Wetland.

Climate

The closest weather station providing climatic data for Garden Bay Wetland is located in Fayette, Michigan. In 1975, the average monthly temperature was 43.4°F, the average daily low for January was 14.2°F and the average daily high in July was 76.3°F. The average annual precipitation is 30.04 inches, with a

mean monthly precipitation of 1.63 inches in January and 3.25 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a half months long, with the last killing frost (28^oF) in 1975 occurring on April 21 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Garden Bay Wetland (U.S.G.S. quadrangle map, Garden, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974).

BIOTIC SETTING

LM 332

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Garden Bay Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Garden Bay Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Garden Bay Wetland.

Reptiles and Amphibians

The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in Garden Bay Wetland.

Avifauna

Big Bay de Noc is an important concentration area for migratory waterfowl, especially during fall migration. Jaworski and Raphael (1978) suggest that the bay is used by resting waterfowl because it is protected from westerly winds and therefore from wave action.

Garden Peninsula is a major shore bird and common loon (Gavia immer) migration area (Jaworski and Raphael, 1978). Sheldon (1965), reports that large numbers of hawks pass over the peninsula during fall migration. He summarizes

many raptor migration observations, including those of Elsworth M. Harger (Game Biologist of Cusino Wildlife Experiment Station, Shingleton, Michigan), who in 1949 observed American kestrels (Falco sparverius), Cooper's hawks (Accipiter cooperii), and large numbers of red-tailed hawks (Buteo jamaicensis) and broad-winged hawks (B. platypterus).

Appendix D-30 contains general information on wetland birds of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Garden Bay Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

A survey of the mammals of the Green Bay islands (Long, 1978) provides some general information which may be useful in characterizing the wetlands of the Delta and Garden Peninsulas (Appendix E-7).

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Garden Bay Wetland.

Endangered Species

The bald eagle (Haliaeetus leucocephalus) is an uncommon resident of the Big Bay de Noc vicinity, but no active nests exist near the shoreline (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication). The osprey (Pandion haliaetus), threatened in Michigan, nests in the Big Bay de Noc area. Postupalsky (1977) identified three pairs of ospreys in the area in 1971, but reports that the breeding population is decreasing in numbers.

According to Jaworski and Raphael (1978), Garden Peninsula is an important migration route for the common loon (Gavia immer), which is classified as "rare" in Michigan, and for raptorial species. Many of these raptors are endangered, threatened, or rare species. For example, the Cooper's hawk (Accipiter cooperii), which is on the Michigan list of threatened species, has been recorded migrating over the peninsula during the fall (Sheldon, 1965). However, no plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in the Garden Bay Wetland by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland.

Population

Garden Bay Wetland is situated in Garden Township of Delta County, Michigan. The county is sparsely populated, having a density of 31 persons per square mile. Table 13-23 indicates that Delta County and Garden Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that rapid population growth is expected to continue in Delta County.

Table 13-23. Population Data for the Vicinity of Garden Bay Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Delta County	39,358	9.6	45,953
Garden Township	786	10.2	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Garden Bay Wetland is rural wooded space. The area surrounding the wetland is primarily in agricultural open space uses to the south and in residential and commercial uses (the community of Garden) to the northeast. A secondary highway lies to the east of Garden Bay Wetland (U.S.G.S. quadrangle map, Garden, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974; Central Upper Peninsula Planning and Development Regional Commission, 1978; Michigan Shorelands Management Unit aerial photograph, 1974). The wetland is under private ownership (Rockford Map Publishers, Inc., 1976). The immediate presence of residential, commercial, and agricultural land use surrounding the wetland, coupled with private ownership, may be seen to reflect moderate development pressures.

Recreation

There are no known state or federal recreational facilities in the vicinity of Garden Bay Wetland.

Mineral, Energy, and Forest Resources

Garden Bay Wetland is within an area underlain by industrial-quality limestone, but there are no operations in the wetland utilizing this resource (Gere, 1977). There are no oil, gas, or coal resources in or near the wetland (Michigan Geological Survey 1977; Smith, 1915).

Garden Bay Wetland is wooded (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978), but specific information on the commercial value of forest resources and operations for harvesting these resources is not available for the wetland.

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Garden Bay Wetland (U.S.G.S. quadrangle map, Garden, Michigan, 1958).

Pollution Sources

There are no NPDES permit holders adjacent to Garden Bay Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Garden Bay Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 332

The literature search identified no on-going or impending research projects pertaining to Garden Bay Wetland.

PUFFY BAY WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LM 333-334

Setting

The Puffy Bay Wetland Complex, comprised of Puffy Bay Wetlands #1 and #2, is adjacent to the western shore of Garden Peninsula in Delta County, Michigan. Puffy Bay Wetlands #1 and #2 lie 2.2 miles and 2.7 miles, respectively, west of the community of Garden, Michigan. Drainage ditches have been dug in Puffy Bay Wetland #1 and off-road vehicles have been operated in Puffy Bay Wetland #2, causing the destruction of vegetation. Both of the wetlands are Lacustrine Systems occupying low, partially wooded sites (U.S.G.S. quadrangle map, Garden, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

Topography

Puffy Bay Wetlands #1 and #2 have a total relief of 5 feet or less, with elevations ranging from 580 to 585 feet above sea level (lake level to only 5 feet above the approximate mean elevation of Lake Michigan). Puffy Bay lies at the base of the Niagara Escarpment, which marks the western boundary of a rolling till plain located on the south-facing slope of the Niagara Cuesta. The Niagara Escarpment forms much of the western shoreline of Garden Peninsula, which is a northern extension of Wisconsin's Door Peninsula. The Great Lakes Basin Commission (1975) describes the Puffy Bay shoreline as a non-erodible low plain.

Surficial Geology

The surficial geology of Puffy Bay Wetlands #1 and #2 consists of rock at or near the surface (Martin, 1957).

Soils

The soil type in Puffy Bay Wetland #1 is Eastport sand, and the soil type in Puffy Bay Wetland #2 is Limestone rock land. Eastport sand has been altered by shifting wind, which has prevented the formation of a distinct soil profile. This soil is alkaline; its surface layer consists of dark-gray sand, which includes organic matter, underlain by loose light-brown sand or fine sand. Eastport sand is well drained and is found in small areas scattered along the bay. Limestone rock land has a surface layer of fine sandy loam or loam. This soil is shallow and generally occurs in areas where the limestone bedrock is within ten inches of the surface. Limestone rock land has very low available water capacity. Slow runoff may cause the soil to be wet most of the year in some areas (Berndt, 1977).

Hydrology

Puffy Creek borders Puffy Bay Wetland #1. Both Puffy Bay Wetlands #1 and #2 are adjacent to Puffy Bay (U.S.G.S. quadrangle map, Garden, Michigan, 1958). The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Puffy Bay Wetlands #1 and #2.

Climate

The closest weather station providing climatic data for the Puffy Bay Wetland Complex is located in Fayette, Michigan. In 1975, the average monthly temperature was 43.4°F, the average daily low for January was 14.2°F and the average daily high in July was 76.3°F. The average annual precipitation is 30.04 inches, with a mean monthly precipitation of 1.63 inches in January and 3.25 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a half months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of the Puffy Bay Wetland Complex (U.S.G.S. quadrangle map, Garden, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974).

BIOTIC SETTING

LM 333-334

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Puffy Bay Wetlands #1 and #2.

Fish

The following species have been found in Puffy Creek and may occur in Puffy Bay Wetland #1: white sucker (Catostomus commersoni), finescale dace (Phoxinus neogaeus), northern redbelly dace (Phoxinus eos), northern redbelly x finescale dace hybrid, lake chub (Couesius plumbeus), longnose dace (Rhinichthys cataractae), common shiner (Notropis cornutus), spottail shiner (Notropis hudsonius), sand shiner (Notropis stramineus), mimic shiner (Notropis volucellus), log perch (Perana caprodes), johnny darter (Etheostoma nigrum), mottled sculpin (Cottus bairdi), and brook stickleback (Culaea inconstans) (Taylor, 1954). A search of the literature provided no site-specific information pertaining to spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Puffy Bay Wetlands #1 and #2, or to major species and species composition in Puffy Bay Wetland #2.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Puffy Bay Wetlands #1 and #2.

Reptiles and Amphibians

Appendix C-13 contains general information on reptiles and amphibians of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Puffy Bay Wetlands #1 and #2. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in these wetlands.

Avifauna

Big Bay de Noc is known to be an important concentration area for waterfowl, especially during fall migration. Jaworski and Raphael (1978) suggest that the bay is used by resting waterfowl because it is protected from westerly winds and therefore from wave action.

Garden Peninsula is a major shore bird and common loon (Gavia immer) migration area (Jaworski and Raphael, 1978). Sheldon (1965), reports that large numbers of hawks pass over the peninsula during fall migration. He summarizes many raptor migration observations, including those of Elsworth M. Harger (Game Biologist of Cusino Wildlife Experiment Station, Shingleton, Michigan), who in 1949 observed American kestrels (Falco sparverius), Cooper's hawks (Accipiter cooperii), and large numbers of red-tailed hawks (Buteo jamaicensis) and broad-winged hawks (B. platypterus).

Appendix D-30 contains general information on wetland birds of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Puffy Bay Wetlands #1 and #2. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing these wetlands.

Mammals

A survey of the mammals of the Green Bay islands (Long, 1978) provides some general information which may be useful in characterizing the wetlands of Delta and Garden Peninsulas (Appendix E-7).

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting the two wetlands comprising the Puffy Bay Wetland Complex.

Endangered Species

The bald eagle (Haliaeetus leucocephalus) is an uncommon resident of the Big Bay de Noc vicinity (Michigan Endangered and Threatened Species Program, 1978), but no active nests exist near the shoreline (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication). The osprey (Pandion haliaetus), threatened in Michigan, also nests in the Big Bay de Noc area. Postupalsky (1977) identified three pairs of ospreys in the area during 1971, but reports that the breeding population is decreasing in numbers.

According to Jaworski and Raphael (1978), Garden Peninsula is an important migration route for the common loon (Gavia immer), which is classified as "rare" in Michigan, and for raptorial species. Many of these raptors are endangered, threatened, or rare species in Michigan. For example, the Cooper's hawk (Accipiter cooperii), threatened in the state, has been recorded migrating over the peninsula during the fall (Sheldon, 1965). However, no plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in the Puffy Bay Wetland Complex by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of these wetlands.

CULTURAL SETTING

LM 333-334

Population

Puffy Bay Wetlands #1 and #2 are located in Fairbanks Township of Delta County, Michigan. The county is sparsely populated, having a density of 31 persons per square mile. Table 13-24 indicates that Delta County and Fairbanks Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that rapid population growth is expected to continue in Delta County.

Table 13-24. Population Data for the Vicinity of Puffy Bay Wetlands #1 and #2

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Delta County	39,358	9.6	45,953
Fairbanks Township	386	24.9	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Puffy Bay Wetlands #1 and #2 is rural wooded space. Land use in the surrounding area is primarily rural open space, with agricultural uses south of the wetlands. An area of shoreline residential development is located along Puffy Bay immediately north of Puffy Bay Wetland #1. An access road lies to the east of Puffy Bay Wetland #1; drainage ditches are present in the wetland (U.S.G.S. quadrangle map, Garden, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974; Central Upper Peninsula Planning and Development Regional Commission, 1978; Michigan Shorelands Management Unit aerial photograph, 1974). The wetlands are under private ownership; the eastern portion of Puffy Bay Wetland #1 lies within a subdivided area (Rockford Map Publishers, Inc., 1976).

The presence of drainage ditches and a subdivided area within Puffy Bay Wetland #1 suggest that the wetland may be subject to moderate to high development pressures. The immediate presence of residential and agricultural land use surrounding Puffy Bay Wetland #2 may be seen to reflect moderate development pressures.

Recreation

There are no known state or federal recreational facilities in the vicinity of Puffy Bay Wetlands #1 and #2.

Mineral, Energy, and Forest Resources

Puffy Bay Wetlands #1 and #2 lie within an area underlain by industrial-quality limestone, but there are no operations in the area exploiting this resource (Gere, 1977). No oil, gas, or coal resources are present in or near the wetlands (Michigan Geological Survey 1977; Smith, 1915).

Puffy Bay Wetlands #1 and #2 are partially wooded (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978), but no information is available concerning commercial value or harvesting of forest resources in these wetlands.

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Puffy Bay Wetlands #1 and #2 (U.S.G.S. quadrangle map, Garden, Michigan, 1958).

Pollution Sources

There are no NPDES permit holders adjacent to Puffy Bay Wetlands #1 and #2 (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Puffy Bay Wetlands #1 and #2 (Peebles and Black, 1976), but the Michigan Coastal Zone Inventory indicates that one archaeological site (20-DE-2) is present in the vicinity of these wetlands. Information regarding the field research and exact location of this site can be obtained from the Michigan History Division.

RESEARCH PROJECTS

LM 333-334

The literature search identified no on-going or impending research projects pertaining to Puffy Bay Wetlands #1 and #2.

SOUTH RIVER BAY WETLAND

PHYSIOGRAPHIC SETTING

LM 335

Setting

South River Bay Wetland is adjacent to the western shoreline of Garden Peninsula in Delta County, Michigan, at the head of South River Bay. The community of Garden, Michigan, is located four miles northeast of South River Bay Wetland, and a steep bluff, 110 feet high, lies adjacent to the east side of the wetland. The wetland is a Lacustrine System occupying a low, wooded site (U.S.G.S. quadrangle map, Fairport, Michigan, 1958; Michigan Shorelands Management Unit aerial photographs, 1974).

Topography

The total relief of South River Bay Wetland is 10 feet; wetland elevations range from 580 to 590 feet above sea level (lake level to 10 feet above the approximate mean elevation of Lake Michigan). The wetland lies lakeward of the Niagara Escarpment, which marks the western boundary of a rolling till plain located on the south-facing slope of the Niagara Cuesta. The Niagara Escarpment forms much of the western shoreline of the Garden Peninsula, which is a northern extension of Wisconsin's Door Peninsula. The Great Lakes Basin Commission (1975) describes the shoreline near South River Bay Wetland as a non-erodible high bluff.

Surficial Geology

The surficial geology for South River Bay Wetland consists of rock at or near the surface (Martin, 1957).

Soils

Cathro muck is found in the northern part of South River Bay Wetland and Tawas muck in the southern part. Cathro muck has a surface layer of black muck underlain by black mucky peat and grayish-brown sandy loam. This soil has very high available water capacity and low natural fertility. Cathro muck is a poorly drained soil which formed from herbaceous organic material. Tawas muck has a surface layer of grayish-brown mucky peat underlain by black muck, dark gray muck, and sand. This soil, formed from organic material, has high available water capacity in the organic layers and low natural fertility. It is generally found on level or depressional areas on lake plains (Berndt, 1977).

Hydrology

South River Bay Wetland is adjacent to South River Bay. There are no streams flowing through the wetland (U.S.G.S. quadrangle map, Fairport, Michigan, 1958). The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in South River Bay Wetland.

Climate

The closest weather station providing climatic data for South River Bay Wetland is located in Fayette, Michigan. In 1975, the average monthly temperature was 43.4^oF, the average daily low for January was 14.2^oF and the average daily high in July was 76.3^oF. The average annual precipitation is 30.04 inches, with a mean monthly precipitation of 1.63 inches in January and 3.25 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a half months long, with the last killing frost (28^oF) in 1975 occurring on April 21 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

Natural special features include the Niagara Escarpment and Snake Island, which lies offshore from the wetland (U.S.G.S. quadrangle map, Fairport, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974).

BIOTIC SETTING

LM 335

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of South River Bay Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in South River Bay Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in South River Bay Wetland.

Reptiles and Amphibians

Appendix C-13 contains general information on reptiles and amphibians of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to South River Bay Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Big Bay de Noc is known to be an important concentration area for waterfowl, especially during fall migration. Jaworski and Raphael (1978) suggest that the bay is used by resting waterfowl because it is protected from westerly winds and therefore from wave action.

Garden Peninsula is a major shore bird and common loon (Gavia immer) migration area (Jaworski and Raphael, 1978). Sheldon (1965), reports that large numbers of hawks pass over the peninsula during fall migration. He summarizes many observations on raptor migration, including those of Elsworth M. Harger (Game Biologist of Cusino Wildlife Experiment Station, Shingleton, Michigan), who in 1949 observed American kestrels (Falco sparverius), Cooper's hawks (Accipiter cooperii), and large numbers of red-tailed hawks (Buteo jamaicensis) and broad-winged hawks (B. platypterus).

Appendix D-30 contains general information on wetland birds of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to South River Bay Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

A survey of the mammals of the Green Bay islands (Long, 1978) provides some general information which may be useful in characterizing the wetlands of the Delta and Garden Peninsulas (Appendix E-7).

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting South River Bay Wetland.

Endangered Species

The bald eagle (Haliaeetus leucocephalus) is an uncommon resident of the Big Bay de Noc vicinity (Michigan Endangered and Threatened Species Program, 1978), but no active nests exist near the shoreline (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication). The osprey (Pandion haliaetus), threatened in Michigan, also nests in the Big Bay de Noc area. Postupalsky (1977) identified three pairs of ospreys in the area during 1971, but reports that the breeding population is decreasing in numbers.

According to Jaworski and Raphael (1978), Garden Peninsula is an important migration route for the common loon (Gavia immer), which is classified as "rare" in Michigan, and for raptorial species. Many of these raptors are endangered, threatened, or rare species in Michigan. For example, the Cooper's hawk (Accipiter cooperii), threatened in the state, has been recorded migrating over

the peninsula during the fall (Sheldon, 1965). However, No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in South River Bay Wetland by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland.

CULTURAL SETTING

LM 335

Population

South River Bay Wetland is located in Fairbanks Township of Delta County, Michigan. The county is sparsely populated, having a density of 31 persons per square mile. Table 13-25 indicates that Delta County and Fairbanks Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that rapid population growth is expected to continue in Delta County.

Table 13-25. Population Data for the Vicinity of South River Bay Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Delta County	39,358	9.6	45,953
Fairbanks Township	386	24.9	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within South River Bay Wetland is rural wooded space. The surrounding area is predominantly in agricultural and other rural open space uses. A secondary highway is located south of South River Bay Wetland (U.S.G.S. quadrangle map, Fairport, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974; Central Upper Peninsula Planning and Development Regional Commission, 1978). The wetland is under private ownership (Rockford Map Publishers, Inc., 1976).

The immediate presence of agricultural land use surrounding the wetland coupled with private ownership may reflect moderate development pressures.

Recreation

There are no known state or federal recreational facilities in South River Bay Wetland. However, the 365-acre Fayette State Park is located southwest of the wetland. Activities available within the park include fishing, hiking, boating, swimming, and camping (Michigan Department of Natural Resources, 1978).

Mineral, Energy, and Forest Resources

South River Bay Wetland lies within an area underlain by industrial-quality limestone, but there are no quarrying operations in the area (Gere, 1977). No oil, gas, or coal resources are present in or near the wetland (Michigan Geological Survey 1977; Smith, 1915).

South River Bay Wetland is wooded (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978), but no information is available concerning commercial value or harvesting of forest resources in this wetland.

Public Utilities and Facilities

There are no public utilities within 0.5 mile of South River Bay Wetland (U.S.G.S. quadrangle map, Fairport, Michigan, 1958).

Pollution Sources

There are no NPDES permit holders adjacent to South River Bay Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of South River Bay Wetland (Peebles and Black, 1976), but the Michigan Coastal Zone Inventory indicates that one archaeological site (20-DE-9) is present in the wetland. The site is a rock shelter of unknown culture and date. Further information regarding the field research and exact location of this site can be obtained from the Michigan History Division.

RESEARCH PROJECTS

LM 335

The literature search identified no on-going or impending research projects pertaining to South River Bay Wetland.

POINT DETOUR WETLAND

PHYSIOGRAPHIC SETTING

LM 336

Setting

Point Detour Wetland is located at the southern end of Garden Peninsula in Delta County, Michigan, 0.1 mile inland from the shoreline and 1.8 miles east of the community of Fairport, Michigan. Point Detour Wetland is a Palustrine System occupying a raised, wooded site within the Manistique River State Forest (U.S.G.S. quadrangle map, Fairport, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974).

Topography

The total relief of Point Detour Wetland is less than 5 feet; wetland elevations range from 595 to 600 feet above sea level, 15 to 20 feet above the approximate mean elevation of Lake Michigan. The wetland lies on a rolling till plain which is located on the south-facing slope of the Niagara Cuesta. Several small islands lie to the south of the wetland; these islands and Garden Peninsula form the northern extension of Wisconsin's Door Peninsula. The Great Lakes Basin Commission (1975) describes the shoreline near Point Detour Wetland as a non-erodible low plain.

Surficial Geology

The surficial geology of Point Detour Wetland consists of rock at or near the surface (Martin, 1957).

Soils

The soil type in Point Detour Wetland is Limestone rock land, which has a surface layer of fine sandy loam or loam. This soil is shallow and generally occurs in areas where the limestone bedrock is within ten inches of the surface. Limestone rock land has very low available water capacity. Slow runoff may cause the soil to be wet most of the year in some areas (Berndt, 1977).

Hydrology

There are no streams flowing through Point Detour Wetland (U.S.G.S. quadrangle map, Fairport, Michigan, 1958). The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Point Detour Wetland.

Climate

The closest weather station providing climatic data for Point Detour Wetland is located in Fayette, Michigan. In 1975, the average monthly temperature was 43.4°F, the average daily low for January was 14.2°F and the

average daily high in July was 76.3°F. The average annual precipitation is 30.04 inches, with a mean monthly precipitation of 1.63 inches in January and 3.25 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a half months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are present in Point Detour Wetland (U.S.G.S. quadrangle map, Fairport, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974).

BIOTIC SETTING

LM 336

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Point Detour Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Point Detour Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Point Detour Wetland.

Reptiles and Amphibians

Appendix C-13 contains general information on reptiles and amphibians of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Point Detour Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Garden Peninsula is a major shore bird and common loon (Gavia immer) migration area (Jaworski and Raphael, 1978). Sheldon (1965), reports that large numbers of hawks pass over the peninsula during fall migration. He summarizes many observations on raptor migration, including those of Elsworth M. Harger

(Game Biologist of Cusino Wildlife Experiment Station, Shingleton, Michigan), who in 1949 observed American kestrels (Falco sparverius), Cooper's hawks (Accipiter cooperii), and large numbers of red-tailed hawks (Buteo jamaicensis) and broad-winged hawks (B. platypterus).

Appendix D-30 contains general information on wetland birds of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Point Detour Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

A survey of the mammals of the Green Bay islands (Long, 1978) provides some general information which may be useful in characterizing the wetlands of the Delta and Garden Peninsulas (Appendix E-7).

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Point Detour Wetland.

Endangered Species

The bald eagle (Haliaeetus leucocephalus) is an uncommon resident of the Garden Peninsula (Michigan Endangered and Threatened Species Program, 1978), but no active nests exist near the shoreline (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication). The osprey (Pandion haliaetus), threatened in Michigan, also nests in the Big Bay de Noc-Garden Peninsula area. Postupalsky (1977) identified three pairs of ospreys in the area during 1971, but reports that the breeding population is decreasing in numbers.

According to Jaworski and Raphael (1978), Garden Peninsula is an important migration route for the common loon (Gavia immer), which is classified as "rare" in Michigan, and for raptorial species. Many of these raptors are endangered, threatened, or rare species in Michigan. For example, the Cooper's hawk (Accipiter cooperii), threatened in the state, has been recorded migrating over the peninsula during the fall (Sheldon, 1965). However, no plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Point Detour Wetland by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland.

Population

Point Detour Wetland is located in Fairbanks Township of Delta County, Michigan. The county is sparsely populated, having a density of 31 persons per square mile. Table 13-26 indicates that Delta County and Fairbanks Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that rapid population growth is expected to continue in Delta County.

Table 13-26. Population Data for the Vicinity Point Detour Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Delta County	39,358	9.6	45,953
Fairbanks Township	386	24.9	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Point Detour Wetland and most of the surrounding area is rural wooded space (Central Upper Peninsula Planning and Development Regional Commission, 1978; Michigan Shorelands Management Unit aerial photograph, 1974). The extreme southwestern portion of the wetland is under state ownership. The remaining portion of the wetland is under private ownership (Rockford Map Publishers, Inc., 1976). The rural nature of the area suggests that developmental pressures are low.

Recreation

Point Detour Wetland lies within the Manistique River State Forest. Although there are no known areas specifically designated for recreational use in or near the wetland, all Michigan state-owned forest lands are open for camping unless otherwise posted. Hunting and fishing are also major uses of state forest lands (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Mineral, Energy, and Forest Resources

No information was found to indicate the presence of any economically viable mineral deposits in or near Point Detour Wetland. There are no oil, gas, or coal resources in the wetland (Michigan Geological Survey 1977; Smith, 1915).

Point Detour Wetland is a wooded site within Manistique River State Forest (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978). State forest lands in the coastal area are within a "water influence zone," in which water quality, water use, and aesthetic surroundings are the principal management concerns. Cover treatments are designed to maintain or enhance these concerns, and timber harvesting within this area is conducted accordingly (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Point Detour Wetland (U.S.G.S. quadrangle map, Fairport, Michigan, 1958).

Pollution Sources

There are no NPDES permit holders adjacent to Point Detour Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Point Detour Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 336

The literature search identified no on-going or impending research projects pertaining to Point Detour Wetland.

SUCKER LAKE WETLAND

PHYSIOGRAPHIC SETTING

LM 337

Setting

Sucker Lake Wetland is adjacent to Lake Michigan on the eastern shoreline of Garden Peninsula in Delta County, Michigan, four miles northeast of the community of Fairport. Sucker Lake, a small, cut-off bay formed by the junction of two bay mouth bars, lies within the wetland. Sucker Lake Wetland is a Lacustrine System occupying a low, partially wooded site within the Manistique River State Forest (U.S.G.S. quadrangle map, Fairport, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974).

Topography

The total relief of Sucker Lake Wetland is 15 feet; wetland elevations range from 580 to 595 feet above sea level (lake level to 15 feet above the approximate mean elevation of Lake Michigan). The wetland lies on a rolling till plain which is located on the south-facing slope of the Niagara Cuesta. Garden Peninsula and several small islands located to the south form the northern extension of Wisconsin's Door Peninsula. The Great Lakes Basin Commission (1975) describes the shoreline near Sucker Lake Wetland as an erodible low plain.

Surficial Geology

The surficial geology of Sucker Lake Wetland consists of rock at or near the surface (Martin, 1957).

Soils

There are four soil types found in Sucker Lake Wetland: Alpena gravelly sandy loam is found along the shore and Eastport sand is found in the southern part of Sucker Lake Wetland. Ruse silt loam and Summerville fine sandy loam are found inland (Berndt, 1977).

Ruse silt loam has a surface layer of black silt loam underlain by olive-gray silt loam and pale-olive sandy loam. In some areas there may be as much as 12 inches of muck on the surface. Ruse silt loam is poorly drained and has moderate available water capacity and medium natural fertility. Eastport sand has been altered by shifting wind which has prevented the formation of a distinct soil profile. This soil is alkaline; its surface layer consists of dark-gray sand, which includes organic matter, underlain by loose light-brown sand or fine sand. Eastport sand is well-drained. The surface layer of Alpena gravelly sandy loam is a very dark gravelly sandy loam. This soil has low available water capacity, low natural fertility, and rapid permeability. Summerville fine sandy loam has a surface layer of very dark gray fine sandy loam. This soil has moderate available water capacity, medium natural fertility, and slow runoff (Berndt, 1977).

Hydrology

There are no streams flowing through Sucker Lake Wetland, but Sucker Lake lies within the northern portion of the wetland close to Lake Michigan. Sucker Lake Wetland is adjacent to Lake Michigan (U.S.G.S. quadrangle map, Fairport, Michigan, 1958). The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Sucker Lake Wetland.

Climate

The closest weather station providing climatic data for Sucker Lake Wetland is located in Fayette, Michigan. In 1975, the average monthly temperature was 43.4°F, the average daily low for January was 14.2°F and the average daily high in July was 76.3°F. The average annual precipitation is 30.04 inches, with a mean monthly precipitation of 1.63 inches in January and 3.25 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a half months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

Sucker Lake, a cut-off bay, lies within Sucker Lake Wetland (U.S.G.S. quadrangle map, Fairport, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974).

BIOTIC SETTING

LM 337

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Sucker Lake Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Sucker Lake Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Sucker Lake Wetland.

Reptiles and Amphibians

Appendix C-13 contains general information on reptiles and amphibians of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Sucker Lake Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Garden Peninsula is a major shore bird and common loon (Gavia immer) migration area (Jaworski and Raphael, 1978). Sheldon (1965), reports that large numbers of hawks pass over the peninsula during fall migration. He summarizes many observations on raptor migration, including those of Elsworth M. Harger (Game Biologist of Cusino Wildlife Experiment Station, Shingleton, Michigan), who in 1949 observed American kestrels (Falco sparverius), Cooper's hawks (Accipiter cooperii), and large numbers of red-tailed hawks (Buteo jamaicensis) and broad-winged hawks (B. platypterus).

Appendix D-30 contains general information on wetland birds of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Sucker Lake Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

A survey of the mammals of the Green Bay islands (Long, 1978) provides some general information which may be useful in characterizing the wetlands of the Delta and Garden Peninsulas (Appendix E-7).

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Sucker Lake Wetland.

Endangered Species

The bald eagle (Haliaeetus leucocephalus) is an uncommon resident of the Garden Peninsula (Michigan Endangered and Threatened Species Program, 1978), but no active nests exist near the shoreline (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication). The osprey (Pandion haliaetus), threatened in Michigan, also nests in the Big Bay de Noc-Garden Peninsula area. Postupalsky (1977) identified three pairs of ospreys in the area during 1971, but reports that the breeding population is decreasing in numbers.

According to Jaworski and Raphael (1978), Garden Peninsula is an important migration route for the common loon (Gavia immer), which is classified as "rare" in Michigan, and for raptorial species. Many of these raptors are endangered, threatened, or rare species in Michigan. For example, the Cooper's hawk (Accipiter cooperii), threatened in the state, has been recorded migrating over the peninsula during the fall (Sheldon, 1965). However, no plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Sucker Lake Wetland by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland.

CULTURAL SETTING

LM 337

Population

Sucker Lake Wetland is located in Fairbanks Township of Delta County, Michigan. The county is sparsely populated, having a density of 31 persons per square mile. Table 13-27 indicates that Delta County and Fairbanks Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that rapid population growth is expected to continue in Delta County.

Table 13-27. Population Data for the Vicinity of Sucker Lake Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Delta County	39,358	9.6	45,953
Fairbanks Township	386	24.9	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within and surrounding Sucker Lake Wetland is rural wooded space (Central Upper Peninsula Planning and Development Regional Commission, 1978; Michigan Shorelands Management Unit aerial photograph, 1974). With the exception of two small areas of private ownership in the southern portion of the wetland, Sucker Lake Wetland is under state ownership (Rockford Map Publishers, Inc., 1976).

The east slope of Garden Peninsula has been nominated and approved as a coastal management Area of Particular Concern (Central Upper Peninsula Planning and Development Regional Commission, 1978). Should the commission plan be adopted, the area would be preserved in its natural state.

Recreation

Sucker Lake Wetland lies within the Manistique River State Forest. Although there are no known areas specifically designated for recreational use in or near the wetland, all Michigan state-owned forest lands are open for camping unless otherwise posted. Hunting and fishing are also major uses of state forest lands (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Mineral, Energy, and Forest Resources

No information was found to indicate the presence of any economically viable mineral deposits in or near Sucker Lake Wetland. There are no oil, gas, or coal resources within the wetland (Michigan Geological Survey 1977; Smith, 1915).

Sucker Lake Wetland is a partially wooded wetland situated within the Manistique River State Forest (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978). State forest lands in the coastal area are within a "water influence zone," in which water quality, water use, and aesthetic surroundings are the principal management concerns. Cover treatments are designed to maintain or enhance these concerns, and timber harvesting within this area is conducted accordingly (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Sucker Lake Wetland (U.S.G.S. quadrangle map, Fairport, Michigan, 1958).

Pollution Sources

There are no NPDES permit holders adjacent to Sucker Lake Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Sucker Lake Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 337

The literature search identified no on-going or impending research projects pertaining to Sucker Lake Wetland.

PORTAGE BAY AREA WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LM 338-340

Setting

The Portage Bay Area Wetland Complex, comprised of Portage Bay Wetlands #1 and #2 and Halfmoon Lake Wetland, is located adjacent to the eastern shoreline of Garden Peninsula in Delta County, Michigan, within the Manistique River State Forest. Portage Bay Wetland #1 lies 3.1 miles south of the community of Garden, Michigan. Portage Bay Wetland #2 is 1.5 miles southeast of Garden, and Halfmoon Lake Wetland lies 2.3 miles east of Garden.

Portage Bay Wetland #1 lies to the south of Portage Bay on a small inlet. A wide sand beach lies between much of the wetland and the lakeshore. Portage Bay Wetland #1 is a Lacustrine System and occupies a low, wooded site. Portage Bay Wetland #2 is located on Portage Bay; the shoreline of the bay is well protected by a barrier beach, and emergent vegetation extends into the shallow bay. This wetland is a Lacustrine System and occupies a low, partially wooded site. Halfmoon Lake Wetland lies to the north of Portage Bay. Halfmoon Lake Wetland is a Lacustrine System and occupies a low, wooded site (U.S.G.S. quadrangle maps, Fairport, Michigan, 1958; Garden, Michigan, 1958; and Cooks, Michigan, 1958; Michigan Shorelands Management Unit aerial photographs, 1974).

Topography

The elevations and total relief of the individual wetlands in the Portage Bay Area Wetland Complex are listed in Table 13-28.

Table 13-28. Elevations and Total Relief of Individual Wetlands in the Portage Bay Area Wetland Complex

	Minimum elevation (feet) ^a	Maximum elevation (feet) ^a	Total relief (feet)
Portage Bay Wetland #1	580	590	10
Portage Bay Wetland #2	580	600	20
Halfmoon Lake Wetland	580	610	30

^a Elevations measured in feet above sea level; the approximate mean elevation of Lake Michigan is 580 feet above sea level.

Portage Bay Wetlands #1 and #2 and Halfmoon Lake Wetland lie on a low lacustrine plain located on the south-facing slope of the Niagara Cuesta. Large wetlands occupy low, inland sites on this plain. Garden Peninsula, together

with several small islands located to the south of the peninsula, forms the northern extension of Wisconsin's Door Peninsula. The Great Lakes Basin Commission (1975) describes the shoreline near Portage Bay Wetlands #1 and #2 and Halfmoon Lake Wetland as a non-erodible low plain.

Surficial Geology

The surficial geology of Portage Bay Wetlands #1 and #2 and Halfmoon Lake Wetland consists of rock at or near the surface (Martin, 1957).

Soils

There are four soil types found in Portage Bay Wetlands #1 and #2 and Halfmoon Lake Wetland. Eastport-Roscommon sands are found along the Lake Michigan shore and Carbondale, Lupton, and Rifle soils are found inland in Portage Bay Wetland #1. Marsh soil is found along the shore of Portage Bay Wetland #2, and Tawas muck and Carbondale, Lupton, and Rifle soils are found inland. Eastport-Roscommon sands are found near the Lake Michigan shore of Halfmoon Lake Wetland; Tawas muck is found near Halfmoon Lake, and Carbondale, Lupton, and Rifle soils are found inland (Berndt, 1977).

Tawas muck has a surface layer of grayish-brown mucky peat underlain with black muck, dark gray muck, and sand. This soil, formed from organic material, has high available water capacity in the organic layers and low natural fertility; it is generally found on level or depressional areas on lake plains. Carbondale, Lupton, and Rifle soils have a surface layer which ranges from muck to peat. These soils formed from decomposed herbaceous and woody material and are very poorly drained, with high water storage capacities. Marsh soils range from sand to clay loam; they are wet most of the year and are generally found on inland lake borders and areas bordering Lake Michigan. Eastport-Roscommon sand is generally found on beach ridges and stabilized dunes. This soil has a surface layer of black, partially decomposed leaf litter underlain by sand. Eastport-Roscommon sand has little available water capacity, rapid permeability, and low natural fertility (Berndt, 1977).

Hydrology

There are no streams flowing through Portage Bay Wetlands #1 and #2 and Halfmoon Lake Wetland. Two unnamed lakes are present in Portage Bay Wetland #1. Halfmoon Lake, Buck Fever Lake, and several small, unnamed lakes lie within Halfmoon Lake Wetland (U.S.G.S. quadrangle maps, Fairport, Michigan, 1958; Garden, Michigan, 1958; Cooks, Michigan, 1958).

The literature search pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Portage Bay Wetlands #1 and #2 or Halfmoon Lake Wetland.

Climate

The closest weather station providing climatic data for the Portage Bay Area Wetland Complex is located in Fayette, Michigan. In 1975, the average monthly temperature was 43.4^oF, the average daily low for January was 14.2^oF and

the average daily high in July was 76.3⁰F. The average annual precipitation is 30.04 inches, with a mean monthly precipitation of 1.63 inches in January and 3.25 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a half months long, with the last killing frost (28⁰F) in 1975 occurring on April 21 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

Natural special features present in Portage Bay Area Wetlands #1 and #2 and Halfmoon Lake Wetland include bay mouth bars and coastal beach ridges (U.S.G.S. quadrangle maps, Fairport, Michigan, 1958; Garden, Michigan, 1958; Cooks, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974).

BIOTIC SETTING

LM 338-340

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of the Portage Bay Area Wetland Complex.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in the Portage Bay Area Wetland Complex.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in the Portage Bay Area Wetland Complex.

Reptiles and Amphibians

Appendix C-13 contains general information on reptiles and amphibians of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Portage Bay Wetlands #1 and #2 and Halfmoon Lake Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in these wetlands.

Avifauna

Garden Peninsula is a major shore bird and common loon (Gavia immer) migration area (Jaworski and Raphael, 1978). Sheldon (1965), reports that large numbers of hawks pass over the peninsula during fall migration. He summarizes many observations on raptor migration, including those of Elsworth M. Harger (Game Biologist of Cusino Wildlife Experiment Station, Shingleton, Michigan), who in 1949 observed American kestrels (Falco sparverius), Cooper's hawks (Accipiter cooperii), and large numbers of red-tailed hawks (Buteo jamaicensis) and broad-winged hawks (B. platypterus).

Appendix D-30 contains general information on wetland birds of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Portage Bay Wetlands #1 and #2 and Halfmoon Lake Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing these wetlands.

Mammals

A survey of the mammals of the Green Bay islands (Long, 1978) provides some general information which may be useful in characterizing the wetlands of the Delta and Garden Peninsulas (Appendix E-7).

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting the three wetlands comprising the Portage Bay Area Wetland Complex.

Endangered Species

The bald eagle (Haliaeetus leucocephalus) is an uncommon resident of the Garden Peninsula (Michigan Endangered and Threatened Species Program, 1978), but no active nests exist near the shoreline (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication). The osprey (Pandion haliaetus), threatened in Michigan, also nests in the Big Bay de Noc-Garden Peninsula area. Postupalsky (1977) identified three pairs of ospreys in the area during 1971, but reports that the breeding population is decreasing in numbers.

According to Jaworski and Raphael (1978), Garden Peninsula is an important migration route for the common loon (Gavia immer), which is classified as "rare" in Michigan, and for raptorial species. Many of these raptors are endangered, threatened, or rare species in Michigan. For example, the Cooper's hawk (Accipiter cooperii), threatened in the state, has been recorded migrating over the peninsula during the fall (Sheldon, 1965). However, no plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in the Portage Bay Area Wetland Complex by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of these wetlands.

CULTURAL SETTING

LM 338-340

Population

The Portage Bay Area Wetland Complex is located in Garden Township of Delta County, Michigan. The county is sparsely populated, having a density of 31 persons per square mile. Table 13-29 indicates that Delta County and Garden Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that rapid population growth is expected to continue in Delta County.

Table 13-29. Population Data for the Vicinity of the Portage Bay Area Wetland Complex

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Delta County	39,358	9.6	45,953
Garden Township	786	10.2	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Portage Bay Wetlands #1 and #2 and Halfmoon Lake Wetland is rural wooded space. The area surrounding these wetlands is primarily in rural open space uses with some agricultural uses inland. Access roads lie adjacent to Portage Bay Wetlands #1 and #2, and a drainage ditch is located in Portage Bay Wetland #2 (U.S.G.S. quadrangle maps, Fairport, Michigan, 1958; Garden, Michigan, 1958; Cooks, Michigan, 1958; Michigan Shorelands Management Unit aerial photograph, 1974; Central Upper Peninsula Planning and Development Regional Commission, 1978; Michigan Shorelands Management Unit aerial photograph, 1974). Portage Bay Wetlands #1 and #2 are predominantly under state ownership with only a few areas of private ownership, while Halfmoon Lake Wetland is entirely under state ownership (Rockford Map Publishers, Inc., 1976).

The east slope of Garden Peninsula, including Portage Bay Wetlands #1 and #2, has been nominated and approved as a coastal management Area of Particular Concern (Central Upper Peninsula Planning and Development Regional Commission,

1978). Should the commission plan be adopted, this area would receive protection as a natural area.

Recreation

Portage Bay Wetlands #1 and #2 and Halfmoon Lake Wetland are situated within Manistique River State Forest. The Portage Bay Campground lies within the southern portion of Portage Bay Wetland #1 and includes facilities for 18 campsites, boating, swimming, fishing, and hiking (Michigan Department of Natural Resources, 1977). Hunting is also a major use of state forest lands (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Mineral, Energy, and Forest Resources

No information was found to indicate the presence of economically viable mineral deposits in or near the Portage Bay Area Wetland Complex. There are no known oil, gas, or coal resources in the wetlands (Michigan Geological Survey Division, 1977; Smith, 1915).

Portage Bay Wetlands #1 and #2 and Halfmoon Lake Wetland are wooded sites within Manistique River State Forest (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978). State forest lands in the coastal area are within a "water influence zone", in which water quality, water use, and aesthetic surroundings are the principal management concerns. Cover treatments are designed to maintain or enhance these concerns, and timber harvesting within the area is conducted accordingly (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Portage Bay Wetlands #1 and #2 and Halfmoon Lake Wetland (U.S.G.S. quadrangle maps, Cooks, Michigan, 1958; Fairport, Michigan, 1958; Garden, Michigan, 1958).

Pollution Sources

There are no NPDES permit holders adjacent to Portage Bay Wetlands #1 and #2 and Halfmoon Lake Wetland. No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Portage Bay Wetlands #1 and #2 and Halfmoon Lake Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 338-340

The literature search identified no on-going or impending research projects pertaining to the Portage Bay Area Wetland Complex.

DELTA COUNTY BORDER WETLAND

PHYSIOGRAPHIC SETTING

LM 341

Setting

Delta County Border Wetland is located 0.1 mile inland from the eastern shoreline of Garden Peninsula in Delta County, Michigan, 3.2 miles east of the community of Garden. A small bay of Lake Michigan lies to the east of Delta County Border Wetland, and the Delta County-Schoolcraft County line is 0.9 mile east of the wetland. Delta County Border Wetland is a Palustrine System; it occupies a raised, partially wooded site within the Manistique River State Forest (U.S.G.S. quadrangle map, Cooks, Michigan, 1958).

Topography

The total relief of Delta County Border Wetland is 10 feet; wetland elevations range from 590 to 600 feet above sea level, 10 to 20 feet above the approximate mean elevation of Lake Michigan. The wetland lies on a low, poorly drained, lacustrine plain on the south-facing slope of the Niagara Cuesta. Large inland wetlands occupy low sites on this plain. Garden Peninsula and several small islands located to the south form the northern extension of Wisconsin's Door Peninsula. The Great Lakes Basin Commission (1975) describes the shoreline near Delta County Border Wetland as a non-erodible low plain.

Surficial Geology

The surficial geology of Delta County Border Wetland consists of rock at or near the surface (Martin, 1957).

Soils

The soil series in Delta County Border Wetland is Carbondale, Lupton, and Rifle soils. Carbondale, Lupton, and Rifle soils have a surface layer which ranges from muck to peat. These soils formed from decomposed herbaceous and woody material and are very poorly drained, with high water storage capacities (Berndt, 1977).

Hydrology

There are no streams flowing through Delta County Border Wetland (U.S.G.S. quadrangle map, Cooks, Michigan, 1958). The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Delta County Border Wetland.

Climate

The closest weather station providing climatic data for Delta County Border Wetland is located in Fayette, Michigan. In 1975, the average monthly

temperature was 43.4°F, the average daily low for January was 14.2°F and the average daily high in July was 76.3°F. The average annual precipitation is 30.04 inches, with a mean monthly precipitation of 1.63 inches in January and 3.25 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a half months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Delta County Border Wetland (U.S.G.S. quadrangle map, Cooks, Michigan, 1958).

BIOTIC SETTING

LM 341

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Delta County Border Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Delta County Border Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Delta County Border Wetland.

Reptiles and Amphibians

Appendix C-13 contains general information on reptiles and amphibians of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Delta County Border Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Garden Peninsula is a major shore bird and common loon (*Gavia immer*) migration area (Jaworski and Raphael, 1978). Sheldon (1965), reports that large numbers of hawks pass over the peninsula during fall migration. He summarizes many observations on raptor migration, including those of Elsworth M. Harger

(Game Biologist of Cusino Wildlife Experiment Station, Shingleton, Michigan), who in 1949 observed American kestrels (Falco sparverius), Cooper's hawks (Accipiter cooperii), and large numbers of red-tailed hawks (Buteo jamaicensis) and broad-winged hawks (B. platyterus).

Appendix D-30 contains general information on wetland birds of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Delta County Border Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Delta County Border Wetland.

Endangered Species

The bald eagle (Haliaeetus leucocephalus) is an uncommon resident of the Garden Peninsula (Michigan Endangered and Threatened Species Program, 1978), but no active nests exist near the shoreline (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication). The osprey (Pandion haliaetus), threatened in Michigan, also nests in the Big Bay de Noc-Garden Peninsula area. Postupalsky (1977) identified three pairs of ospreys in the area during 1971, but reports that the breeding population is decreasing in numbers.

According to Jaworski and Raphael (1978), Garden Peninsula is an important migration route for the common loon (Gavia immer), which is classified as "rare" in Michigan, and for raptorial species. Many of these raptors are endangered, threatened, or rare species in Michigan. For example, the Cooper's hawk (Accipiter cooperii), threatened in the state, has been recorded migrating over the peninsula during the fall (Sheldon, 1965). However, no plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Delta County Border Wetland by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland.

Population

Delta County Border Wetland is situated in Garden Township of Delta County, Michigan. The county is sparsely populated, having a density of 31 persons per square mile. Table 13-30 indicates that Delta County and Garden Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that rapid population growth is expected to continue in Delta County.

Table 13-30. Population Data for the Vicinity of Delta County Border Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Delta County	39,358	9.6	45,953
Garden Township	786	10.2	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Delta County Border Wetland and most of the surrounding area is rural wooded space. Two shoreline residences are located just to the east of the wetland. An access road lies adjacent to Delta County Border Wetland (Central Upper Peninsula Planning and Development Regional Commission, 1978). The eastern portion of the wetland is under private ownership; the rest of the wetland is under state ownership (Rockford Map Publishers, Inc., 1976).

The east slope of Garden Peninsula, including Delta County Border Wetland, has been nominated and approved as a coastal management Area of Particular Concern (Central Upper Peninsula Planning and Development Regional Commission, 1978). Should the commission's plan be adopted, this area would be preserved in a natural state.

Recreation

Delta County Border Wetland lies within the Manistique River State Forest. Although there are no known areas specifically designated for recreational use near the wetland, all Michigan state forest lands are open for camping unless otherwise posted. Hunting and fishing are also major uses of state forest lands (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Mineral, Energy, and Forest Resources

No information was identified to indicate the presence of economically viable mineral deposits in or near Delta County Border Wetland. There are no known oil, gas, or coal resources in the wetland (Michigan Geological Survey 1977; Smith, 1915).

Delta County Border Wetland is a partially wooded site within Manistique River State Forest (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978). State forest lands in the coastal area are within a "water influence zone," in which water quality, water use, and aesthetic surroundings are the principal management concerns. Cover treatments are designed to maintain or enhance these concerns, and timber harvesting within this area is conducted accordingly (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Delta County Border Wetland (U.S.G.S. quadrangle map, Cooks, Michigan, 1958).

Pollution Sources

There are no NPDES permit holders adjacent to Delta County Border Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Delta County Border Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 341

The literature search identified no on-going or impending research projects pertaining to Delta County Border Wetland.

POINT O'KEEFE AREA WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LM 342-343

Setting

The Point O'Keefe Area Wetland Complex, comprised of Point O'Keefe Wetland and Trail Creek Wetland, is adjacent to the eastern shoreline of Garden Peninsula in Schoolcraft County, Michigan, on either side of Point O'Keefe. Point O'Keefe Wetland and Trail Creek Wetland lie 4.5 and 5.6 miles, respectively, east of the community of Garden, Michigan.

Point O'Keefe Wetland is situated to the west of Point O'Keefe. The wetland is narrow and parallels the shoreline for a distance of approximately 0.9 mile. Point O'Keefe Wetland is a low, non-wooded Lacustrine System. Trail Creek Wetland parallels the shoreline to the east of Point O'Keefe. Trail Creek Wetland is a low, partially wooded Lacustrine System (U.S.G.S. quadrangle map, Cooks, Michigan, 1958).

Topography

The total relief of Point O'Keefe Wetland is approximately 5 feet, with wetland elevations ranging from 580 to 585 feet above sea level (lake level to 5 feet above the approximate mean elevation of Lake Michigan). Trail Creek Wetland has a total relief of 10 feet, with elevations ranging from lake level to 590 feet above sea level. The wetlands lie on a low lacustrine plain on the south-facing slope of the Niagara Cuesta. Large wetlands occupy low inland sites on this plain. Garden Peninsula, together with several small islands located to the south, forms the northern extension of Wisconsin's Door Peninsula. The Great Lakes Basin Commission (1975) describes the shoreline near Point O'Keefe Wetland and Trail Creek Wetland as a non-erodible low plain.

Surficial Geology

The surficial geology of Point O'Keefe Wetland and Trail Creek Wetland is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in Point O'Keefe Wetland is Coastal beach, and Eastport sand is predominant in Trail Creek Wetland. Coastal beach consists of sand or limestone bedrock and mudflats, and is generally found along a narrow strip of land bordering Lake Michigan. Eastport sand has been altered by shifting wind, which has prevented the formation of a distinct soil profile. This soil is alkaline; the surface layer consists of dark-gray sand which includes organic matter, underlain by loose light-brown sand or fine sand. Eastport sand is well drained (Foster et al., 1939; Berndt, 1977).

Hydrology

There are no streams flowing through Point O'Keefe Wetland; however, the wetland is adjacent to Lake Michigan. Trail Creek flows through Trail Creek Wetland and has an elevational change of 10 feet as it travels through the wetland. Trail Creek Wetland is also adjacent to Lake Michigan (U.S.G.S. quadrangle map, Cooks, Michigan, 1958). The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Point O'Keefe Wetland or Trail Creek Wetland.

Climate

The closest weather station providing climatic data for the Point O'Keefe Area Wetland Complex is located in Fayette, Michigan. In 1975, the average monthly temperature was 43.4^oF, the average daily low for January was 14.2^oF and the average daily high in July was 76.3^oF. The average annual precipitation is 30.04 inches, with a mean monthly precipitation of 1.63 inches in January and 3.25 inches in July based on the normal period from 1941-1970. The growing season is approximately six and a half months long, with the last killing frost (28^oF) in 1975 occurring on April 21 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are present in Point O'Keefe Wetland or Trail Creek Wetland (U.S.G.S. quadrangle map, Cooks, Michigan, 1958).

BIOTIC SETTING

LM 342-343

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Point O'Keefe Wetland and Trail Creek Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Point O'Keefe Area Wetland and Trail Creek Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Point O'Keefe Area Wetland and Trail Creek Wetland.

Reptiles and Amphibians

Appendix C-13 contains general information on reptiles and amphibians of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Point O'Keefe Wetland and Trail Creek Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in these wetlands.

Avifauna

Garden Peninsula is a major shore bird and common loon (Gavia immer) migration area (Jaworski and Raphael, 1978). Sheldon (1965), reports that large numbers of hawks pass over the peninsula during fall migration. He summarizes many observations on raptor migration, including those of Elsworth M. Harger (Game Biologist of Cusino Wildlife Experiment Station, Shingleton, Michigan), who in 1949 observed American kestrels (Falco sparverius), Cooper's hawks (Accipiter cooperii), and large numbers of red-tailed hawks (Buteo jamaicensis) and broad-winged hawks (B. platypterus).

Appendix D-30 contains general information on wetland birds of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to Point O'Keefe Wetland and Trail Creek Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing these wetlands.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting the Point O'Keefe Area Wetland Complex.

Endangered Species

The bald eagle (Haliaeetus leucocephalus) is an uncommon resident of the Garden Peninsula (Michigan Endangered and Threatened Species Program, 1978), but no active nests exist near the shoreline (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication). The osprey (Pandion haliaetus), threatened in Michigan, also nests in the Big Bay de Noc-Garden Peninsula area. Postupalsky (1977) identified three pairs of ospreys in the area during 1971, but reports that the breeding population is decreasing in numbers.

According to Jaworski and Raphael (1978), Garden Peninsula is an important migration route for the common loon (Gavia immer), which is classified as "rare" in Michigan, and for raptorial species. Many of these raptors are endangered, threatened, or rare species in Michigan. For example, the Cooper's hawk

(*Accipiter cooperii*), threatened in the state, has been recorded migrating over the peninsula during the fall (Sheldon, 1965). However, no plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in the Point O'Keefe Area Wetland Complex by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of these wetlands.

CULTURAL SETTING

LM 342-343

Population

Point O'Keefe Wetland and Trail Creek Wetland are located in Thompson Township of Schoolcraft County, Michigan. The county is sparsely populated, having a density of seven persons per square mile. Table 13-31 indicates that Schoolcraft County and Thompson Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that rapid population growth is expected to continue in Schoolcraft County.

Table 13-31. Population Data for the Vicinity of Point O'Keefe Wetland and Trail Creek Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Schoolcraft County	8,659	5.3	10,125
Thompson Township	346	9.1	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within the Point O'Keefe Area Wetland Complex and most of the surrounding area is rural open space (Central Upper Peninsula Planning and Development Regional Commission, 1978). Point O'Keefe Wetland is under mixed state and private ownership, while Trail Creek Wetland is entirely under private ownership (Rockford Map Publishers, Inc., 1970; Central Upper Peninsula Planning and Development Regional Commission, 1978). Given the rural nature of the area, developmental pressures are assumed to be low.

Recreation

There are no known state or federal recreational facilities in the vicinity of Point O'Keefe Wetland or Trail Creek Wetland.

Mineral, Energy, and Forest Resources

No information was identified to indicate the presence of any economically viable mineral deposits in or near Point O'Keefe Wetland and Trail Creek Wetland. There are no oil, gas, or coal resources in the wetlands (Michigan Geological Survey 1977; Smith, 1915).

No significant forest resources are present in Point O'Keefe Wetland or Trail Creek Wetland (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Point O'Keefe Wetland or Trail Creek Wetland (U.S.G.S. quadrangle map, Cooks, Michigan, 1958).

Pollution Sources

There are no NPDES permit holders adjacent to Point O'Keefe Wetland or Trail Creek Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Point O'Keefe Wetland and Trail Creek Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 342-343

The literature search identified no on-going or impending research projects pertaining to Point O'Keefe Wetland and Trail Creek Wetland.

LITTLE HARBOR AREA WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LM 344-346

Setting

The Little Harbor Area Wetland Complex, comprised of Cole Point Wetland, Little Harbor Wetland, and Pillows Point Wetland, is adjacent to the Lake Michigan shoreline on the eastern side of Garden Peninsula in Schoolcraft County, Michigan. Cole Point Wetland is 7.5 miles east of the community of Garden, Michigan; Little Harbor Wetland and Pillows Point Wetland lie 8.0 and 9.3 miles east of Garden, respectively.

Cole Point Wetland lies on Cole Point, a bay mouth bar west of Little Harbor. The wetland is a low, heavily wooded Lacustrine System. Little Harbor Wetland lies on the east side of Little Harbor, and parallels the Lake Michigan shoreline for a distance of roughly one mile. Little Harbor Wetland is a low, partially wooded Lacustrine System. Pillows Point Wetland lies the farthest east of the three wetlands, between Miller Point and Pillows Point, two small sandbars protruding into the lake. Pillows Point Wetland is a low, non-wooded Lacustrine System (U.S.G.S. quadrangle map, Cooks, Michigan, 1958; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

Topography

The elevations and total relief of the individual wetlands in the wetland complex are listed in Table 13-32.

Table 13-32. Elevations and Total Relief of Individual Wetlands in the Little Harbor Area Wetland Complex

	Minimum elevation (feet) ^a	Maximum elevation (feet) ^a	Total relief (feet)
Cole Point Area Wetland	580	585	5
Little Harbor Wetland	580	590	10
Pillows Point Wetland	580	585	5

^a Elevations measured in feet above sea level; the approximate mean elevation of Lake Michigan is 580 feet above sea level.

Surficial Geology

The surficial geology of Cole Point Wetland, Little Harbor Wetland, and Pillows Point Wetland is characterized by lake beds comprised mainly of sand.

These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

Coastal beach soil is found in Cole Point Wetland and Pillows Point Wetland, as well as along the shore of Little Harbor Wetland. Ruse fine sandy loam is found inland in Little Harbor Wetland. Coastal beach soil consists of sand or limestone bedrock and mud flats. Ruse fine sandy loam has a surface layer of black organic matter or mucky material, underlain by fine sandy loam or silty loam. This soil is poorly drained, with good natural fertility, and is generally found in slight depressions (Foster et al., 1939).

Hydrology

There are no streams flowing through Cole Point Wetland or Little Harbor Wetland. An unnamed perennial stream flows into Lake Michigan through Pillows Point Wetland. All three wetlands are adjacent to Lake Michigan (U.S.G.S. quadrangle map, Cooks, Michigan, 1958).

The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Cole Point Wetland, Little Harbor Wetland, or Pillows Point Wetland.

Climate

The closest weather station providing climatic data for the Little Harbor Area Wetland Complex is located in Manistique, Michigan. The average annual temperature for the normal period from 1941-1970 is not available. In 1975, the average daily low temperature in January was 8.2^oF and the average daily high in July was 79.1^oF. The average annual precipitation is 30.24 inches, with a mean monthly precipitation of 1.38 inches in January and 3.00 inches in July based on the normal period from 1941-1970. The growing season is approximately four and three fourths months long, with the last killing frost (28^oF) in 1975 occurring on April 21 and the first killing frost on September 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are present in any of the wetlands of the Little Harbor Area Wetland Complex (U.S.G.S. quadrangle map, Cooks, Michigan, 1958).

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of the Little Harbor Area Wetland Complex.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in the Little Harbor Area Wetland Complex.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in the Little Harbor Area Wetland Complex.

Reptiles and Amphibians

Appendix C-13 contains general information on reptiles and amphibians of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to the Little Harbor Area Wetland Complex. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in these wetlands.

Avifauna

Garden Peninsula is a major shore bird and common loon (Gavia immer) migration area (Jaworski and Raphael, 1978). Sheldon (1965), reports that large numbers of hawks pass over the peninsula during fall migration. He summarizes many observations on raptor migration, including those of Elsworth M. Harger (Game Biologist of Cusino Wildlife Experiment Station, Shingleton, Michigan), who in 1949 observed American kestrels (Falco sparverius), Cooper's hawks (Accipiter cooperii), and large numbers of red-tailed hawks (Buteo jamaicensis) and broad-winged hawks (B. platypterus).

Appendix D-30 contains general information on wetland birds of Lake Section 13, but care should be exercised in the interpretation of the relevance of these studies to the Little Harbor Area Wetland Complex. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing these wetlands.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting the three wetlands comprising the Little Harbor Area Wetland Complex.

Endangered Species

The bald eagle (Haliaeetus leucocephalus) is an uncommon resident of the Garden Peninsula (Michigan Endangered and Threatened Species Program, 1978), but no active nests exist near the shoreline (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication). The osprey (Pandion haliaetus), threatened in Michigan, also nests in the Big Bay de Noc-Garden Peninsula area. Postupalsky (1977) identified three pairs of ospreys in the area during 1971, but reports that the breeding population is decreasing in numbers.

According to Jaworski and Raphael (1978), Garden Peninsula is an important migration route for the common loon (Gavia immer), which is classified as "rare" in Michigan, and for raptorial species. Many of these raptors are endangered, threatened, or rare species in Michigan. For example, the Cooper's hawk (Accipiter cooperii), threatened in the state, has been recorded migrating over the peninsula during the fall (Sheldon, 1965). However, no plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in the Little Harbor Area Wetland Complex by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of these wetlands.

CULTURAL SETTING

LM 344-346

Population

The Little Harbor Area Wetland Complex is located in Thompson Township of Schoolcraft County, Michigan. The county is sparsely populated, having a density of seven persons per square mile. Table 13-33 indicates that Schoolcraft County and Thompson Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that rapid population growth is expected to continue in Schoolcraft County.

Table 13-33. Population Data for the Vicinity of the Little Harbor Area Wetland Complex

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Schoolcraft County	8,659	5.3	10,125
Thompson Township	346	9.1	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within the Little Harbor Area Wetland Complex is rural wooded space. Land use in the area surrounding these wetlands is primarily rural open space, with only a few scattered residences inland from the wetlands (Central Upper Peninsula Planning and Development Regional Commission, 1978). The wetlands are under private ownership (Rockford Map Publishers, Inc., 1970; Central Upper Peninsula Planning and Development Regional Commission, 1978). Given the rural nature of the area, developmental pressures appear to be low.

Recreation

There are no known state or federal recreational facilities in the vicinity of Cole Point Wetland, Little Harbor Wetland, and Pillows Point Wetland.

Mineral, Energy, and Forest Resources

No information was identified to indicate the presence of any economically viable mineral deposits in or near Cole Point Wetland, Little Harbor Wetland, and Pillows Point Wetland. There are no oil, gas, or coal resources in these wetlands (Michigan Geological Survey, 1977; Smith, 1915).

Cole Point Wetland and Little Harbor Wetland are wooded (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978), but specific information on the commercial value of forest resources and operations for harvesting these resources is not available.

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Cole Point Wetland, Little Harbor Wetland, and Pillows Point Wetland (U.S.G.S. quadrangle map, Cooks, Michigan, 1958).

Pollution Sources

There are no NPDES permit holders adjacent to Cole Point Wetland, Little Harbor Wetland, and Pillows Point Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Cole Point Wetland, Little Harbor Wetland, and Pillows Point Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 344-346

The literature search identified no on-going or impending research projects pertaining to the Little Harbor Area Wetland Complex.

Table 13-34. Data Gaps - Lake Section 13

Data Gap*	Wetland Number	301	302	303	304	305	306-310	311	312	313-314	315	316	317	318-319	320-321	322-325	326	327-328	329	330-331	332	333-334		
Physiographic Setting	Setting																							
	Topography																							
	Surficial Geology																*							
	Soils																							
	Hydrology	Water Level Fluctuations	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		Groundwater	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		Water Quality	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		Depth	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		Seasonal Changes	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Climate	Climate																						
Special Features																								
Biotic Setting	Vegetation	Major Species Distribution	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
		Major Species Composition	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		Density/Productivity	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		Relationship to Water Levels	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Fish	Major species	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		Species Composition	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		Seasonal Distribution	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		Spawning and Hatching Areas	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		Commercial/Recreational Use	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		Life Histories	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		Food Sources	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Invertebrates	Species Composition	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		Seasonal Distribution	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		Density/Productivity	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		Food Sources	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Amphibians/Reptiles	Relationship to Water Levels	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		Major Species	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		Seasonal Distribution	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		Density/Productivity	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		Recreational/Commercial Use	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Avifauna	Life Histories	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Food Sources	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Relationship to Water Levels	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Major Species	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Seasonal Distribution	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Density/Productivity	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Recreational/Commercial Use	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Mammals	Life Histories	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Food Sources	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Relationship to Water Levels	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Major Species	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Seasonal Distribution	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Density/Productivity	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Recreational/Commercial Use	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Cultural Setting	Endangered Species																							
	Health	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Population																							
	Land Use and Ownership																							
	Recreation																							
	Mineral, Energy, Forest Resource																							
	Public Utilities/Facilities																							
	Point Pollution Sources																							
	Non-Point Pollution Sources	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Historic Features																							
Archaeologic Features	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		

Table 13-34 (concluded)

Data Gap*		Wetland Number	335	336	337	338-340	341	342-343	344-346	
Physiographic Setting	Setting									
	Topography									
	Surficial Geology									
	Soils									
	Hydrology	Water Level Fluctuations	*	*	*	*	*	*	*	*
		Groundwater	*	*	*	*	*	*	*	*
		Water Quality	*	*	*	*	*	*	*	*
		Depth	*	*	*	*	*	*	*	*
		Seasonal Changes	*	*	*	*	*	*	*	*
	Climate									
	Special Features									
	Biotic Setting	Vegetation	Major Species Distribution	*	*	*	*	*	*	*
			Major Species Composition	*	*	*	*	*	*	*
			Density/Productivity	*	*	*	*	*	*	*
Relationship to Water Levels			*	*	*	*	*	*	*	
Fish		Major species	*	*	*	*	*	*	*	
		Species Composition	*	*	*	*	*	*	*	
		Seasonal Distribution	*	*	*	*	*	*	*	
		Spawning and Hatching Areas	*	*	*	*	*	*	*	
		Commercial/Recreational Use	*	*	*	*	*	*	*	
		Life Histories	*	*	*	*	*	*	*	
Invertebrates		Species Composition	*	*	*	*	*	*	*	
		Seasonal Distribution	*	*	*	*	*	*	*	
		Density/Productivity	*	*	*	*	*	*	*	
		Food Sources	*	*	*	*	*	*	*	
Amphibians/Reptiles	Relationship to Water Levels	*	*	*	*	*	*	*		
	Major Species	*	*	*	*	*	*	*		
	Seasonal Distribution	*	*	*	*	*	*	*		
	Density/Productivity	*	*	*	*	*	*	*		
	Recreational/Commercial Use	*	*	*	*	*	*	*		
	Life Histories	*	*	*	*	*	*	*		
Avifauna	Food Sources	*	*	*	*	*	*	*		
	Relationship to Water Levels	*	*	*	*	*	*	*		
	Major Species	*	*	*	*	*	*	*		
	Seasonal Distribution	*	*	*	*	*	*	*		
	Density/Productivity	*	*	*	*	*	*	*		
	Recreational/Commercial Use	*	*	*	*	*	*	*		
Mammals	Life Histories	*	*	*	*	*	*	*		
	Food Sources	*	*	*	*	*	*	*		
	Relationship to Water Levels	*	*	*	*	*	*	*		
	Major Species	*	*	*	*	*	*	*		
	Seasonal Distribution	*	*	*	*	*	*	*		
	Density/Productivity	*	*	*	*	*	*	*		
Cultural Setting	Recreational/Commercial Use	*	*	*	*	*	*	*		
	Life Histories	*	*	*	*	*	*	*		
	Food Sources	*	*	*	*	*	*	*		
	Relationship to Water Levels	*	*	*	*	*	*	*		
	Endangered Species									
	Health	*	*	*	*	*	*	*		
	Population									
	Land Use and Ownership									
Recreation										
Mineral, Energy, Forest Resources										
Public Utilities/Facilities										
Point Pollution Sources										
Non-Point Pollution Sources	*	*	*	*	*	*	*			
Historic Features										
Archaeologic Features		*	*	*	*	*	*			

LAKE SECTION 14

INTRODUCTION

Lake Section 14 extends along the Lake Michigan shoreline from just east of the Delta County-Schoolcraft County border near Point aux Barques to a point west of Naubinway, Michigan, near the Lower Millecoquins River. The lake section includes parts of Schoolcraft and Mackinac Counties. Both of these counties are sparsely populated.

All of the wetlands in Lake Section 14 lie on a low lacustrine plain which is located on the south-facing slope of the Niagara Cuesta. Large wetlands are common in low inland areas on this plain. The predominant shore types along this section of shoreline are erodible and non-erodible low plains. Low sand dunes and sand and gravel beaches occur along portions of the shoreline (Great Lakes Basin Commission, 1975).

Figures 14-1 and 14-2 show the approximate location of the 32 wetlands in Lake Section 14. Latitude, longitude, acreage, and classification for each of these wetlands are presented in Table 14-1. The wetlands in Lake Section 14 have elevations ranging from 580 to 560 feet above sea level (lake level to 70 feet above the approximate mean elevation of Lake Michigan). Most of these wetlands appear to be lake-influenced. Twenty-three of the wetlands are Lacustrine Systems, and the others are Palustrine Systems.

Information related to the physiographic and cultural features of the 32 wetlands is summarized in the individual wetland narratives presented in this chapter. Published sources lack site-specific information on the biotic and hydrologic characteristics of all but two of these wetlands.

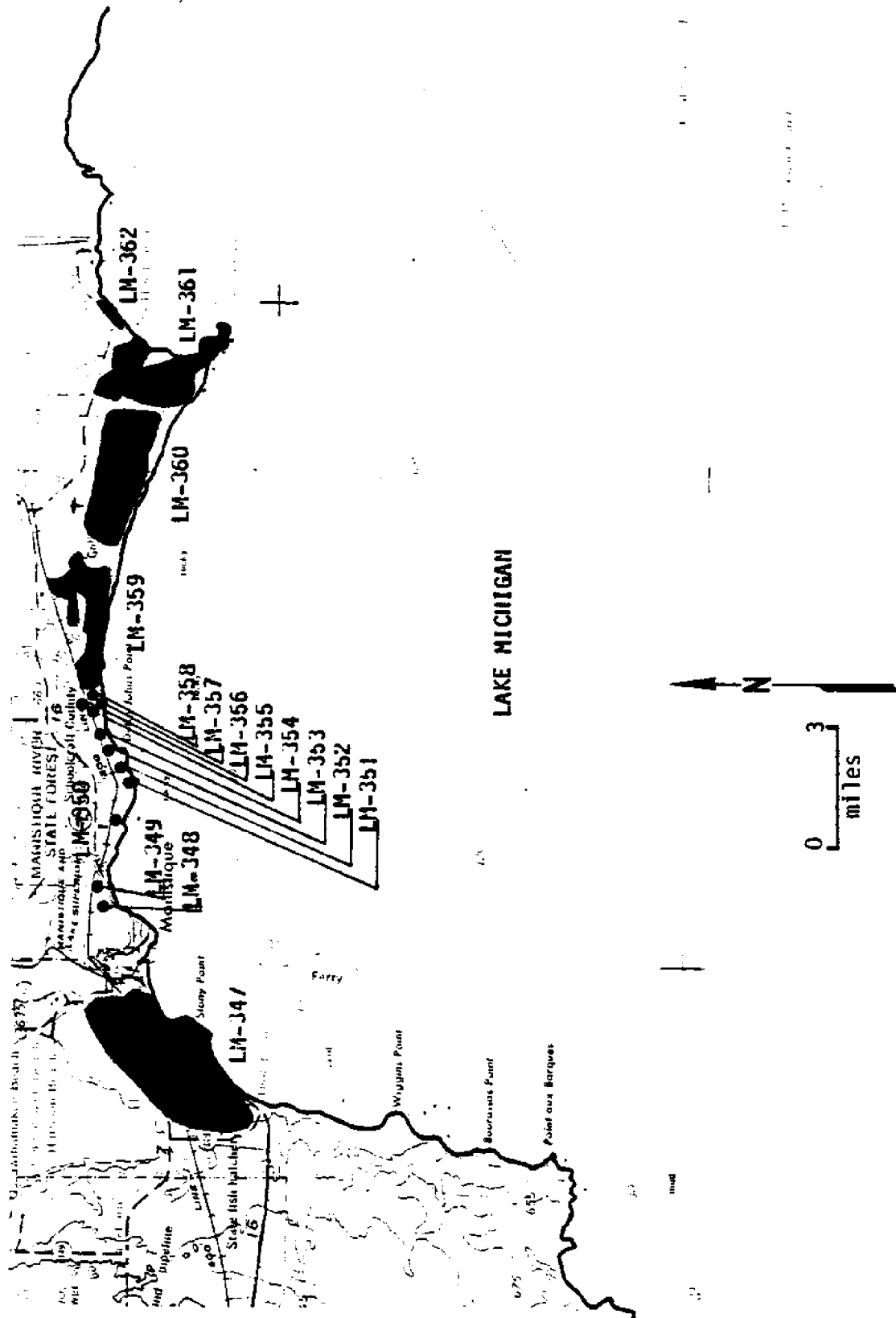


Figure 14-1. Lake Section 14 - Manistique Area
-1270-

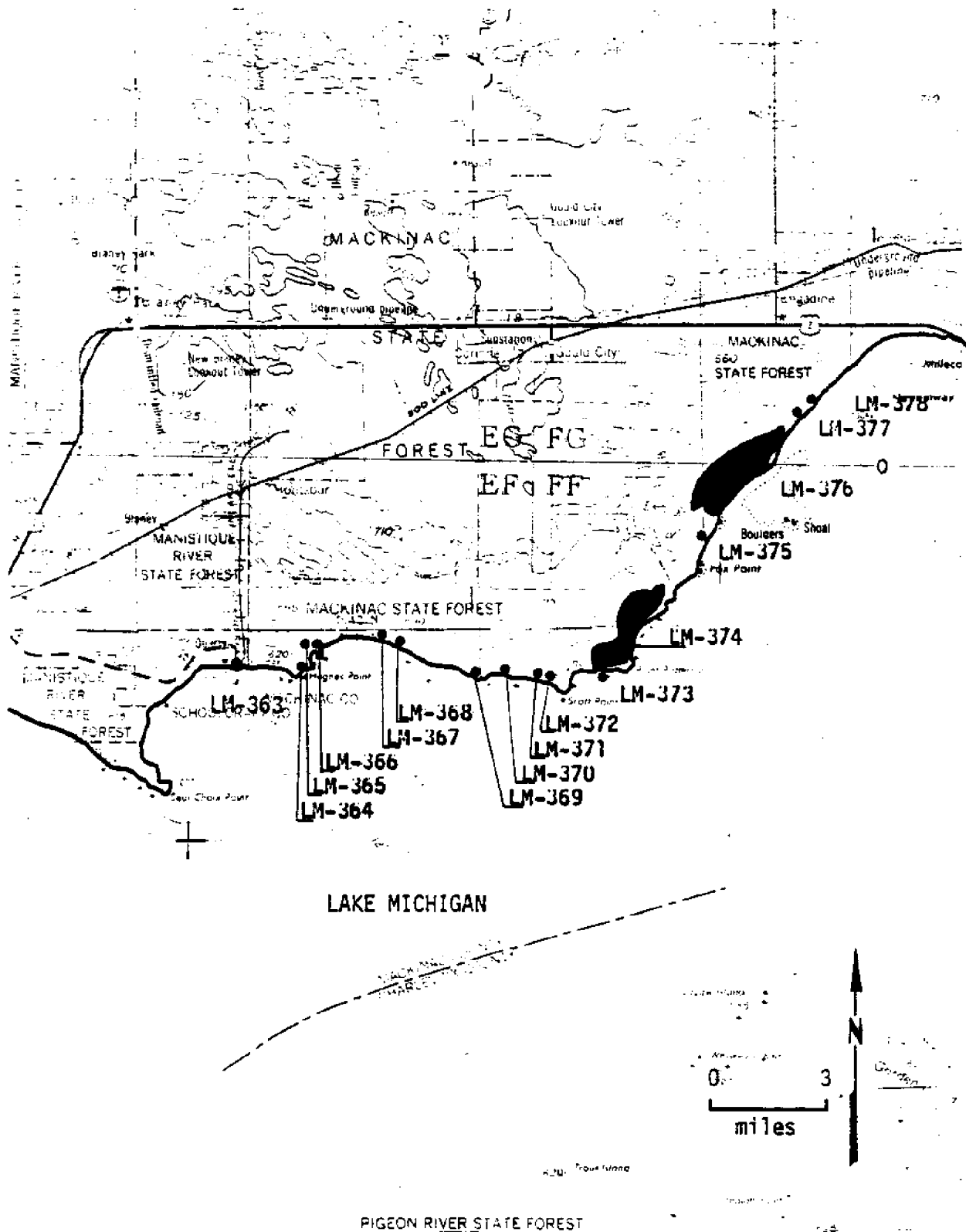


Figure 14-2. Lake Section 14 - Mackinac State Forest Area
 -1271-

Table 14-1. Location, Acreage, and Classification of Wetlands
in Lake Section 14

Wetland Number	Wetland	Latitude	Longitude	Acreage	Classification ^a
347	Stony Point Area Wetland	45°56'50"	86°17'40"	4355	L
348	Manistique City Wetland	45°58'10"	86°14'50"	3	L
349	Manistique Township Wetland #1	45°58'00"	86°13'30"	24	L
350	Manistique Township Wetland #2	45°57'22"	86°13'25"	14	L
DUTCH JOHNS POINT AREA WETLAND COMPLEX					
351	Manistique Township Wetland #3	45°57'40"	86°11'22"	4	L
352	Manistique Township Wetland #4	45°57'15"	86°08'53"	1	L
353	Manistique Township Wetland #5	45°57'30"	86°08'40"	7	L
354	Dutch Johns Point Wetland	45°57'25"	86°08'20"	9	L
355	Dry Creek Area Wetland	45°57'50"	86°07'40"	1	P
SEUL CHOIX POINT AREA WETLAND COMPLEX					
356	Marblehead Creek Area Wetland #1	45°57'55"	86°07'05"	6	L
357	Marblehead Creek Area Wetland #2	45°57'64"	86°07'00"	1	L
358	Marblehead Creek Wetland	45°58'30"	86°06'35"	166	L
359	Gulliver Lake Wetland	45°58'30"	86°02'43"	922	L
360	Clear Lake Wetland	45°57'50"	85°38'50"	3871	L
361	Seul Choix Bay Wetland #1	45°56'40"	85°55'52"	822	L
362	Seul Choix Bay Wetland #2	45°57'45"	85°54'10"	47	L
363	Port Inland Wetland	45°58'50"	85°52'15"	17	P
SEINERS POINT AREA WETLAND COMPLEX					
364	Hughes Point Area Wetland	45°58'24"	86°49'45"	53	L
365	Sainers Point Wetland #1	45°58'34"	85°49'42"	1	P
366	Sainers Point Wetland #2	45°58'40"	85°49'26"	3	P
SWAN CREEK AREA WETLAND COMPLEX					
367	Swan Creek Area Wetland #1	45°58'52"	85°48'10"	4	L
368	Swan Creek Area Wetland #2	45°58'52"	85°47'52"	6	L
369	Peterson Creek Area Wetland #1	45°58'10"	85°46'00"	13	L
370	Peterson Creek Area Wetland #2	45°58'15"	85°45'12"	10	P
BIRCH POINT WETLAND COMPLEX					
371	Birch Point Wetland #1	45°58'30"	85°44'20"	10	P
372	Birch Point Wetland #2	45°58'30"	85°43'50"	20	P
POINT PATTERSON AREA WETLAND COMPLEX					
373	Scott Point Wetland	45°57'40"	85°41'20"	6	L
374	Point Patterson Wetland	45°59'20"	85°39'30"	1475	L
375	Fox Point Area Wetland	46°01'00"	85°36'43"	7	L
376	McNeil Creek Wetland	46°04'00"	85°33'42"	369	L
GARFIELD TOWNSHIP WETLAND COMPLEX					
377	Garfield Township Wetland #1	46°06'50"	85°28'40"	130	P
378	Garfield Township Wetland #2	46°05'33"	85°27'23"	72	P

^aP=palustrine
L=lacustrine
R=riverine

STONY POINT AREA WETLAND

PHYSIOGRAPHIC SETTING

LM 347

Setting

Stony Point Area Wetland is located 250 feet from the northern shoreline of Lake Michigan in Schoolcraft County, Michigan in a low area between Indian Lake and Lake Michigan. Portions of the wetland are adjacent to the cities of Manistique and Thompson. Indian Lake was a bay of Lake Michigan at one time, but the action of waves and currents has developed a bar of sand and gravel across the mouth of the indentation, converting the bay into a lake. The southern portion of Stony Point Area Wetland features low coastal beach ridges and swales. The western end of the wetland is near Indian Lake State Park. Stony Point Area Wetland is a Lacustrine System; it occupies a low, wooded site within the Manistique River State Forest (U.S.G.S. quadrangle map, Cooks, Michigan, 1958).

Topography

The total relief of Stony Point Area Wetland is 40 feet; wetland elevations range from 580 to 620 feet above sea level (lake level to 40 feet above the approximate mean elevation of Lake Michigan). The wetland lies on a low, poorly drained lacustrine plain on the south-facing slope of the Niagara Cuesta. Large wetlands occupy low inland sites on this plain. The Great Lakes Basin Commission (1975) describes the shoreline along Stony Point Area Wetland as an erodible low plain featuring low sand dunes.

Surficial Geology

The surficial geology of Stony Point Area Wetland is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The two major soil types found in Stony Point Area Wetland are Rifle peat and Wallace-Rifle complex. Small areas of Eastport sand and Carbondale muck are also present, near the center of the wetland. Rifle peat consists of dark-brown, moderately decomposed woody peat over fibrous peat underlain by sand. This soil is high in organic matter and has very little mineral matter. Rifle peat is a wet soil generally found on flat plains. Wallace-Rifle complex consists of low sand ridges alternating with swales and wetland areas. The ridges consist mostly of sand, and the swales consist of Rifle peat. Carbondale muck consists of dark-brown, moderately decomposed woody material which is high in ash content. This soil is generally underlain by clayey fill, sand, or limestone. Carbondale muck is wet and includes material which is highly decomposed. Eastport sand has been altered by shifting wind which has prevented the formation of a distinct soil profile. This soil is alkaline, with a surface

layer of dark-gray sand comprised of organic matter underlain by loose light-brown sand or fine sand. Eastport sand is well drained (Foster et al., 1939; Berndt, 1977).

Hydrology

There are three streams flowing through Stony Point Area Wetland: Manistique Creek, Thompson Creek, and an unnamed creek. Thompson Creek originates in the northwestern portion of the wetland and borders the southern portion. Thompson Creek has an elevational change of approximately 30 feet as it travels through the wetland. Manistique Creek originates in the northern part of Stony Point Area Wetland, and has a ten foot change in elevation as it travels through the wetland. Chemical analyses of Thompson Creek and Manistique Creek, sampled in 1930, are available in Sinclair (1959). An unnamed stream borders the southern tip of Stony Point Area Wetland near Lake Michigan. This stream originates in a small pond adjacent to the wetland and has little change in elevation as it joins Thompson Creek. In addition to these three streams, there are at least five small ponds scattered through the wetland (U.S.G.S. quadrangle map, Cooks, Michigan, 1958).

The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Stony Point Area Wetland.

Climate

The closest weather station providing climatic data for Stony Point Area Wetland is located in Manistique, Michigan. The average annual temperature for the normal period from 1941-1970 is not available. In 1975, the average daily low for January was 8.2°F and the average daily high in July was 79.1°F. The average annual precipitation is 30.24 inches, with a mean monthly precipitation of 1.38 inches in January and 3.00 inches in July based on the normal period from 1941-1970. The growing season is approximately four and three-quarters months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on September 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Stony Point Area Wetland (U.S.G.S. quadrangle map, Cooks, Michigan, 1958).

BIOTIC SETTING

LM 347

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Stony Point Area Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Stony Point Area Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Stony Point Area Wetland.

Reptiles and Amphibians

Appendix C-14 contains general information on reptiles and amphibians of Lake Section 14, but care should be exercised in the interpretation of the relevance of these studies to Stony Point Area Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Appendix D-31 contains general information on wetland birds of Lake Section 14, but care should be exercised in the interpretation of the relevance of these studies to Stony Point Area Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Stony Point Area Wetland.

Endangered Species

The bald eagle (Haliaeetus leucocephalus) is an uncommon resident of the Big Bay de Noc-Garden Peninsula area (Michigan Endangered and Threatened Species Program, 1978). Although the bald eagle historically nested near the shoreline, no active nests currently exist along Lake Section 14 (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication). The osprey (Pandion haliaetus), threatened in Michigan, nests in the Big Bay de Noc-Garden Peninsula area. Postupalsky (1977) identified

three pairs of ospreys in the area during 1971 (including one in Schoolcraft County), but reports that this breeding population is decreasing in numbers.

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Stony Point Area Wetland by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland. However, an NPDES permit holder discharges sewage waste near the wetland and may have some effect on its health.

CULTURAL SETTING

LM 347

Population

Stony Point Area Wetland is located in Hiawatha Township of Schoolcraft County, Michigan. The county is sparsely populated, having a density of seven persons per square mile. Table 14-2 indicates that Schoolcraft County and Hiawatha Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that rapid population growth is expected to continue in Schoolcraft County.

Table 14-2. Population Data for the Vicinity of Stony Point Area Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Schoolcraft County	8,659	5.3	10,125
Hiawatha Township	939	17.1	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Stony Point Area Wetland is rural wooded space. The surrounding area is primarily in rural open space uses, with areas of residential, commercial, and industrial development to the northeast (the city of Manistique) and south (the city of Thompson) of the wetland. Scattered residences are also located along the inland border of the wetland. Stony Point Area Wetland is crossed by a primary highway, several secondary highways, access roads, and a rail line (U.S.G.S. quadrangle map, Cooks, Michigan, 1958; Central Upper Peninsula Planning and Development Regional Commission, 1978). Stony

Point Area Wetland is under mixed state and private ownership, with state ownership predominating (Rockford Map Publishers, Inc., 1970; Central Upper Peninsula Planning and Development Regional Commission, 1978).

Thompson Creek and approximately the northern two-thirds of the shoreline abutting the wetland have been nominated as a coastal management area of particular concern (Central Upper Peninsula Planning and Development Regional Commission, 1978). Should the nomination be approved, developmental pressures on this portion of the wetland will be low, since it will be protected as a natural area.

Recreation

Stony Point Area Wetland lies within the Manistique River State Forest. Although there are no known areas specifically designated for recreational uses in or near the wetland, all Michigan state forest lands are open for camping unless otherwise posted. Hunting and fishing are also major uses of state forest lands (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Mineral, Energy, and Forest Resources

Stony Point Area Wetland lies within an area underlain by industrial-quality limestone, but there are no quarrying operations in the vicinity (Gere, 1977). No oil, gas, or coal resources are present in the wetland (Michigan Geological Survey, 1977; Smith, 1915).

Stony Point Area Wetland is a wooded site within the Manistique River State Forest (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978). State-owned forest lands in the coastal area are within a "water influence zone," in which water quality, water use, and aesthetic surroundings are the principal management concerns. Cover treatments are designed to maintain or enhance these concerns, and timber harvesting is conducted accordingly (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Stony Point Area Wetland (U.S.G.S. quadrangle map, Cooks, Michigan, 1958).

Pollution Sources

An NPDES permit holder is located to the west of Stony Point Area Wetland (T41N, R15W, NE 1/4 of NE 1/4, Sec. 13) and discharges sewage waste (Michigan Water Quality Division, 1978). The extent and effects of this discharge on Stony Point Area Wetland are not known. No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Stony Point Area Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 347

The literature search identified no on-going or impending research projects pertaining to Stony Point Area Wetland.

MANISTIQUE CITY WETLAND

PHYSIOGRAPHIC SETTING

LM 348

Setting

Manistique City Wetland is located 250 feet from the northern shoreline of Lake Michigan in Schoolcraft County, Michigan, adjacent to the city of Manistique. Manistique City Wetland is a Lacustrine System; it occupies a low, wooded site to the east of the mouth of the Manistique River (U.S.G.S. quadrangle map, Manistique East, Michigan, 1972).

Topography

The total relief of Manistique City Wetland is slight; wetland elevations range from approximately 583 to 586 feet above sea level, 3 to 6 feet above the approximate mean elevation of Lake Michigan. The wetland lies on a low lacustrine plain on the south-facing slope of the Niagara Cuesta. Large wetlands occupy low inland sites on this plain. The Great Lakes Basin Commission (1975) describes the shoreline near Manistique City Wetland as an erodible low plain.

Surficial Geology

The surficial geology of Manistique City Wetland is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in Manistique City Wetland is Rifle peat, which consists of dark-brown, moderately decomposed woody peat over fibrous peat underlain by sand. It is high in organic matter and has very little mineral matter. Rifle peat is a wet soil generally found on flat plains (Foster et al., 1939).

Hydrology

There are no streams flowing through Manistique City Wetland (U.S.G.S. quadrangle map, Manistique East, Michigan, 1972). The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Manistique City Wetland.

Climate

The closest weather station providing climatic data for Manistique City Wetland is located in Manistique, Michigan. The average annual temperature for the normal period from 1941-1970 is not available. In 1975, the average daily low for January was 8.2°F and the average daily high in July was 79.1°F. The

average annual precipitation is 30.24 inches, with a mean monthly precipitation of 1.38 inches in January and 3.00 inches in July based on the normal period from 1941-1970. The growing season is approximately four and three-quarters months long, with the last killing frost (28^oF) in 1975 occurring on April 21 and the first killing frost on September 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Manistique City Wetland (U.S.G.S. quadrangle map, Manistique East, Michigan, 1972).

BIOTIC SETTING

LM 348

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Manistique City Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Manistique City Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Manistique City Wetland.

Reptiles and Amphibians

Appendix C-14 contains general information on reptiles and amphibians of Lake Section 14, but care should be exercised in the interpretation of the relevance of these studies to Manistique City Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Appendix D-31 contains general information on wetland birds of Lake Section 14, but care should be exercised in the interpretation of the relevance of these studies to Manistique City Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories,

relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Manistique City Wetland.

Endangered Species

The bald eagle (Haliaeetus leucocephalus) is an uncommon resident of the Big Bay de Noc-Garden Peninsula area (Michigan Endangered and Threatened Species Program, 1978). Although the bald eagle historically nested near the shoreline, no active nests currently exist along Lake Section 14 (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication). The osprey (Pandion haliaetus), threatened in Michigan, nests in the Big Bay de Noc-Garden Peninsula area. Postupalsky (1977) identified three pairs of ospreys in the area during 1971 (including one in Schoolcraft County), but reports that this breeding population is decreasing in numbers.

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Manistique City Wetland by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland.

CULTURAL SETTING

LM 348

Population

Manistique City Wetland is located adjacent to the city of Manistique in Manistique Township of Schoolcraft County, Michigan. The county is sparsely populated, having a density of seven persons per square mile. Table 14-3 indicates that the city of Manistique experienced a moderate rate of population decline between 1970 and 1975, but Manistique Township and Schoolcraft County experienced rapid growth during the same time period. Projections for 1990 indicate that rapid population growth is expected to continue in Schoolcraft County.

Table 14-3. Population Data for the Vicinity of Manistique City Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Schoolcraft County	8,659	5.3	10,125
Manistique Township	859	20.0	--
City of Manistique	4,162	-3.7	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Manistique City Wetland is rural wooded space. The surrounding area is characterized by residential, commercial, and industrial development (the city of Manistique) west of the wetland. The area north of the wetland is primarily in rural open space uses, with occasional areas of residential development. A primary highway is located inland of Manistique City Wetland. The wetland is under private ownership (U.S.G.S. quadrangle map, Manistique East,, Michigan, 1972; Central Upper Peninsula Planning and Development Regional Commission, 1978), and its location suggests that it is subject to high development pressures.

Recreation

There are no known state or federal recreational facilities in the vicinity of Manistique City Wetland.

Mineral, Energy, and Forest Resources

Manistique City Wetland lies within an area underlain by industrial-quality limestone, but there are no quarrying operations in the vicinity (Gere, 1977). No oil, gas, or coal resources are present in the wetland (Michigan Geological Survey, 1977; Smith, 1915).

Manistique City Wetland is wooded (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978), but it was not determined through the literature search whether this wooded area is used for commercial production.

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Manistique City Wetland (U.S.G.S. quadrangle map, Manistique East, Michigan, 1972).

Pollution Sources

There are no NPDES permit holders adjacent to Manistique City Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Manistique City Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 348

The literature search identified no on-going or impending research projects pertaining to Manistique City Wetland.

MANISTIQUE TOWNSHIP WETLAND #1

PHYSIOGRAPHIC SETTING

LM 349

Setting

Manistique Township Wetland #1 is located 0.2 mile from the northern shoreline of Lake Michigan, in Schoolcraft County, Michigan, 0.4 mile east of the city of Manistique. Manistique Township Wetland #1 lies lakeward of a series of coastal beach ridges that generally parallel the shoreline. Manistique Township Wetland #1 is a Lacustrine System; it occupies a low, wooded site (U.S.G.S. quadrangle map, Manistique East, Michigan, 1972).

Topography

The total relief of Manistique Township Wetland #1 is 5 feet; wetland elevations range from 595 to 600 feet above sea level, 15 to 20 feet above the approximate mean elevation of Lake Michigan. The wetland lies on a low lacustrine plain on the south-facing slope of the Niagara Cuesta. Large wetlands occupy low inland sites on this plain. The Great Lakes Basin Commission (1975) describes the shoreline near Manistique Township Wetland #1 as an area of low sand dunes.

Surficial Geology

The surficial geology of Manistique Township Wetland #1 is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in Manistique Township Wetland #1 is Granby sand, which has a surface layer of muck overlying wet gray sand and limestone. It is poorly drained and has low natural fertility. Granby sand is generally found on low, flat areas and may have permanently wet spots (Foster et al., 1939).

Hydrology

There are no streams flowing through Manistique Township Wetland #1 (U.S.G.S. quadrangle map, Manistique East, Michigan, 1972). The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Manistique Township Wetland #1.

Climate

The closest weather station providing climatic data for Manistique Township Wetland #1 is located in Manistique, Michigan. The average annual temperature for the normal period from 1941-1970 is not available. In 1975, the

average daily low for January was 8.2°F and the average daily high in July was 79.1°F. The average annual precipitation is 30.24 inches, with a mean monthly precipitation of 1.38 inches in January and 3.00 inches in July based on the normal period from 1941-1970. The growing season is approximately four and three-quarters months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on September 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Manistique Township Wetland #1 (U.S.G.S. quadrangle map, Manistique East, Michigan, 1972).

BIOTIC SETTING

LM 349

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Manistique Township Wetland #1.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Manistique Township Wetland #1.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Manistique Township Wetland #1.

Reptiles and Amphibians

Appendix C-14 contains general information on reptiles and amphibians of Lake Section 14, but care should be exercised in the interpretation of the relevance of these studies to Manistique Township Wetland #1. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food source, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Appendix D-31 contains general information on wetland birds of Lake Section 14, but care should be exercised in the interpretation of the relevance of these studies to Manistique Township Wetland #1. The literature search

provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Manistique Township Wetland #1.

Endangered Species

The bald eagle (Haliaeetus leucocephalus) is an uncommon resident of the Big Bay de Noc-Garden Peninsula area (Michigan Endangered and Threatened Species Program, 1978). Although the bald eagle historically nested near the shoreline, no active nests currently exist along Lake Section 14 (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication). The osprey (Pandion haliaetus), threatened in Michigan, nests in the Big Bay de Noc-Garden Peninsula area. Postupalsky (1977) identified three pairs of ospreys in the area during 1971 (including one in Schoolcraft County), but reports that this breeding population is decreasing in numbers.

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Manistique Township Wetland #1 by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland.

CULTURAL SETTING

LM 349

Population

Manistique Township Wetland #1 is located in Manistique Township of Schoolcraft County, Michigan. The county is sparsely populated, having a density of seven persons per square mile. Table 14-4 indicates that Schoolcraft County and Manistique Township experienced a rapid rate of population growth between 1970 and 1975, and projections for 1990 indicate that rapid population growth is expected to continue in Schoolcraft County.

Table 14-4. Population Data for the Vicinity of Manistique Township Wetland #1

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Schoolcraft County	8,659	5.3	10,125
Manistique Township	859	20.0	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Manistique Township Wetland #1 is rural wooded space. The surrounding area is primarily in rural open space uses, with occasional areas of residential, commercial, and industrial development along U.S. Highway 2 and an area of residential, industrial, and commercial development (the city of Manistique) southwest of the wetland. A primary highway and a sand pit are located near the wetland (U.S.G.S. quadrangle map, Manistique East, Michigan, 1972; Central Upper Peninsula Planning and Development Regional Commission, 1978). The wetland is under private ownership (Rockford Map Publishers, Inc., 1970; Central Upper Peninsula Planning and Development Regional Commission, 1978), and its location suggests that it is subject to moderate development pressures.

Recreation

There are no known state or federal recreational facilities in the vicinity of Manistique Township Wetland #1.

Mineral, Energy, and Forest Resources

Manistique Township Wetland #1 lies within an area underlain by industrial-quality limestone, but there are no quarrying operations in the vicinity (Gere, 1977). No oil, gas, or coal resources are present in the wetland (Michigan Geological Survey, 1977; Smith, 1915).

Manistique Township Wetland #1 is wooded (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978), but it was not determined through the literature search whether this wooded area is used for commercial production.

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Manistique Township Wetland #1 (U.S.G.S. quadrangle map, Manistique East, Michigan, 1972).

Pollution Sources

There are no NPDES permit holders adjacent to Manistique Township Wetland #1 (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Manistique Township Wetland #1, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 349

The literature search identified no on-going or impending research projects pertaining to Manistique Township Wetland #1.

MANISTIQUE TOWNSHIP WETLAND #2

PHYSIOGRAPHIC SETTING

LM 350

Setting

Manistique Township Wetland #2 is located 250 feet from the northern shoreline of Lake Michigan, in Schoolcraft County, Michigan, 1.5 miles east of the city of Manistique. A broad sand beach separates the wetland from the lake, and a bluffline, 70 feet high, lies 0.3 mile inland from the wetland. Manistique Township Wetland #2 is a Lacustrine System and occupies a low, wooded site (U.S.G.S. quadrangle map, Manistique East, Michigan, 1972).

Topography

The total relief of Manistique Wetland #2 is less than 5 feet; wetland elevations range from 582 to 586 feet above sea level, 2 to 6 feet above the approximate mean elevation of Lake Michigan. The wetland lies on a low lacustrine plain on the south-facing slope of the Niagara Cuesta. Large wetlands occupy low inland sites on this plain. The Great Lakes Basin Commission (1975) describes the shoreline near Manistique Township Wetland #2 as a non-erodible plain.

Surficial Geology

The surficial geology of Manistique Township Wetland #2 is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in Manistique Township Wetland #2 is Granby sand, which has a surface layer of muck overlying wet gray sand and limestone. It is poorly drained and has low natural fertility. Granby sand is generally found on low, flat areas and may have permanently wet spots (Foster et al., 1939).

Hydrology

There are no streams flowing through Manistique Township Wetland #2 (U.S.G.S. quadrangle map, Manistique East, Michigan, 1972). The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Manistique Township Wetland #2.

Climate

The closest weather station providing climatic data for Manistique Township Wetland #2 is located in Manistique, Michigan. The average annual temperature for the normal period from 1941-1970 is not available. In 1975, the

average daily low for January was 8.2°F and the average daily high in July was 79.1°F. The average annual precipitation is 30.24 inches, with a mean monthly precipitation of 1.38 inches in January and 3.00 inches in July based on the normal period from 1941-1970. The growing season is approximately four and three-quarters months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on September 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are present in Manistique Township Wetland #2 (U.S.G.S. quadrangle map, Manistique East, Michigan, 1972).

BIOTIC SETTING

LM 350

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Manistique Township Wetland #2.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Manistique Township Wetland #2.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Manistique Township Wetland #2.

Reptiles and Amphibians

Appendix C-14 contains general information on reptiles and amphibians of Lake Section 14, but care should be exercised in the interpretation of the relevance of these studies to Manistique Township Wetland #2. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food source, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Appendix D-31 contains general information on wetland birds of Lake Section 14, but care should be exercised in the interpretation of the relevance of these studies to Manistique Township Wetland #2. The literature search

provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Manistique Township Wetland #2.

Endangered Species

The bald eagle (Haliaeetus leucocephalus) is an uncommon resident of the Big Bay de Noc-Garden Peninsula area (Michigan Endangered and Threatened Species Program, 1978). Although the bald eagle historically nested near the shoreline, no active nests currently exist along Lake Section 14 (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication). The osprey (Pandion haliaetus), threatened in Michigan, nests in the Big Bay de Noc-Garden Peninsula area. Postupalsky (1977) identified three pairs of ospreys in the area during 1971 (including one in Schoolcraft County), but reports that this breeding population is decreasing in numbers.

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Manistique Township Wetland #2 by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland.

CULTURAL SETTING

LM 350

Population

Manistique Township Wetland #2 is located in Manistique Township of Schoolcraft County, Michigan. The county is sparsely populated, having a density of seven persons per square mile. Table 14-5 indicates that Schoolcraft County and Manistique Township experienced a rapid rate of population growth between 1970 and 1975, and projections for 1990 indicate that rapid population growth is expected to continue in Schoolcraft County.

Table 14-5. Population Data for the Vicinity of Manistique Township Wetland #2

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Schoolcraft County	8,659	5.3	10,125
Manistique Township	859	20.0	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Manistique Township Wetland #2 is rural wooded space. The surrounding area is primarily in rural open space uses, with a cemetery immediately northwest of the wetland. The area further inland is characterized by active and inactive agricultural land and scattered residences (Central Upper Peninsula Planning and Development Regional Commission, 1978). The wetland is under private ownership (Rockford Map Publishers, Inc., 1970; Central Upper Peninsula Planning and Development Regional Commission, 1978).

The sand dunes of Manistique Township have been nominated as a coastal management area of particular concern (Central Upper Peninsula Planning and Development Regional Commission, 1978). If the sand dunes are accepted under the coastal zone management program, the wetland would receive protection as a natural area; otherwise, moderate development pressures may arise owing to residential growth.

Recreation

There are no known state or federal recreational facilities in the vicinity of Manistique Township Wetland #2.

Mineral, Energy, and Forest Resources

Manistique Township Wetland #2 lies within an area underlain by industrial-quality limestone, but there are no quarrying operations in the vicinity (Gere, 1977). No oil, gas, or coal resources are present in the wetland (Michigan Geological Survey, 1977; Smith, 1915).

Manistique Township Wetland #2 is wooded (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978), but it was not determined through the literature search whether this wooded area is used for commercial production.

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Manistique Township Wetland #2 (U.S.G.S. quadrangle map, Manistique East, Michigan, 1972).

Pollution Sources

There are no NPDES permit holders adjacent to Manistique Township Wetland #2 (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Manistique Township Wetland #2, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 350

The literature search identified no on-going or impending research projects pertaining to Manistique Township Wetland #2.

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DUTCH JOHNS POINT AREA WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LM 351-354

Setting

The Dutch Johns Point Area Wetland Complex, comprised of Manistique Township Wetlands #3-#5 and Dutch Johns Point Wetland, is located on the northern shore of Lake Michigan in Schoolcraft County, Michigan. Manistique Township Wetland #5 is situated 250 feet inland, and the rest of the wetlands in the complex are adjacent to the shoreline. Manistique Township Wetland #3 lies 3.3 miles east of the city of Manistique, while Manistique Township Wetland #5 and Dutch Johns Point Wetland are approximately 3.9 miles east of Manistique. A broad sand beach lies lakeward of the Dutch Johns Point Area Wetland Complex. All of the wetlands in the complex are Lacustrine Systems that occupy low sites. Manistique Township Wetland #5 is wooded; the remainder of the wetlands are partially wooded (U.S.G.S. quadrangle map, Manistique East, Michigan, 1972).

Topography

The total relief of Manistique Township Wetlands #3 and #5 is 5 feet, with elevations ranging from 585 to 590 feet above sea level (5 to 10 feet above the approximate mean elevation of Lake Michigan). Manistique Township Wetland #4 has a total relief of 15 feet, with elevations ranging from 580 to 595 feet. Dutch Johns Point Wetland has a total relief of 5 feet, with elevations ranging from 580 to 585 feet above sea level. The wetland complex lies on a low lacustrine plain on the south-facing slope of the Niagara Cuesta. Large wetlands occupy low inland sites on this plain. The Great Lakes Basin Commission (1975) describes the shoreline near the Dutch Johns Point Area Wetland Complex as an erodible low plain.

Surficial Geology

The surficial geology of Manistique Township Wetlands #3-#5 and Dutch Johns Point Wetland is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

There are three soil types found in the Dutch Johns Point Area Wetland Complex. Table 14-6 lists the soil types for the individual wetlands.

Table 14-6. Soil Types for the Individual Wetlands in the Dutch Johns Point Area Wetland Complex

Wetland	Soil type
Manistique Township Wetland #3	Eastport sand
Manistique Township Wetland #4	Granby sand and Coastal beach
Manistique Township Wetland #5	Eastport sand
Dutch Johns Point Wetland	Coastal beach and Eastport sand

Coastal beach soil consists of sand or limestone bedrock and mud flats; it is generally found along narrow strips of land bordering Lake Michigan. Eastport sand, an alkaline soil, has been altered by shifting wind which has prevented the formation of a distinct soil profile. It has a surface layer of dark-gray sand which includes organic matter, underlain by loose light-brown sand or fine sand. Eastport sand is well drained. Granby sand has a surface layer of muck overlying wet gray sand and limestone. It is poorly drained, has low natural fertility, and contains lime. Granby sand is generally found on low, flat areas and may have permanently wet spots (Foster et al., 1939; Berndt, 1977).

Hydrology

There are no streams flowing through any of the wetlands in the Dutch Johns Point Area Wetland Complex (U.S.G.S. quadrangle map, Manistique East, Michigan, 1972). The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in the Dutch Johns Point Area Wetland Complex.

Climate

The closest weather station providing climatic data for the Dutch Johns Point Area Wetland Complex is located in Manistique, Michigan. The average annual temperature for the normal period from 1941-1970 is not available. In 1975, the average daily low for January was 8.2°F and the average daily high in July was 79.1°F. The average annual precipitation is 30.24 inches, with a mean monthly precipitation of 1.38 inches in January and 3.00 inches in July based on the normal period from 1941-1970. The growing season is approximately four and three-quarters months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on September 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Manistique Township Wetland #4 (U.S.G.S. quadrangle map, Manistique East, Michigan, 1972).

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of the Dutch Johns Point Area Wetland Complex.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in the Dutch Johns Point Area Wetland Complex.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in the Dutch Johns Point Area Wetland Complex.

Reptiles and Amphibians

Appendix C-14 contains general information on reptiles and amphibians of Lake Section 14, but care should be exercised in the interpretation of the relevance of these studies to the Dutch Johns Point Area Wetland Complex. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food source, or relationship to water levels of the reptiles and amphibians in these wetlands.

Avifauna

Appendix D-31 contains general information on wetland birds of Lake Section 14, but care should be exercised in the interpretation of the relevance of these studies to the Dutch Johns Point Area Wetland Complex. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing these wetlands.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting the four wetlands comprising the Dutch Johns Point Area Wetland Complex.

Endangered Species

The bald eagle (Haliaeetus leucocephalus) historically nested along the shoreline of Lake Section 14. The bald eagle currently is an uncommon summer resident of this area, but no nests exist near the shoreline (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication).

The osprey (Pandion haliaetus), threatened in Michigan, does not nest in the immediate vicinity of the Dutch Johns Point Area Wetland Complex. However, osprey populations exist on the western edge and central portion of Lake Section 14 (Postupalsky, 1977). Postupalsky identified three osprey pairs in the western group in 1971, but reports that this population is decreasing in numbers. The central group, which extends 15 to 20 miles inland in the Manistique Lakes area, had 12 osprey pairs in 1971. Postupalsky reports that this population is increasing in size.

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Manistique Township Wetlands #3-#5 or Dutch Johns Point Wetland by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of these wetlands.

CULTURAL SETTING

LM 351-354

Population

The Dutch Johns Point Area Wetland Complex is located in Manistique Township of Schoolcraft County, Michigan. The county is sparsely populated, having a density of seven persons per square mile. Table 14-7 indicates that Schoolcraft County and Manistique Township experienced a rapid rate of population growth between 1970 and 1975, and projections for 1990 indicate that rapid population growth is expected to continue in Schoolcraft County.

Table 14-7. Population Data for the Vicinity of the Dutch Johns Point Area Wetland Complex

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Schoolcraft County	8,659	5.3	10,125
Manistique Township	859	20.0	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Manistique Township Wetlands #3-#5 and Dutch Johns Point Wetland is rural wooded space. The surrounding area is primarily in rural open space use. Only one residence, immediately east of Manistique Township Wetland #4, is present in the area. An access road crosses Manistique Township Wetland #4 (U.S.G.S. quadrangle map, Manistique East, Michigan, 1972; Central Upper Peninsula Planning and Development Regional Commission, 1978). The wetlands are under private ownership (Rockford Map Publishers, Inc., 1970; Central Upper Peninsula Planning and Development Regional Commission, 1978).

The sand dunes of Manistique Township and the township park lying between Manistique Township Wetlands #4 and #5 have both been nominated as coastal management areas of particular concern (Central Upper Peninsula Planning and Development Regional Commission, 1978). If the sand dunes are accepted under the coastal zone management program, the wetlands in the Dutch Johns Point Area Wetland Complex would receive limited protection as a natural area. Shoreline development in this area is still a possibility.

Recreation

There are no known state or federal recreational facilities in the vicinity of the Dutch Johns Point Area Wetland Complex. A township park lies between Manistique Township Wetlands #4 and #5.

Mineral, Energy, and Forest Resources

The Dutch Johns Point Area Wetland Complex lies within an area underlain by limestone and dolomites, but there are no quarrying operations in the vicinity (Gere, 1977). No oil, gas, or coal resources are present in the wetlands (Michigan Geological Survey, 1977; Smith, 1915).

Manistique Township Wetlands #3-#5 and Dutch Johns Point Wetland are partially wooded (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978), but it was not determined through the literature search whether this wooded area is used for commercial production.

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Manistique Township Wetlands #3-#5 and Dutch Johns Point Wetland (U.S.G.S. quadrangle map, Manistique East, Michigan, 1972).

Pollution Sources

There are no NPDES permit holders adjacent to Manistique Township Wetlands #3-#5 and Dutch Johns Point Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Manistique Township Wetlands #3-#5 and Dutch Johns Point Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 351-354

The literature search identified no on-going or impending research projects pertaining to the Dutch Johns Point Area Wetland Complex.

DRY CREEK AREA WETLAND

PHYSIOGRAPHIC SETTING

LM 355

Setting

Dry Creek Area Wetland is located 0.2 mile from the northern shoreline of Lake Michigan in Schoolcraft County, Michigan, five miles east of the city of Manistique. A small lake is situated to the north of the wetland; Dry Creek, located 0.1 mile west of the wetland, flows out of this lake and into Lake Michigan. A broad sand beach lies lakeward of the wetland. Dry Creek Area Wetland is a Palustrine System; it occupies a raised, wooded site (U.S.G.S. quadrangle map, Manistique East, Michigan, 1972).

Topography

The total relief of Dry Creek Area Wetland is less than 10 feet; wetland elevations range from roughly 584 to 590 feet above sea level, 4 to 10 feet above the approximate mean elevation of Lake Michigan. The wetland lies on a low lacustrine plain on the south-facing slope of the Niagara Cuesta. Large wetlands occupy low inland sites on this plain. The Great Lakes Basin Commission (1975) describes the shoreline near Dry Creek Area Wetland as an erodible low plain.

Surficial Geology

The surficial geology of Dry Creek Area Wetland is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in Dry Creek Area Wetland is Wallace-Rifle complex, which consists of low sand ridges alternating with swales and wetlands. The ridges are mostly sand and the swales contain Rifle peat. Rifle peat is a wet soil comprised of dark-brown, moderately decomposed woody peat over fibrous peat underlain by sand; it is high in organic matter and has very little mineral content (Foster et al., 1939).

Hydrology

There are no streams flowing through Dry Creek Area Wetland (U.S.G.S. quadrangle map, Manistique East, Michigan, 1972). The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in this wetland.

Climate

The closest weather station providing climatic data for Dry Creek Area Wetland is located in Manistique, Michigan. The average annual temperature for the normal period from 1941-1970 is not available. In 1975, the average daily low for January was 8.2°F and the average daily high in July was 79.1°F. The average annual precipitation is 30.24 inches, with a mean monthly precipitation of 1.38 inches in January and 3.00 inches in July based on the normal period from 1941-1970. The growing season is approximately four and three-quarters months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on September 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Dry Creek Area Wetland (U.S.G.S. quadrangle map, Manistique East, Michigan, 1972).

BIOTIC SETTING

LM 355

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Dry Creek Area Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Dry Creek Area Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Dry Creek Area Wetland.

Reptiles and Amphibians

Appendix C-14 contains general information on reptiles and amphibians of Lake Section 14, but care should be exercised in the interpretation of the relevance of this information to Dry Creek Area Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Appendix D-31 contains general information on wetland birds of Lake Section 14, but care should be exercised in the interpretation of the relevance of this information to Dry Creek Area Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Dry Creek Area Wetland.

Endangered Species

The bald eagle (Haliaeetus leucocephalus) historically nested along the shoreline of Lake Section 14. The bald eagle currently is an uncommon summer resident of this area, but no nests exist near the shoreline (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication).

The osprey (Pandion haliaetus), threatened in Michigan, does not nest in the immediate vicinity of Dry Creek Area Wetland. However, osprey populations exist on the western edge and central portion of Lake Section 14 (Postupalsky, 1977). Postupalsky identified three osprey pairs in the western group in 1971, but reports that this population is decreasing in numbers. The central group, which extends 15 to 20 miles inland in the Manistique Lakes area, had 12 osprey pairs in 1971. Postupalsky reports that this population is increasing in size.

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Dry Creek Area Wetland by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland.

CULTURAL SETTING

LM 355

Population

Dry Creek Area Wetland is located in Manistique Township of Schoolcraft County, Michigan. The county is sparsely populated, having a density of seven persons per square mile. Table 14-8 indicates that Schoolcraft County and Manistique Township experienced a rapid rate of population growth between 1970

and 1975, and projections for 1990 indicate that rapid population growth is expected to continue in Schoolcraft County.

Table 14-8. Population Data for the Vicinity of Dry Creek Area Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Schoolcraft County	8,659	5.3	10,125
Manistique Township	859	20.0	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Dry Creek Area Wetland and most of the surrounding area is rural wooded space. An access road lies lakeward of Dry Creek Area Wetland (U.S.G.S. map, Manistique East, Michigan, 1972; Central Upper Peninsula Planning and Development Regional Commission, 1978). The wetland is under private ownership (Rockford Map Publishers, Inc., 1970; Central Upper Peninsula Planning and Development Regional Commission, 1978).

The sand dunes of Manistique Township have been nominated as a coastal management area of particular concern (Central Upper Peninsula Planning and Development Regional Commission, 1978). If the sand dunes near Dry Creek Area Wetland are accepted under the program, the wetland may receive protection as a natural area; if not, the wetland is likely to be under low to moderate development pressure from the possibility of residential development.

Recreation

There are no known state or federal recreational facilities in the vicinity of Dry Creek Area Wetland.

Mineral, Energy, and Forest Resources

Dry Creek Area Wetland lies within an area underlain by limestone and dolomites, but there are no quarrying operations in the vicinity (Gere, 1977). No oil, gas, or coal resources are present in the wetland (Michigan Geological Survey, 1977; Smith, 1915).

Dry Creek Area Wetland is wooded (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978), but it was not determined through the literature search whether this wooded area is used for commercial production.

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Dry Creek Area Wetland (U.S.G.S. quadrangle map, Manistique East, Michigan, 1972).

Pollution Sources

There are no NPDES permit holders adjacent to Dry Creek Area Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Dry Creek Area Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 355

The literature search identified no on-going or impending research projects pertaining to Dry Creek Area Wetland.

SEUL CHOIX POINT AREA WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LM 356-362

Setting

The Seul Choix Point Area Wetland Complex is comprised of Marblehead Creek Area Wetlands #1 and #2, Marblehead Creek Wetland, Gulliver Lake Wetland, Clear Lake Wetland, and Seul Choix Bay Wetlands #1 and #2. The wetland complex is located on the northern shore of Lake Michigan in Schoolcraft County, Michigan. The locations of these wetlands relative to the lakeshore and the community of Gulliver, Michigan, are indicated in Table 14-9.

Table 14-9. Location of Individual Wetlands in Seul Choix Point Area Wetland Complex

Wetland	Distance from lakeshore	Distance to Gulliver, Michigan
Marblehead Creek Area Wetland #1	0.5 mile	5.2 miles southwest
Marblehead Creek Area Wetland #2	0.2 mile	5.1 miles southwest
Marblehead Creek Wetland	0.1 mile	4.0 miles southwest
Gulliver Lake Wetland	400 feet	1.2 miles southwest
Clear Lake Wetland	0.1 mile	1.4 miles south
Seul Choix Bay Wetland #1	adjacent	4.3 miles southeast
Seul Choix Bay Wetland #2	adjacent	5.9 miles southeast

A broad sand beach lies lakeward of all of the wetlands in the Seul Choix Point Area Wetland Complex, and much of this shoreline features coastal beach ridges and swales. Marblehead Creek Area Wetland #1 lies to the west of the mouth of Marblehead Creek. This Lacustrine wetland occupies a low, wooded site within the coastal beach ridges. Marblehead Creek Area Wetland #2 lies to the north of Marblehead Creek Area Wetland #1, near Marblehead Creek. This wetland is also a low, wooded, Lacustrine System. Marblehead Creek Wetland lies on either side of Marblehead Creek and extends northward to Cookson Lake. This wetland is a low, partially wooded, Lacustrine System. Gulliver Lake Wetland extends from Rocky Point inland to Gulliver Lake. Several open water areas lie within the wetland, among the beach ridges. An intermittent stream, Gulliver Lake Outlet, flows through the eastern portion of this low, partially wooded, Lacustrine wetland (U.S.G.S. quadrangle maps, Seul Choix Point, Michigan, 1972; Gulliver, Michigan, 1972).

Clear Lake Wetland lies between Gulliver Lake and McDonald Lake. Clear Lake Wetland is a low, partially wooded, Lacustrine System. Seul Choix Bay Wetland #1 lies on Seul Choix Point and extends northward to Bulldog Creek. Seul Choix Bay Wetland #1 is a low, wooded, Lacustrine System. Seul Choix Bay

Wetland #2 lies on the north bank of Bulldog Creek and extends northward to an area of industrial tailings. A large quarry lies inland from the wetland. This wetland is a low, partially wooded, Lacustrine System (U.S.G.S. quadrangle maps, Seul Choix Point, Michigan, 1972; Gulliver, Michigan, 1972).

Topography

Elevations in Seul Choix Point Area Wetland Complex range from lake level to 650 feet above sea level (70 feet above the approximate mean elevation of Lake Michigan). Elevation and total relief for the individual wetlands comprising Seul Choix Point Area Wetland Complex are presented in Table 14-10.

Table 14-10. Elevations and Total Relief of Individual Wetlands in the Seul Choix Point Area Wetland Complex

	Minimum elevation (feet) ^a	Maximum elevation (feet) ^a	Total relief (feet)
Marblehead Creek Area Wetland #1	585	590	5
Marblehead Creek Area Wetland #2	593	598	5
Marblehead Creek Wetland	595	625	30
Gulliver Lake Wetland	595	650	55
Clear Lake Wetland	595	620	25
Seul Choix Bay Wetland #1	580	610	30
Seul Choix Bay Wetland #2	580	595	15

^a Elevations measured in feet above sea level; the approximate mean elevation of Lake Michigan is 580 feet above sea level

The Seul Choix Point Area Wetland Complex lies on a low, lacustrine plain on the south-facing slope of the Niagara Cuesta. Large wetlands occupy low inland sites on this plain. The Great Lakes Basin Commission (1975) describes the shoreline near the Seul Choix Point Area Wetland Complex as an erodible low plain with low sand dunes.

Surficial Geology

The surficial geology of Marblehead Creek Area Wetlands #1 and #2, Marblehead Creek Wetland, Gulliver Lake Wetland, Clear Lake Wetland, and Seul Choix Bay Wetland #1 is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion. The surficial geology of Seul Choix Bay Wetland #2 is characterized by both lake beds and rock at or near the surface (Martin, 1957; Dorr and Eschman, 1970).

Soils

There are six soil types found in the Seul Choix Point Wetland Complex: Carbondale muck, Spalding peat, Wallace-Houghton complex, Wallace-Rifle complex, Rifle peat, and Granby sand. Carbondale muck is a wet soil consisting of dark-brown, moderately decomposed woody material, high in ash content, which is underlain by clayey till, sand, or limestone. The Wallace-Houghton complex consists of a flat, wet plain of Houghton muck with mounds and ridges of sand. Houghton muck consists of brown or dark-grown fine fibrous muck with very little decomposition in the surface layer; it is an organic soil which has accumulated on wet sandy areas. Spalding peat consists of slightly decomposed fibrous and woody material underlain by yellow fibrous peat. It is poorly drained and is generally found on flat, wet sand plains (Foster et al., 1939).

Wallace-Rifle complex consists of low sand ridges alternating with swales and wetlands. Rifle peat consists of dark-brown, moderately decomposed woody peat over fibrous peat underlain by sand. This soil is high in organic matter and has very little mineral content; is poorly drained, has low natural fertility, and contains lime. Granby sand is generally found on low flat areas and may have permanently wet spots (Foster et al., 1939).

Hydrology

There are no streams flowing through Marblehead Creek Area Wetlands #1 and #2, Gulliver Lake Wetland, Clear Lake Wetland, or Seul Choix Bay Wetland #2. Marblehead Creek flows through Marblehead Creek Wetland. This creek has a 20-foot change in elevation as it travels through the wetland. Seul Choix Bay Wetland #1 is adjacent to an unnamed stream which originates from an unnamed pond in the wetland. Gulliver Lake Wetland and Clear Lake Wetland encompass numerous ponded areas and unnamed lakes (U.S.G.S. quadrangle maps, Gulliver, Michigan, 1972; Seul Choix Point, Michigan, 1972).

The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in the Seul Choix Point Area Wetland Complex.

Climate

The closest weather station providing climatic data for the Seul Choix Point Area Wetland Complex is located in Manistique, Michigan. The average annual temperature for the normal period from 1941-1970 is not available. In 1975, the average daily low for January was 8.2°F and the average daily high in July was 79.1°F. The average annual precipitation is 30.24 inches, with a mean monthly precipitation of 1.38 inches in January and 3.00 inches in July based on the normal period from 1941-1970. The growing season is approximately four and three-quarters months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on September 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

Coastal beach ridges are situated within the wetland complex (U.S.G.S. quadrangle maps, Seul Choix Point, Michigan, 1972; Gulliver, Michigan, 1972).

BIOTIC SETTING

LM 356-362

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of the Seul Choix Point Area Wetland Complex.

Fish

Fish species found in Gulliver Lake and their relative abundance are listed in Table 14-11. Spawning habitat in the lake was deemed adequate for all species except northern pike (Esox lucius), which were limited to the inlet and outlet areas of the lake for spawning (Roelofs and Locke, 1941). Most of these species probably occur in or near Gulliver Lake Wetland and Clear Lake Wetland.

Table 14-11. Fish Species and Relative Abundance in Gulliver Lake, Schoolcraft County, Michigan^a

<u>Use Category^b and Common Name</u>	<u>Relative Abundance</u>
<u>Game Species</u>	
northern pike	few
yellow perch	abundant
walleye	few
smallmouth bass	common
pumpkinseed	few
rock bass	common
cisco	rare
<u>Coarse Species</u>	
white sucker	few

Forage Species

mimic shiner	abundant
brassy minnow	abundant
common shiner	abundant
sand shiner	rare
logperch	few
johnny darter	few
Iowa darter	few
mottled sculpin	rare

^a from Taylor (1954) and Roelofs and Locke (1941)

^b according to Roelofs and Locke (1941)

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in all seven wetlands in the Seul Choix Point Area Wetland Complex, or to major species, species composition, or spawning and hatching areas in Marblehead Creek Wetlands #1-#3 or Seul Choix Wetlands #1 and #2.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in the Seul Choix Point Area Wetland Complex.

Reptiles and Amphibians

Appendix C-14 contains general information on reptiles and amphibians of Lake Section 14, but care should be exercised in the interpretation of the relevance of these studies to the Seul Choix Point Area Wetland Complex. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in these wetlands.

Avifauna

Appendix D-31 contains general information on wetland birds of Lake Section 14, but care should be exercised in the interpretation of the relevance of these studies to the Seul Choix Point Area Wetland Complex. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing these wetlands.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting the Seul Choix Point Area Wetland Complex.

Endangered Species

The bald eagle (Haliaeetus leucocephalus) historically nested along the shoreline of Lake Section 14. The bald eagle currently is an uncommon summer resident of this area, but no nests exist near the shoreline (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication).

The osprey (Pandion haliaetus), threatened in Michigan, nests on the western edge and central portion of Lake Section 14 (Postupalsky, 1977). The central group extends 15 to 20 miles inland in the Manistique Lakes area, east of the Seul Choix Point Area Wetland Complex. Postupalsky observed 12 osprey pairs in the area during 1971, and reports that this population is increasing in size.

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in the Seul Choix Point Area Wetland Complex by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of these wetlands.

CULTURAL SETTING

LM 356-362

Population

The Seul Choix Point Area Wetland Complex is located in Mueller Township of Schoolcraft County, Michigan. The county is sparsely populated, having a density of seven persons per square mile. Table 14-12 indicates that Schoolcraft County experienced a rapid rate of population growth between 1970 and 1975. The population of Mueller Township remained stable during the same time period. Projections for 1990 indicate that rapid population growth is expected to continue in Schoolcraft County.

Table 14-12. Population Data for the Vicinity of the Seul Choix Point Area Wetland Complex

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Schoolcraft County	8,659	5.3	10,125
Mueller Township	261	-0.8	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within all of the wetlands in the Seul Choix Point Area Wetland Complex and most of the surrounding area is rural open or wooded space. Notable exceptions include shoreline residential development along Clear, Gulliver, and McDonald Lakes and along Michibay Road, south of Gulliver Lake. A quarry and an area of tailings ponds are located north and west of Seul Choix Bay Wetland #2. Access roads lie within or adjacent to all of the wetlands in the Seul Choix Point Area Wetland Complex. A rail line runs through Marblehead Creek Wetland and Gulliver Lake Wetland. A lighthouse is located at Seul Choix Point near Seul Choix Bay Wetland #1 (U.S.G.S. quadrangle maps, Seul Choix Point, Michigan, 1972; Gulliver, Michigan, 1972; Central Upper Peninsula Planning and Development Regional Commission, 1978).

Marblehead Creek Area Wetlands #1 and #2, Marblehead Creek Wetland, Gulliver Lake Wetland, and Seul Choix Bay Wetland #2 are privately owned. Marblehead Creek Wetland and Gulliver Lake Wetland are owned by paper companies. Seul Choix Bay Wetland #2 is also corporate-owned. Clear Lake Wetland and Seul Choix Bay Wetland #1 are under mixed state-private ownership (Central Upper Peninsula Planning and Development Regional Commission, 1978; Rockford Map Publishers, Inc., 1970).

Development pressures for Marblehead Creek Wetland and Gulliver Lake Wetland appear to be moderate to high, based on ownership by paper companies. Seul Choix Bay Wetland #2 may also face moderate to high development pressures. This wetland is corporate-owned and lies adjacent to a large industrial complex. Industrial disposal of tailings and quarry operations are present adjacent to the wetland.

Clear Lake Wetland and Seul Choix Bay Wetland #1 contain large tracts within Manistique River State Forest. Development pressures in these wetlands may be low. However, it should be noted that timber harvest, mineral extraction, and recreational development can occur in state forest lands.

Recreation

Clear Lake Wetland and Seul Choix Bay Wetland #1 lie within the Manistique River State Forest. Although there are no known areas specifically designated for recreational use in the wetlands, all Michigan state forest lands are open for camping unless otherwise posted. Hunting and fishing are also major uses of state forest lands (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Mineral, Energy, and Forest Resources

Marblehead Creek Area Wetlands #1 and #2, Marblehead Creek Wetland, Gulliver Lake Wetland, Clear Lake Wetland, and the southern portion of Seul Choix Bay Wetland #1 are within an area underlain by limestone and dolomites. The northern portions of Seul Choix Bay Wetland #1 and Seul Choix Bay Wetland #2 are underlain by industrial-quality dolomites, and an active dolomite quarry is located just northwest of Seul Choix Bay Wetland #2.

Seul Choix Bay Wetlands #1 and #2 are within an area of clay resources, but there are no operations in the wetlands exploiting this resource (Gere, 1977). There are three active sand and gravel operations in the area east of Gulliver Lake Wetland; another is located north of the western portion of Clear Lake Wetland (Michigan Department of State Highways and Transportation aerial photograph, 1973). There are no known oil, gas, or coal resources in the wetlands of the Seul Choix Point Area Wetland Complex (Michigan Geological Survey, 1977; Smith, 1915).

Clear Lake Wetland and Seul Choix Bay Wetland #1 are partially wooded areas within Manistique River state Forest. State-owned forest lands in the coastal area are within a "water influence zone," in which water quality, water use, and aesthetic surroundings are the principal management concerns. Cover treatments are designed to maintain or enhance these concerns, and timber harvesting is conducted accordingly (Henry H. Webster, Michigan Department of Natural Resources, personal communication). The ownership of Marblehead Creek Wetland and Gulliver Lake Wetland by paper companies implies the exploitation of wood resources in these two wetlands.

Public Utilities and Facilities

There are no public utilities within 0.5 mile of any of the wetlands in the Seul Choix Point Area Wetland Complex (U.S.G.S. quadrangle maps, Gulliver, Michigan, 1972; Seul Choix Point, Michigan, 1972).

Pollution Sources

There are no NPDES permit holders adjacent to any of the wetlands in the Seul Choix Point Area Wetland Complex (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of the Seul Choix Point Area Wetland Complex, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 356-362

The literature search identified no on-going or impending research projects pertaining to the Seul Choix Point Area Wetland Complex.

PORT INLAND WETLAND

PHYSIOGRAPHIC SETTING

LM 363

Setting

Port Inland Wetland is located 0.1 mile from the northern shoreline of Lake Michigan in Schoolcraft County, Michigan, north of Inland Harbor and seven miles east of the community of Gulliver. Port Inland Wetland was connected, at one time, to larger wetlands located nearby. However, construction of rail lines and a highway has separated Port Inland Wetland from the other wetlands. A series of parallel coastal beach ridges lies within the wetland. Port Inland Wetland is a Palustrine System; it occupies a raised, wooded site (U.S.G.S. quadrangle map, Hughes Point, Michigan, 1972).

Topography

The total relief of Port Inland Wetland is less than 10 feet; wetland elevations range from roughly 595 to 600 feet above sea level, 15 to 20 feet above the approximate mean elevation of Lake Michigan. The wetland lies on a low lacustrine plain on the south-facing slope of the Niagara Cuesta. Large wetlands occupy low inland sites on this plain. The Great Lakes Basin Commission (1975) describes the shoreline near the wetland as a non-erodible low plain.

Surficial Geology

The surficial geology of Port Inland Wetland is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in Port Inland Wetland is Eastport-Roscommon sand. This soil, generally found on beach ridges and stabilized dunes, has a surface layer of black, partially decomposed leaf litter underlain by sand. Eastport-Roscommon sand has little available water capacity, rapid permeability, and low natural fertility (Berndt, 1977; Michigan Agricultural Experiment Station, 1952).

Hydrology

There are no streams flowing through Port Inland Wetland (U.S.G.S. quadrangle map, Hughes Point, Michigan, 1972). The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Port Inland Wetland.

Climate

The closest weather station providing climatic data for Port Inland Wetland is located in Manistique, Michigan. The average annual temperature for the normal period from 1941-1970 is not available. In 1975, the average daily low for January was 8.2^oF and the average daily high in July was 79.1^oF. The average annual precipitation is 30.24 inches, with a mean monthly precipitation of 1.38 inches in January and 3.00 inches in July based on the normal period from 1941-1970. The growing season is approximately four and three-quarters months long, with the last killing frost (28^oF) in 1975 occurring on April 21 and the first killing frost on September 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Port Inland Wetland (U.S.G.S. quadrangle map, Hughes Point, Michigan, 1972).

BIOTIC SETTING

LM 363

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Port Inland Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Port Inland Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Port Inland Wetland.

Reptiles and Amphibians

Appendix C-14 contains general information on reptiles and amphibians of Lake Section 14, but care should be exercised in the interpretation of the relevance of this information to Port Inland Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Appendix D-31 contains general information on wetland birds of Lake Section 14, but care should be exercised in the interpretation of the relevance of this information to Port Inland Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Port Inland Wetland.

Endangered Species

The bald eagle (Haliaeetus leucocephalus) historically nested along the shoreline of Lake Section 14. The bald eagle currently is an uncommon summer resident of this area, but no nests exist near the shoreline (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication).

The osprey (Pandion haliaetus), threatened in Michigan, nests on the western edge and central portion of Lake Section 14 (Postupalsky, 1977). The central group extends 15 or 20 miles inland in the Manistique Lakes area, east of Port Inland Wetland. Postupalsky observed 12 osprey pairs in the area during 1971, and reports that this population is increasing in size.

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Special Program, 1976) were documented in Port Inland Wetland by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland. However, an NPDES permit holder discharges sewage waste near the wetland and may have some effect on its health.

CULTURAL SETTING

LM 363

Population

Port Inland Wetland is located in Mueller Township of Schoolcraft County, Michigan. The county is sparsely populated, having a density of seven persons per square mile. Table 14-13 indicates that Schoolcraft County experienced a rapid rate of population growth between 1970 and 1975. The population of Mueller Township remained stable during the same time period. Projections for

1990 indicate that rapid population growth is expected to continue in Schoolcraft County.

Table 14-13. Population Data for the Vicinity of Port Inland Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Schoolcraft County	8,659	5.3	10,125
Mueller Township	261	-0.8	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

The southern portion of Port Inland Wetland is within an industrial area, while the northern portion is open space. Similarly, the area immediately surrounding the southern portion of the wetland is in industrial use, while the area surrounding the northern portion of the wetland is open space. Land uses further inland are primarily rural open space. A large stone quarry and a highway are located near the western border of Port Inland Wetland. A rail line lies to the south and east of the wetland and harbor facilities lie to the south (U.S.G.S. quadrangle map, Hughes Point, Michigan, 1972; Central Upper Peninsula Planning and Development Regional Commission, 1978). The wetland is under private (corporate) ownership (Rockford Map Publishers, Inc., 1970), and appears to face high development pressures owing to the immediate presence of heavy industry.

Recreation

There are no known state or federal recreational facilities in the vicinity of Port Inland Wetland.

Mineral, Energy, and Forest Resources

Port Inland Wetland lies within an area underlain by industrial-quality dolomites; an active dolomite quarry is located west of the wetland. Port Inland Wetland also lies within an area of clay resources, but there are no operations in the wetland exploiting this resource (Gere, 1977). An active sand and gravel operation is situated within the Port Inland industrial area to the west of the wetland (Michigan Department of State Highways and Transportation aerial photograph, 1973). There are no oil, gas, or coal resources in the wetland (Michigan Geological Survey, 1977; Smith, 1915).

Port Inland Wetland is wooded (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978), but it was not determined

through the literature search whether this wooded area is used for commercial production.

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Port Inland Wetland (U.S.G.S. quadrangle map, Hughes Point, Michigan, 1972).

Pollution Sources

The Inland Lime and Stone Company holds three NPDES permits for discharges from its tailings pond into Lake Michigan and the Milakokia River. These discharges occur southwest of Port Inland, and their effect, if any, on Port Inland Wetland is not known (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Port Inland Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 363

The literature search identified no on-going or impending research projects pertaining to Port Inland Wetland.

SEINERS POINT AREA WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LM 364-366

Setting

The Seiners Point Area Wetland Complex, comprised of Hughes Point Area Wetland and Seiners Point Wetlands #1 and #2, is located on the northern shore of Lake Michigan in Mackinac County, Michigan. Hughes Point Area Wetland and Seiners Point Wetland #2 are adjacent to the shoreline; Seiners Point Wetland #1 lies 0.1 mile inland. All three of the wetlands are approximately nine miles east of the community of Gulliver.

Hughes Point Area Wetland lies 0.5 mile north of Hughes Point. It is a Lacustrine System and occupies a low, non-wooded site. Seiners Point Wetland #1 is a small, Palustrine System. The wetland occupies a raised, wooded site and is located to the north of Hughes Point Area Wetland. Seiners Creek is east of this wetland. Seiners Point Wetland #2 is located west of the mouth of Seiners Creek. The wetland is a Palustrine System occupying a raised, non-wooded site (U.S.G.S. quadrangle map, Hughes Point, Michigan, 1972).

Topography

Hughes Point Area Wetland has a total relief of 5 feet with elevations ranging from lake level to 585 feet above sea level. Seiners Point Wetland #1 has a total relief of less than 5 feet, with elevations ranging from roughly 586 to 590 feet above sea level. The elevation of Seiners Point Wetland #2 ranges from lake level to 590 feet above sea level. Total relief in the wetland is ten feet. All three wetlands lie on a low lacustrine plain on the south-facing slope of the Niagara Cuesta. Large wetlands occupy low inland sites on this plain. The Great Lakes Basin Commission (1975) describes the shoreline near the wetlands as a non-erodible low plain.

Surficial Geology

The surficial geology of Hughes Point Area Wetland and Seiners Point Wetlands #1 and #2 is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in Hughes Point Area Wetland and Seiners Point Wetlands #1 and #2 is Eastport-Roscommon sand, which is generally found on beach ridges and stabilized dunes. This soil has a surface layer of black, partially decomposed leaf litter underlain by sand; it has little available water capacity, rapid permeability, and low natural fertility (Berndt, 1977; Michigan Agricultural Experiment Station, 1952).

Hydrology

A short intermittent stream, originating in a small pond adjacent to the wetland, flows through Hughes Point Area Wetland with little change in elevation. There are no streams flowing through Seiners Point Wetlands #1 and #2 (U.S.G.S. quadrangle map, Hughes Point, Michigan, 1972).

The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Hughes Point Area Wetland and Seiners Point Wetlands #1 and #2.

Climate

The closest weather station providing climatic data for the Seiners Point Area Wetland Complex is located in Manistique, Michigan. The average annual temperature for the normal period from 1941-1970 is not available. In 1975, the average daily low for January was 8.2°F and the average daily high in July was 79.1°F. The average annual precipitation is 30.24 inches, with a mean monthly precipitation of 1.38 inches in January and 3.00 inches in July based on the normal period from 1941-1970. The growing season is approximately four and three-quarters months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on September 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are present within Hughes Point Area Wetland and Seiners Point Wetlands #1 and #2 (U.S.G.S. quadrangle map, Hughes Point, Michigan, 1972).

BIOTIC SETTING

LM 364-366

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of the Seiners Point Area Wetland Complex.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in the Seiners Point Area Wetland Complex.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in the Seiners Point Area Wetland Complex.

Reptiles and Amphibians

Appendix C-14 contains general information on reptiles and amphibians of Lake Section 14, but care should be exercised in the interpretation of the relevance of this information to Hughes Point Area Wetland and Seiners Point Wetlands #1 and #2. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in these wetlands.

Avifauna

Appendix D-31 contains general information on wetland birds of Lake Section 14, but care should be exercised in the interpretation of the relevance of this information to Hughes Point Area Wetland and Seiners Point Wetlands #1 and #2. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing these wetlands.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting the Seiners Point Area Wetland Complex.

Endangered Species

The bald eagle (Haliaeetus leucocephalus) historically nested along the shoreline of Lake Section 14. The bald eagle currently is an uncommon summer resident of this area, but no nests exist near the shoreline (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication).

The osprey (Pandion haliaetus), threatened in Michigan, nests on the western edge and central portion of Lake Section 14 (Postupalsky, 1977). The central group extends 15 to 20 miles inland in the Manistique Lakes area, east of Hughes Point Area Wetland and Seiners Point Wetlands #1 and #2. Postupalsky observed 12 osprey pairs in the area during 1971, and reported that this population was increasing in size.

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan

Endangered and Threatened Species Program, 1976) were documented in the Seiners Point Area Wetland Complex by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of these wetlands.

CULTURAL SETTING

LM 364-366

Population

The Seiners Point Area Wetland Complex is located in Newton Township of Mackinac County, Michigan. The county is sparsely populated, having a density of ten persons per square mile. Table 14-14 indicates that Mackinac County and Newton Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that Mackinac County is expected to undergo moderate population growth in the future.

Table 14-14. Population Data for the Vicinity of the Seiners Point Area Wetland Complex

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Mackinac County	10,714	10.9	12,208
Newton Township	387	28.1	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Hughes Point Area Wetland and Seiners Point Wetlands #1 and #2 is rural open space. The surrounding area is similarly in rural open space uses (U.S.G.S. quadrangle map, Hughes Point, Michigan, 1972; Razaque and McNamara, 1976; Tremont, 1977). The wetlands are under state ownership (Rockford Map Publishers, Inc., 1972).

The western Mackinac County shoreline has been identified as a unique natural area in the coastal zone area of particular concern program. This shoreline has been under consideration for approval as a wild area by the State Wilderness and Natural Areas Advisory Board for several years (Razaque, 1977). Although designated as a fragile area, this portion of the shoreline has also been deemed suitable for intensive resort development (Razaque and McNamara, 1976). No further information was identified through the literature search

pertaining to development pressures on Hughes Point Area Wetland and Seiners Point Wetlands #1 and #2.

Recreation

There are no known state or federal recreational facilities in the vicinity of Hughes Point Area Wetland and Seiners Point Wetlands #1 and #2.

Mineral, Energy, and Forest Resources

Hughes Point Area Wetland and Seiners Point Wetlands #1 and #2 lie within an area of known clay resources and industrial-quality dolomites, but there are no operations in the area exploiting these resources (Gere, 1977). No known oil, gas, or coal resources are present in the wetlands (Michigan Geological Survey, 1977; Smith, 1915).

Hughes Point Area Wetland and Seiners Point Wetland #2 are non-wooded; Seiners Point Wetland #1 is wooded (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978). It was not determined through the literature search whether the wooded area in Seiners Point Wetland #1 is used for commercial production.

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Hughes Point Area Wetland and Seiners Point Wetlands #1 and #2 (U.S.G.S. quadrangle map, Hughes Point, Michigan, 1972).

Pollution Sources

There are no NPDES permit holders adjacent to Hughes Point Area Wetland and Seiners Point Wetlands #1 and #2 (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Hughes Point Area Wetland and Seiners Point Wetlands #1 and #2, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 364-366

The literature search identified no on-going or impending research projects pertaining to the Seiners Point Area Wetland Complex.

SWAN CREEK AREA WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LM 367-368

Setting

The Swan Creek Area Wetland Complex, comprised of Swan Creek Area Wetlands #1 and #2, is located 0.2 mile from the northern shoreline of Lake Michigan in Mackinac County, Michigan, ten miles east of the community of Gulliver. Swan Creek Area Wetlands #1 and #2 are Lacustrine Systems; they occupy low, wooded sites within the Mackinac State Forest (U.S.G.S. quadrangle map, Hughes Point, Michigan, 1972).

Topography

Elevations of Swan Creek Area Wetlands #1 and #2 range from 595 to 600 feet above sea level, 15 to 20 feet above the approximate mean elevation of Lake Michigan. Both wetlands have a total relief of 5 feet. The wetlands lie on a low lacustrine plain which is located on the south-facing slope of the Niagara Cuesta. Large wetlands occupy low inland sites on this plain. The Great Lakes Basin Commission (1975) describes the shoreline near the wetlands as an erodible low plain featuring a sand and gravel beach.

Surficial Geology

The surficial geology of Swan Creek Area Wetlands #1 and #2 is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in Swan Creek Area Wetlands #1 and #2 is Eastport-Roscommon sand. This soil, generally found on beach ridges and stabilized dunes, has a surface layer of black, partially decomposed leaf litter underlain by sand. Eastport-Roscommon sand has little available water capacity, rapid permeability, and low natural fertility (Berndt, 1977; Michigan Agricultural Experiment Station, 1952).

Hydrology

There are no streams flowing through Swan Creek Area Wetlands #1 and #2 (U.S.G.S. quadrangle map, Hughes Point, Michigan, 1972). The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Swan Creek Area Wetlands #1 and #2.

Climate

The closest weather station providing climatic data for the Swan Creek Area Wetland Complex is located in Manistique, Michigan. The average annual temperature for the normal period from 1941-1970 is not available. In 1975, the average daily low for January was 8.2°F and the average daily high in July was 79.1°F. The average annual precipitation is 30.24 inches, with a mean monthly precipitation of 1.38 inches in January and 3.00 inches in July based on the normal period from 1941-1970. The growing season is approximately four and three-quarters months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on September 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are present in Swan Creek Area Wetlands #1 and #2 (U.S.G.S. quadrangle map, Hughes Point, Michigan, 1972).

BIOTIC SETTING

LM 367-368

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Swan Creek Area Wetlands #1 and #2.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Swan Creek Area Wetlands #1 and #2.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Swan Creek Area Wetlands #1 and #2.

Reptiles and Amphibians

Appendix C-14 contains general information on reptiles and amphibians of Lake Section 14, but care should be exercised in the interpretation of the relevance of this information to Swan Creek Area Wetlands #1 and #2. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in these wetlands.

Avifauna

Appendix D-31 contains general information on wetland birds of Lake Section 14, but care should be exercised in the interpretation of the relevance of this information to Swan Creek Area Wetlands #1 and #2. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing these wetlands.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting the Swan Creek Area Wetland Complex.

Endangered Species

The bald eagle (Haliaeetus leucocephalus) historically nested along the shoreline of Lake Section 14. The bald eagle currently is an uncommon summer resident of this area, but no nests exist near the shoreline (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication).

The osprey (Pandion haliaetus), threatened in Michigan, nests on the western edge and central portion of Lake Section 14 (Postupalsky, 1977). The central group extends 15 to 20 miles inland in the Manistique Lakes area, a short distance east of Swan Creek Area Wetlands #1 and #2. Postupalsky observed 12 osprey pairs in the area during 1971, and reported that this population was increasing in size.

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in the Swan Creek Area Wetland Complex by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of these wetlands.

CULTURAL SETTING

LM 367-368

Population

The Swan Creek Area Wetland Complex is located in Newton Township of Mackinac County, Michigan. The county is sparsely populated, having a density of ten persons per square mile. Table 14-15 indicates that Mackinac County and

Newton Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that Mackinac County is expected to undergo moderate population growth in the future.

Table 14-15. Population Data for the Vicinity of Swan Creek Area Wetlands #1 and #2

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Mackinac County	10,714	10.9	12,208
Newton Township	387	28.1	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Swan Creek Area Wetlands #1 and #2 and most of the surrounding area is rural wooded space (U.S.G.S. quadrangle map, Hughes Point, Michigan, 1972; Razaque and McNamara, 1976; Tremont, 1977). The wetlands are under state ownership (Rockford Map Publishers, Inc., 1972).

The western Mackinac County shoreline has been identified as a unique natural area in the coastal zone area of particular concern program. This shoreline has been under consideration for approval as a wild area by the State Wilderness and Natural Areas Advisory Board for several years (Razaque, 1977). Although designated as a fragile area, this portion of the shoreline has also been deemed suitable for intensive resort development (Razaque and McNamara, 1976). No further information was identified through the literature search pertaining to development pressures on Swan Creek Area Wetlands #1 and #2.

Recreation

Swan Creek Area Wetlands #1 and #2 lie within the Mackinac State Forest. Although there are no known areas specifically designated for recreational use in the wetlands, all Michigan state forest lands are open for camping unless otherwise posted. Hunting and fishing are also major uses of state forest lands (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Mineral, Energy, and Forest Resources

Swan Creek Area Wetlands #1 and #2 lie within an area of known clay resources and industrial-quality dolomites, but there are no operations in the

area exploiting these resources (Gere, 1977). No known oil, gas, or coal resources are present in the wetlands (Michigan Geological Survey, 1977; Smith, 1915).

Swan Creek Area Wetlands #1 and #2 are wooded sites within the Mackinac State Forest (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978). State-owned forest lands in the coastal area are within a "water influence zone," in which water quality, water use, and aesthetic surroundings are the principal management concerns. Cover treatments are designed to maintain or enhance these concerns, and timber harvesting is conducted accordingly (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Swan Creek Area Wetlands #1 and #2 (U.S.G.S. quadrangle map, Hughes Point, Michigan, 1972).

Pollution Sources

There are no NPDES permit holders adjacent to Swan Creek Area Wetlands #1 and #2 (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Swan Creek Area Wetlands #1 and #2, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 367-368

The literature search identified no on-going or impending research projects pertaining to the Swan Creek Area Wetlands.

PETERSON CREEK AREA WETLAND #1

PHYSIOGRAPHIC SETTING

LM 369

Setting

Peterson Creek Area Wetland #1 is adjacent to the northern shoreline of Lake Michigan in Mackinac County, Michigan, approximately 11.5 miles east of the community of Gulliver. Low sand dunes surround the wetland, which is situated on a small headland. Peterson Creek Area Wetland #1 is a Lacustrine System; it occupies a low, partially wooded site within the Mackinac State Forest (U.S.G.S. quadrangle map, Hughes Point, Michigan, 1972).

Topography

The total relief of Peterson Creek Area Wetland #1 is approximately 6 feet. Wetland elevations range from 584 to 590 feet above sea level, 4 to 10 feet above the approximate mean elevation of Lake Michigan. The wetland lies on a low lacustrine plain on the south-facing slope of the Niagara Cuesta. Large wetlands occupy low inland sites on this plain. The Great Lakes Basin Commission (1975) describes the shoreline near Peterson Creek Area Wetland #1 as an erodible low plain featuring a sand and gravel beach.

Surficial Geology

The surficial geology of Peterson Creek Area Wetland #1 is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in Peterson Creek Area Wetland #1 is Eastport-Roscommon sand. This soil, generally found on beach ridges and stabilized dunes, has a surface layer of black, partially decomposed leaf litter underlain by sand. Eastport-Roscommon sand has little available water capacity, rapid permeability, and low natural fertility (Berndt, 1977; Michigan Agricultural Experiment Station, 1952).

Hydrology

There are no streams flowing through Peterson Creek Area Wetland #1 (U.S.G.S. quadrangle map, Hughes Point, Michigan, 1972). The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Peterson Creek Area Wetland #1.

Climate

The closest weather station providing climatic data for Peterson Creek Area Wetland #1 is located in Manistique, Michigan. The average annual temperature for the normal period from 1941-1970 is not available. In 1975, the average daily low for January was 8.2°F and the average daily high in July was 79.1°F. The average annual precipitation is 30.24 inches, with a mean monthly precipitation of 1.38 inches in January and 3.00 inches in July based on the normal period from 1941-1970. The growing season is approximately four and three-quarters months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on September 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are present in Peterson Creek Area Wetland #1 (U.S.G.S. quadrangle map, Hughes Point, Michigan, 1972).

BIOTIC SETTING

LM 369

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Peterson Creek Area Wetland #1.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Peterson Creek Area Wetland #1.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Peterson Creek Area Wetland #1.

Reptiles and Amphibians

Appendix C-14 contains general information on reptiles and amphibians of Lake Section 14, but care should be exercised in the interpretation of the relevance of this information to Peterson Creek Area Wetland #1. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Appendix D-31 contains general information on wetland birds of Lake Section 14, but care should be exercised in the interpretation of the relevance of this information to Peterson Creek Area Wetland #1. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Peterson Creek Area Wetland #1.

Endangered Species

The bald eagle (Haliaeetus leucocephalus) historically nested along the shoreline of Lake Section 14. The bald eagle currently is an uncommon summer resident of this area, but no nests exist near the shoreline (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication).

The osprey (Pandion haliaetus), threatened in Michigan, nests on the western edge and central portion of Lake Section 14 (Postupalsky, 1977). The central group extends 15 to 20 miles inland in the Manistique Lakes area, a short distance east of Peterson Creek Area Wetlands #1. Postupalsky observed 12 osprey pairs in the area during 1971, and reported that this population was increasing in size.

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Peterson Creek Area Wetland #1 by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland.

CULTURAL SETTING

LM 369

Population

Peterson Creek Area Wetland #1 is located in Newton Township of Mackinac County, Michigan. The county is sparsely populated, having a density of ten persons per square mile. Table 14-16 indicates that Mackinac County and Newton

Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that Mackinac County is expected to undergo moderate population growth in the future.

Table 14-16. Population Data for the Vicinity of Peterson Creek Area Wetland #1

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Mackinac County	10,714	10.9	12,208
Newton Township	387	28.1	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Peterson Creek Area Wetland #1 and most of the surrounding area is rural open space (U.S.G.S. quadrangle map, Hughes Point, Michigan, 1972; Razaque and McNamara, 1976; Tremont, 1977). The wetland is under state ownership (Rockford Map Publishers, Inc., 1972).

The western Mackinac County shoreline has been identified as a unique natural area in the coastal zone area of particular concern program. This shoreline has been under consideration for approval as a wild area by the State Wilderness and Natural Areas Advisory Board for several years (Razaque, 1977). Although designated as a fragile area, this portion of the shoreline has also been deemed suitable for intensive resort development (Razaque and McNamara, 1976). No further information was identified through the literature search pertaining to future development pressures on Peterson Creek Area Wetland #1.

Recreation

Peterson Creek Area Wetland #1 lies within the Mackinac State Forest. Although there are no known areas specifically designated for recreational use in the wetland, all Michigan state forest lands are open for camping unless otherwise posted. Hunting and fishing are also major uses of state forest lands (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Mineral, Energy, and Forest Resources

Peterson Creek Area Wetland #1 lies within an area of known clay resources and industrial-quality dolomites, but there are no operations in the area exploiting these resources (Gere, 1977). No known oil, gas, or coal resources are present in the wetland (Michigan Geological Survey, 1977; Smith, 1915).

Peterson Creek Area Wetland #1 is a partially wooded site within the Mackinac State Forest (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978). State-owned forest lands in the coastal area are within a "water influence zone," in which water quality, water use, and aesthetic surroundings are the principal management concerns. Cover treatments are designed to maintain or enhance these concerns, and timber harvesting is conducted accordingly (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Peterson Creek Area Wetland #1 (U.S.G.S. quadrangle map, Hughes Point, Michigan, 1972).

Pollution Sources

There are no NPDES permit holders adjacent to Peterson Creek Area Wetland #1 (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Peterson Creek Area Wetland #1, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 369

The literature search identified no on-going or impending research projects pertaining to Peterson Creek Area Wetland #1.

PETERSON CREEK AREA WETLAND #2

PHYSIOGRAPHIC SETTING

LM 370

Setting

Peterson Creek Area Wetland #2 is located 0.2 mile from the northern shoreline of Lake Michigan in Mackinac County, Michigan, 12 miles east of the community of Gulliver. Peterson Creek flows into Lake Michigan 0.1 mile east of the wetland. Peterson Creek Area Wetland #2 is a Palustrine System; it occupies a raised, wooded site within the Mackinac State Forest (U.S.G.S. quadrangle map, Hughes Point, Michigan, 1972).

Topography

The total relief of Peterson Creek Area Wetland #2 is less than 5 feet; wetland elevations range from roughly 603 to 606 feet above sea level, 23 to 26 feet above the approximate mean elevation of Lake Michigan. The wetland lies on a low lacustrine plain on the south-facing slope of the Niagara Cuesta. Large wetlands occupy low inland sites on this plain. The Great Lakes Basin Commission (1975) describes the shoreline near Peterson Creek Area Wetland #2 as a non-erodible low plain with a sand and gravel beach.

Surficial Geology

The surficial geology of Peterson Creek Area Wetland #2 is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in Peterson Creek Area Wetland #2 is Eastport-Roscommon sand. This soil, generally found on beach ridges and stabilized dunes, has a surface layer of black, partially decomposed leaf litter underlain by sand. Eastport-Roscommon sand has little available water capacity, rapid permeability, and low natural fertility (Berndt, 1977; Michigan Agricultural Experiment Station, 1952).

Hydrology

There are no streams flowing through Peterson Creek Area Wetland #2 (U.S.G.S. quadrangle map, Hughes Point, Michigan, 1972). The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Peterson Creek Area Wetland #2.

Climate

The closest weather station providing climatic data for Peterson Creek Area Wetland #2 is located in Manistique, Michigan. The average annual temperature for the normal period from 1941-1970 is not available. In 1975, the average daily low for January was 8.2°F and the average daily high in July was 79.1°F. The average annual precipitation is 30.24 inches, with a mean monthly precipitation of 1.38 inches in January and 3.00 inches in July based on the normal period from 1941-1970. The growing season is approximately four and three-quarters months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on September 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are present in Peterson Creek Area Wetland #2 (U.S.G.S. quadrangle map, Hughes Point, Michigan, 1972).

BIOTIC SETTING

LM 370

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Peterson Creek Area Wetland #2.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Peterson Creek Area Wetland #2.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Peterson Creek Area Wetland #2.

Reptiles and Amphibians

Appendix C-14 contains general information on reptiles and amphibians of Lake Section 14, but care should be exercised in the interpretation of the relevance of this information to Peterson Creek Area Wetland #2. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Appendix D-31 contains general information on wetland birds of Lake Section 14, but care should be exercised in the interpretation of the relevance of this information to Peterson Creek Area Wetland #2. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Peterson Creek Area Wetland #2.

Endangered Species

The bald eagle (Haliaeetus leucocephalus) historically nested along the shoreline of Lake Section 14. The bald eagle currently is an uncommon summer resident of this area, but no nests exist near the shoreline (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication).

The osprey (Pandion haliaetus), threatened in Michigan, nests on the western edge and central portion of Lake Section 14 (Postupalsky, 1977). The central group extends 15 to 20 miles inland in the Manistique Lakes area, a short distance east of Peterson Creek Area Wetland #2. Postupalsky observed 12 osprey pairs in the area during 1971, and reported that this population was increasing in size.

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Peterson Creek Area Wetland #2 by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland.

CULTURAL SETTING

LM 370

Population

Peterson Creek Area Wetland #2 is located in Newton Township of Mackinac County, Michigan. The county is sparsely populated, having a density of ten persons per square mile. Table 14-17 indicates that Mackinac County and Newton

Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that Mackinac County is expected to undergo moderate population growth in the future.

Table 14-17. Population Data for the Vicinity of Peterson Creek Area Wetland #2

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Mackinac County	10,714	10.9	12,208
Newton Township	387	28.1	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Peterson Creek Area Wetland #2 and most of the surrounding area is rural wooded space (U.S.G.S. quadrangle map, Hughes Point, Michigan, 1972; Razaque and McNamara, 1976; Tremont, 1977). The wetland is under state ownership (Rockford Map Publishers, Inc., 1972).

The western Mackinac County shoreline has been identified as a unique natural area in the coastal zone area of particular concern program. This shoreline has been under consideration for approval as a wild area by the State Wilderness and Natural Areas Advisory Board for several years (Razaque, 1977). Although designated as a fragile area, this portion of the shoreline has also been deemed suitable for intensive resort development (Razaque and McNamara, 1976). No further information was identified through the literature search pertaining to future development pressures on Peterson Creek Area Wetland #2.

Recreation

Peterson Creek Area Wetland #2 lies within the Mackinac State Forest. Although there are no known areas specifically designated for recreational use in the wetland, all Michigan state forest lands are open for camping unless otherwise posted. Hunting and fishing are also major uses of state forest lands (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Mineral, Energy, and Forest Resources

Peterson Creek Area Wetland #2 lies within an area of known clay resources and industrial-quality dolomites, but there are no operations in the area exploiting these resources (Gere, 1977). No known oil, gas, or coal resources are present in the wetland (Michigan Geological Survey, 1977; Smith, 1915).

Peterson Creek Area Wetland #2 is a wooded site within Mackinac State Forest (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978). State-owned forest lands in the coastal area are within a "water influence zone," in which water quality, water use, and aesthetic surroundings are the principal management concerns. Cover treatments are designed to maintain or enhance these concerns, and timber harvesting is conducted accordingly (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Peterson Creek Area Wetland #2 (U.S.G.S. quadrangle map, Hughes Point, Michigan, 1972).

Pollution Sources

There are no NPDES permit holders adjacent to Peterson Creek Area Wetland #2 (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Peterson Creek Area Wetland #2, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 370

The literature search identified no on-going or impending research projects pertaining to Peterson Creek Area Wetland #2.

BIRCH POINT WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LM 371-372

Setting

The Birch Point Wetland Complex, comprised of Birch Point Wetlands #1 and #2, is located 0.2 mile from the northern shoreline of Lake Michigan in Mackinac County, Michigan, 13 miles east of the community of Gulliver. Both wetlands are Palustrine Systems and occupy raised, wooded sites within the Mackinac State Forest (U.S.G.S. quadrangle map, Point Patterson, Michigan, 1973).

Topography

Elevations within Birch Point Wetland #1 range from 590 to 599 feet above sea level, 10 to 19 feet above the approximate mean elevation of Lake Michigan. The wetland has a total relief of less than ten feet. Birch Point Wetland #2 has elevations ranging from 590 to 595 feet above sea level; total relief in the wetland is five feet. Both wetlands lie on a low lacustrine plain on the south-facing slope of the Niagara Cuesta. Large wetlands occupy low inland sites on this plain. The Great Lakes Basin Commission (1975) describes the shoreline near Birch Point Wetlands #1 and #2 as a nonerodible low plain with a sand and gravel beach.

Surficial Geology

The surficial geology of Birch Point Wetlands #1 and #2 is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in Birch Point Wetlands #1 and #2 is Eastport-Roscommon sand. This soil, generally found on beach ridges and stabilized dunes, has a surface layer of black, partially decomposed leaf litter underlain by sand. Eastport-Roscommon sand has little available water capacity, rapid permeability, and low natural fertility (Berndt, 1977; Michigan Agricultural Experiment Station, 1952).

Hydrology

There are no streams flowing through Birch Point Wetlands #1 and #2 (U.S.G.S. quadrangle map, Point Patterson, Michigan, 1973). The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Birch Point Wetlands #1 and #2.

Climate

The closest weather station providing climatic data for the Birch Point Wetland Complex is located in St. James (Beaver Island), Michigan. In 1975, the average monthly temperature was 44.3^oF; the average daily low for January was 19.5^oF and the average daily high in July was 78.0^oF. The average annual precipitation is 29.23 inches, with a mean monthly precipitation of 2.62 inches in January and 1.77 inches in July based on the normal period from 1941-1970. The growing season is approximately six and three-quarters months long, with the last killing frost (28^oF) in 1975 occurring on April 22 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Birch Point Wetlands #1 and #2 (U.S.G.S. quadrangle map, Point Patterson, Michigan, 1973).

BIOTIC SETTING

LM 371-372

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Birch Point Wetlands #1 and #2.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Birch Point Wetlands #1 and #2.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Birch Point Wetlands #1 and #2.

Reptiles and Amphibians

Appendix C-14 contains general information on reptiles and amphibians of Lake Section 14, but care should be exercised in the interpretation of the relevance of this information to Birch Point Wetlands #1 and #2. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in these wetlands.

Avifauna

Appendix D-31 contains general information on wetland birds of Lake Section 14, but care should be exercised in the interpretation of the relevance of this information to Birch Point Wetlands #1 and #2. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing these wetlands.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting the Birch Point Wetland Complex.

Endangered Species

The bald eagle (Haliaeetus leucocephalus) historically nested along the shoreline of Lake Section 14. The bald eagle currently is an uncommon summer resident of this area, but no nests exist near the shoreline (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication).

The osprey (Pandion haliaetus), threatened in Michigan, nests on the western edge and central portion of Lake Section 14 (Postupalsky, 1977). The central group extends 15 to 20 miles inland in the Manistique Lakes area, near Birch Point Wetlands #1 and #2. Postupalsky observed 12 osprey pairs in 1971, and reported that this population was increasing in size.

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in the Birch Point Wetland Complex by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of these wetlands.

CULTURAL SETTING

LM 371-372

Population

Birch Point Wetlands #1 and #2 are located in Newton Township of Mackinac County, Michigan. The county is sparsely populated, having a density of ten persons per square mile. Table 14-18 indicates that Mackinac County and Newton Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that Mackinac County is expected to undergo moderate population growth in the future.

Table 14-18. Population Data for the Vicinity of Birch Point Wetlands #1 and #2

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Mackinac County	10,714	10.9	12,208
Newton Township	387	28.1	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Birch Point Wetlands #1 and #2 and most of the surrounding area is rural wooded space. A foot trail lies lakeward of Birch Point Wetlands #1 and #2 (U.S.G.S. quadrangle map, Point Patterson, Michigan, 1973; Razaque and McNamara, 1976; Tremont, 1977). Birch Point Wetland #1 is under private ownership, while Birch Point Wetland #2 is under state ownership (Rockford Map Publishers, Inc., 1972).

The western Mackinac County shoreline has been identified as a unique natural area in the coastal zone area of particular concern program. This shoreline has been under consideration for approval as a wild area by the State Wilderness and Natural Areas Advisory Board for several years (Razaque, 1977). Although designated as a fragile area, this portion of the shoreline has also been deemed suitable for intensive resort development (Razaque and McNamara, 1976). No further information was identified through the literature search pertaining to development pressures on Birch Point Wetlands #1 and #2.

Recreation

Birch Point Wetlands #1 and #2 lie within the Mackinac State Forest. Although there are no known areas specifically designated for recreational use in the wetlands, all Michigan state forest lands are open for camping unless otherwise posted. Hunting and fishing are also major uses of state forest lands (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Mineral, Energy, and Forest Resources

Birch Point Wetlands #1 and #2 lie within an area of known clay resources and industrial-quality dolomites, but there are no operations in the area exploiting these resources (Gere, 1977). No known oil, gas, or coal resources are present in the wetlands (Michigan Geological Survey, 1977; Smith, 1915).

Birch Point Wetlands #1 and #2 are wooded sites within Mackinac State Forest (Indiana University, Environmental Systems Application Center aerial

reconnaissance, 1978). State-owned forest lands in the coastal area are within a "water influence zone," in which water quality, water use, and aesthetic surroundings are the principal management concerns. Cover treatments are designed to maintain or enhance these concerns, and timber harvesting is conducted accordingly (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Birch Point Wetlands #1 and #2 (U.S.G.S. quadrangle map, Point Patterson, Michigan, 1973).

Pollution Sources

There are no NPDES permit holders adjacent to Birch Point Wetlands #1 and #2 (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Birch Point Wetlands #1 and #2, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 371-372

The literature search identified no on-going or impending research projects pertaining to Birch Point Wetlands #1 and #2.

POINT PATTERSON AREA WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LM 373-374

Setting

The Point Patterson Area Wetland Complex, comprised of Scott Point Wetland and Point Patterson Wetland, is adjacent to the northern shoreline of Lake Michigan in Mackinac County, Michigan, 15.5 and 15.0 miles, respectively, east of the community of Gulliver. Scott Point Wetland lies south of the mouth of Newton Creek and north of Scott Point. Point Patterson Wetland extends along the shoreline from the mouth of Newton Creek to a point north of Grants Point. Low coastal beach ridges occupy portions of the wetland, and a broad sand beach lies lakeward of the northern end. Both wetlands are Lacustrine Systems occupying low, partially wooded sites within the Mackinac State Forest (U.S.G.S. quadrangle maps, Point Patterson, Michigan, 1973; Gould City, Michigan, 1973).

Topography

Scott Point Wetland has a total relief of approximately 5 feet with elevations ranging from 580 to 585 feet above sea level (lake level to 5 feet above the approximate mean elevation of Lake Michigan). Elevations within Point Patterson Wetland range from lake level to 20 feet above sea level; the total relief of the wetland is 20 feet. Scott Point Wetland and Point Patterson Wetland lie on a low lacustrine plain on the south-facing slope of the Niagara Cuesta. Large wetlands occupy low inland sites on this plain. The Great Lakes Basin Commission (1975) describes the shoreline near Scott Point Wetland and Point Patterson Wetland as an erodible low plain.

Surficial Geology

The surficial geology of Scott Point Wetland and Point Patterson Wetland is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in Scott Point Wetland is Eastport-Roscommon sand, which is also predominant in Point Patterson Wetland. Carbondale muck and Rifle peat are found in the southern portion of Point Patterson Wetland and near Point Patterson Creek (Berndt, 1977; Michigan Agricultural Experiment Station, 1952).

Eastport-Roscommon sand, generally found on beach ridges and stabilized dunes, has a surface layer of black, partially decomposed leaf litter underlain by sand. Eastport-Roscommon sand has little available water capacity, rapid permeability, and low natural fertility. Carbondale muck consists of dark-brown, moderately decomposed woody material which is high in ash content. It is underlain by clayey till, sand, or limestone. This soil is wet and has areas

that are highly decomposed. Rifle peat consists of dark-brown, moderately decomposed woody peat over fibrous peat underlain by sand. This soil is high in organic matter and has very little mineral content. Rifle peat is a wet soil generally found on flat plains (Berndt, 1977; Michigan Agricultural Experiment Station, 1952).

Hydrology

There are three streams flowing through Point Patterson Wetland: Newton Creek, Point Patterson Creek, and the Cataract River. Newton Creek originates in a small lake near the southern edge of Point Patterson Wetland and has little change in elevation as it travels through the wetland. Point Patterson Creek has several tributaries which have their origin in open water areas in the southern half of the wetland. The longest tributary has approximately a 15-foot change in elevation before it joins Point Patterson Creek. Point Patterson Creek has a 10-foot change in elevation as it travels through Point Patterson Wetland. The Cataract River originates in a lake not far from Point Patterson Wetland. This river has a 20-foot change in elevation as it travels through the wetland. There are also numerous open water areas in point Patterson Wetland. No streams flow through Scott Point Wetland (U.S.G.S. quadrangle map, Point Patterson, Michigan, 1972).

The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Scott Point Wetland and Point Patterson Wetland.

Climate

The closest weather station providing climatic data for the Point Patterson Area Wetland Complex is located in St. James (Beaver Island), Michigan. In 1975, the average monthly temperature was 44.3^oF; the average daily low for January was 19.5^oF and the average daily high in July was 78.0^oF. The average annual precipitation is 29.23 inches, with a mean monthly precipitation of 2.62 inches in January and 1.77 inches in July based on the normal period from 1941-1970. The growing season is approximately six and three-quarters months long, with the last killing frost (28^oF) in 1975 occurring on April 22 and the first killing frost on November 14 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of the Point Patterson Area Wetland Complex (U.S.G.S. quadrangle maps, Point Patterson, Michigan, 1973; Gould City, Michigan, 1973).

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of the Point Patterson Area Wetland Complex.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in the Point Patterson Area Wetland Complex.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in the Point Patterson Area Wetland Complex.

Reptiles and Amphibians

Appendix C-14 contains general information on reptiles and amphibians of Lake Section 14, but care should be exercised in the interpretation of the relevance of this information to Scott Point Wetland and Point Patterson Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in these wetlands.

Avifauna

Appendix D-31 contains general information on wetland birds of Lake Section 14, but care should be exercised in the interpretation of the relevance of this information to Scott Point Wetland and Point Patterson Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing these wetlands.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting the Point Patterson Area Wetland Complex.

Endangered Species

The bald eagle (Haliaeetus leucocephalus) historically nested along the shoreline of Lake Section 14. The bald eagle currently is an uncommon summer resident of this area, but no nests exist near the shoreline (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication).

The osprey (Pandion haliaetus), threatened in Michigan, nests on the western edge and central portion of Lake Section 14 (Postupalsky, 1977). The central group extends 15 to 20 miles inland in the Manistique Lakes area, near Scott Point Wetland and Point Patterson Wetland. Postupalsky observed 12 osprey pairs in the area during 1971, and reported that this population was increasing in size.

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in the Point Patterson Area Wetland Complex by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of these wetlands.

CULTURAL SETTING

LM 373-374

Population

Scott Point Wetland and Point Patterson Wetland are located in Newton Township of Mackinac County, Michigan. The county is sparsely populated, having a density of ten persons per square mile. Table 14-19 indicates that Mackinac County and Newton Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that Mackinac County is expected to undergo moderate population growth in the future.

Table 14-19. Population Data for the Vicinity of Scott Point Wetland and Point Patterson Wetland

	Estimated Population 1975 ^a	Estimated % Δ 1970-1975 ^a	Projected Population 1990 ^b
Mackinac County	10,714	10.9	12,208
Newton Township	387	28.1	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within the Point Patterson Area Wetland Complex and most of the surrounding area is rural open space. An access road lies within Point Patterson Wetland and foot trails and an abandoned railroad grade lie inland of the wetland (U.S.G.S. quadrangle maps, Point Patterson, Michigan, 1973; Gould City, Michigan, 1973; Razaque and McNamara, 1976; Tremont, 1977). Scott Point Wetland is under private ownership, while Point Patterson Wetland is under mixed state, private, and corporate ownership (Rockford Map Publishers, Inc., 1972). Both wetlands are included in an area which has been deemed suitable for extensive resort development (Razaque and McNamara, 1976).

Recreation

Scott Point Wetland and Point Patterson Wetland lie within the Mackinac State Forest. Although there are no known areas specifically designated for recreational use in the wetlands, all Michigan state forest lands are open for camping unless otherwise posted. Hunting and fishing are also major uses of state forest lands (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Mineral, Energy, and Forest Resources

Scott Point Wetland and Point Patterson Wetland lie within an area of industrial-quality dolomites, but there are no operations in the area exploiting this resource (Gere, 1977). No known oil, gas, or coal resources are present in the wetlands (Michigan Geological Survey, 1977; Smith, 1915).

Scott Point Wetland and Point Patterson Wetland are partially wooded sites within the Mackinac State Forest (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978). State-owned forest lands in the coastal area are within a "water influence zone," in which water quality, water use, and aesthetic surroundings are the principal management concerns. Cover treatments are designed to maintain or enhance these concerns, and timber harvesting is conducted accordingly (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Scott Point Wetland and Point Patterson Wetland (U.S.G.S. quadrangle maps, Point Patterson, Michigan, 1973; Gould City, Michigan, 1973).

Pollution Sources

There are no NPDES permit holders adjacent to Scott Point Wetland and Point Patterson Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Scott Point Wetland and Point Patterson Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976):

RESEARCH PROJECTS

LM 373-374

The literature search identified no on-going or impending research projects pertaining to Scott Point Wetland and Point Patterson Wetland.

FOX POINT AREA WETLAND

PHYSIOGRAPHIC SETTING

LM 375

Setting

Fox Point Area Wetland is located 250 feet from the northern shoreline of Lake Michigan in Mackinac County, Michigan, 7.5 miles southwest of the community of Engadine. Fox Point Area Wetland is situated between two small lakes, and is lakeward of a system of low beach ridges. The shoreline north of the wetland features a broad sand beach. Fox Point Area Wetland is a Lacustrine System; it occupies a low, non-wooded site in the Mackinac State Forest (U.S.G.S. quadrangle map, Engadine, Michigan, 1973; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

Topography

The total relief of Fox Point Area Wetland is less than 5 feet; wetland elevations range from 580 to approximately 584 feet above sea level (lake level to 4 feet above the approximate mean elevation of Lake Michigan). The wetland lies on a low lacustrine plain on the south-facing slope of the Niagara Cuesta. Large wetlands occupy low inland sites on this plain. The Great Lakes Basin Commission (1975) describes the shoreline near the wetland as an erodible low plain with a sand and gravel beach.

Surficial Geology

The surficial geology of Fox Point Area Wetland is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in Fox Point Area Wetland is Eastport-Roscommon sand. This soil, generally found on beach ridges and stabilized dunes, has a surface layer of black, partially decomposed leaf litter underlain by sand. Eastport-Roscommon sand has little available water capacity, rapid permeability, and low natural fertility (Berndt, 1977; Michigan Agricultural Experiment Station, 1952).

Hydrology

There are no streams flowing through Fox Point Area Wetland (U.S.G.S. quadrangle map, Engadine, Michigan, 1973). The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Fox Point Area Wetland.

Climate

The closest weather station providing climatic data for Fox Point Area Wetland is located in Kincheloe Air Force Base, Michigan. In 1975, the average monthly temperature was 42.7^oF; the average daily low for January was 10.8^oF and the average daily high in July was 80.3^oF. The average annual precipitation is 31.79 inches, with a mean monthly precipitation of 1.94 inches in January and 2.97 inches in July based on the normal period from 1941-1970. The growing season is approximately six and one-quarter months long, with the last killing frost (28^oF) in 1975 occurring on April 21 and the first killing frost on October 29 (National Oceanic and Atmospheric Administration, 1975).

Special Features

There are no natural special features present in Fox Point Area Wetland (U.S.G.S. quadrangle map, Engadine, Michigan, 1973).

BIOTIC SETTING

LM 375

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Fox Point Area Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Fox Point Area Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Fox Point Area Wetland.

Reptiles and Amphibians

Appendix C-14 contains general information on reptiles and amphibians of Lake Section 14, but care should be exercised in the interpretation of the relevance of this information to Fox Point Area Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Appendix D-31 contains general information on wetland birds of Lake Section 14, but care should be exercised in the interpretation of the relevance of this information to Fox Point Area Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Fox Point Area Wetland.

Endangered Species

The bald eagle (Haliaeetus leucocephalus) historically nested along the shoreline of Lake Section 14. The bald eagle currently is an uncommon summer resident of this area, but no nests exist near the shoreline (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication).

The osprey (Pandion haliaetus), threatened in Michigan, nests on the western edge and central portion of Lake Section 14 (Postupalsky, 1977). The central group extends 15 to 20 miles inland in the Manistique Lakes area, near Fox Point Area Wetland. Postupalsky observed 12 osprey pairs in the area during 1971, and reported that this population was increasing in size.

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Fox Point Area Wetland by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland.

CULTURAL SETTING

LM 375

Population

Fox Point Area Wetland is located in Garfield Township of Mackinac County, Michigan. The county is sparsely populated, having a density of ten persons per square mile. Table 14-20 indicates that Mackinac County and Garfield Township

experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that Mackinac County is expected to undergo moderate population growth in the future.

Table 14-20. Population Data for the Vicinity of Fox Point Area Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Mackinac County	10,714	10.9	12,208
Garfield Township	1,239	22.3	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Fox Point Area Wetland and most of the surrounding area is rural open space (U.S.G.S. quadrangle map, Engadine, Michigan, 1973; Razaque and McNamara, 1976; Tremont, 1977). The wetland is under private ownership (Rockford Map Publishers, Inc., 1972). Since this area has been deemed suitable for intensive resort development (Razaque and McNamara, 1976), the wetland is likely to be subject to moderate development pressures.

Recreation

Although Fox Point Area Wetland lies within the Mackinac State Forest, the wetland is privately owned. Use of the wetland for recreational purposes would be dependent upon the permission of the owner.

Mineral, Energy, and Forest Resources

Fox Point Area Wetland lies within an area underlain by industrial-quality dolomites, but there are no operations in the area exploiting this resource (Gere, 1977). No oil, gas, or coal resources are present in the wetland (Michigan Geological Survey, 1977; Smith, 1915). There are no significant forest resources present in Fox Point Area Wetland (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Fox Point Area Wetland (U.S.G.S. quadrangle map, Engadine, Michigan, 1973).

Pollution Sources

There are no NPDES permit holders adjacent to Fox Point Area Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Fox Point Area Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 375

The literature search identified no on-going or impending research projects pertaining to Fox Point Area Wetland.

MCNEIL CREEK WETLAND

PHYSIOGRAPHIC SETTING

LM 376

Setting

McNeil Creek Wetland is located along the northern shore of Lake Michigan in Mackinac County, Michigan, four miles south of the community of Engadine; portions of the wetland lie adjacent to the shoreline. McNeil Creek Wetland extends along the shoreline from the mouth of the Crow River northward to a point roughly 0.8 mile southwest of the mouth of McNeil Creek. A series of coastal beach ridges lies within the wetland, and small lakes occupy swales within these ridges. McNeil Creek Wetland is a Lacustrine System and occupies a low, partially wooded site within the Mackinac State Forest (U.S.G.S. quadrangle map, Engadine, Michigan, 1973; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

Topography

The total relief of McNeil Creek Wetland is 40 feet; wetland elevations range from 580 to 620 feet above sea level (lake level to 40 feet above the approximate mean elevation of Lake Michigan). The wetland lies on a low lacustrine plain on the south-facing slope of the Niagara Cuesta. Large wetlands occupy low inland sites on this plain. The Great Lakes Basin Commission (1975) describes the shoreline near McNeil Creek Wetland as an erodible low plain featuring a sand and gravel beach.

Surficial Geology

The surficial geology of McNeil Creek Wetland is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The two soil types found in McNeil Creek Wetland are Eastport-Roscommon sand and Roscommon mucky sand. Roscommon mucky sand has a surface layer consisting of black muck underlain by sand; it has little available water capacity, rapid permeability, and low natural fertility. Eastport-Roscommon sand has a surface layer of black, partially decomposed leaf litter underlain by sand; this soil has little available water capacity, rapid permeability, and low natural fertility (Berndt, 1977; Michigan Agricultural Experiment Station, 1952).

Hydrology

The Crow River and McNeil Creek flow through McNeil Creek Wetland. The Crow River borders the southern edge of the wetland and has an elevational change of six feet as it travels through the wetland. McNeil Creek originates in the southern part of the wetland and has about a 12-foot change in elevation

as it travels through the wetland. There are also numerous areas of open water and small ponds located in McNeil Creek Wetland (U.S.G.S. quadrangle map, Engadine, Michigan, 1973).

The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in this wetland.

Climate

The closest weather station providing climatic data for McNeil Creek Wetland is located in Kincheloe Air Force Base, Michigan. In 1975, the average monthly temperature was 42.7^oF; the average daily low for January was 10.8^oF and the average daily high in July was 80.3^oF. The average annual precipitation is 31.79 inches, with a mean monthly precipitation of 1.94 inches in January and 2.97 inches in July based on the normal period from 1941-1970. The growing season is approximately six and one-quarter months long, with the last killing frost (28^oF) in 1975 occurring on April 21 and the first killing frost on October 29 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of McNeil Creek Wetland (U.S.G.S. quadrangle map, Engadine, Michigan, 1973; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

BIOTIC SETTING

LM 376

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of McNeil Creek Wetland.

Fish

The following species were found in the mouth of Crow Creek and may occur in adjacent McNeil Creek Wetland: white sucker (Catostomus commersoni), northern redbelly dace (Phoxinus eos), lake chub (Couesius plumbeus), blacknose dace (Rhinichthys atratulus), longnose dace (Rhinichthys cataractae), emerald shiner (Notropis atherinoides), spottail shiner (Notropis hudsonius), sand shiner (Notropis stramineus), banded killifish (Fundulus diaphanus), yellow perch (Perca flavescens), logperch (Percina caprodes), johnny darter (Etheostoma nigrum), mottled sculpin (Cottus bairdi), and brook stickleback (Culaea inconstans) (Taylor, 1954).

A search of the literature provided no site-specific information pertaining to spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in McNeil Creek Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in McNeil Creek Wetland.

Reptiles and Amphibians

Appendix C-14 contains general information on reptiles and amphibians of Lake Section 14, but care should be exercised in the interpretation of the relevance of this information to McNeil Creek Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Appendix D-31 contains general information on wetland birds of Lake Section 14, but care should be exercised in the interpretation of the relevance of this information to McNeil Creek Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting McNeil Creek Wetland.

Endangered Species

The bald eagle (Haliaeetus leucocephalus) historically nested along the shoreline of Lake Section 14. The bald eagle currently is an uncommon summer resident of this area, but no nests exist near the shoreline (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication).

The osprey (Pandion haliaetus), threatened in Michigan, nests on the western edge and central portion of Lake Section 14 (Postupalsky, 1977). The central group extends 15 to 20 miles inland in the Manistique Lakes area, near McNeil Creek Wetland. Postupalsky observed 12 osprey pairs in 1971, and reported that this population was increasing in size.

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in McNeil Creek Wetland by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland.

CULTURAL SETTING

LM 376

Population

McNeil Creek Wetland is located in Garfield Township of Mackinac County, Michigan. The county is sparsely populated, having a density of ten persons per square mile. Table 14-21 indicates that Mackinac County and Garfield Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that Mackinac County is expected to undergo moderate population growth in the future.

Table 14-21. Population Data for the Vicinity of McNeil Creek Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Mackinac County	10,714	10.9	12,208
Garfield Township	1,239	22.3	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within McNeil Creek Wetland and most of the surrounding area is rural open space. An access road lies within McNeil Creek Wetland, and a campground is located to the south of the wetland (U.S.G.S. quadrangle map, Engadine, Michigan, 1973; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978; Razaque and McNamara, 1976; Tremont, 1977). The wetland is under mixed state, private, and corporate ownership (Rockford Map Publishers, Inc., 1972). Since this area has been deemed suitable for intensive resort development (Razaque and McNamara, 1976), the privately and corporately-owned portions of the wetland may be subject to moderate development pressures.

Recreation

McNeil Creek Wetland lies within the Mackinac State Forest. Portions of the wetland are state-owned. Although there are no known areas specifically

designated for recreational use in the wetland, all Michigan state forest lands are open for camping unless otherwise posted. Hunting and fishing are also major uses of state forest lands (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Mineral, Energy, and Forest Resources

McNeil Creek Wetland lies within an area underlain by industrial-quality dolomites, but there are no operations in the area exploiting this resource (Gere, 1977). No oil, gas, or coal resources are present in the wetland (Michigan Geological Survey, 1977; Smith, 1915).

McNeil Creek Wetland is a partially wooded site within the Mackinac State Forest (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978). State-owned forest lands in the coastal area are within a "water influence zone", in which water quality, water use, and aesthetic surroundings are the principal management concerns. Cover treatments are designed to maintain or enhance these concerns, and timber harvesting is conducted accordingly (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of McNeil Creek Wetland (U.S.G.S. quadrangle map, Engadine, Michigan, 1973).

Pollution Sources

There are no NPDES permit holders adjacent to McNeil Creek Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of McNeil Creek Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 376

The literature search identified no on-going or impending research projects pertaining to McNeil Creek Wetland.

GARFIELD TOWNSHIP WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LM 377-378

Setting

The Garfield Township Wetland Complex, comprised of Garfield Township Wetlands #1 and #2, is located 0.1 mile from the northern shoreline of Lake Michigan in Mackinac County, Michigan, three miles south of the community of Engadine. Garfield Township Wetlands #1 and #2 are Palustrine Systems; Garfield Township Wetland #1 is heavily wooded and Garfield Township Wetland #2 is partially wooded. Both wetlands occupy raised sites in the Mackinac State Forest (U.S.G.S. quadrangle map, Engadine, Michigan, 1973; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

Topography

The total relief of Garfield Township Wetland #1 is 30 feet; wetland elevations range from 580 to 610 feet above sea level (lake level to 30 feet above the approximate mean elevation of Lake Michigan). Garfield Township Wetland #2 has a total relief of 10 feet with elevations ranging from 590 to 600 feet above sea level. The wetlands lie on a low lacustrine plain on the south-facing slope of the Niagara Cuesta. Large wetlands occupy low inland sites on this plain. The Great Lakes Basin Commission (1975) describes the shoreline near Garfield Township Wetlands #1 and #2 as an erodible low plain featuring a sand and gravel beach.

Surficial Geology

The surficial geology of Garfield Township Wetlands #1 and #2 is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in Garfield Township Wetland #1 is Roscommon mucky sand; in Garfield Township Wetland #2 the soil is Eastport-Roscommon sand. Roscommon mucky sand has a surface layer consisting of black muck underlain by sand; it has little available water capacity, rapid permeability, and low natural fertility. Eastport-Roscommon sand, generally found on beach ridges and stabilized dunes, has a surface layer of black, partially decomposed leaf litter underlain by sand. Eastport-Roscommon sand has little available water capacity, rapid permeability, and low natural fertility (Berndt, 1977; Michigan Agricultural Experiment Station, 1952).

Hydrology

There are no streams flowing through Garfield Township Wetlands #1 and #2 (U.S.G.S. quadrangle map, Engadine, Michigan, 1973). The literature search

provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in these wetlands.

Climate

The closest weather station providing climatic data for the Garfield Township Wetland Complex is located in Kincheloe Air Force Base, Michigan. In 1975, the average monthly temperature was 42.7°F; the average daily low for January was 10.8°F and the average daily high in July was 80.3°F. The average annual precipitation is 31.79 inches, with a mean monthly precipitation of 1.94 inches in January and 2.97 inches in July based on the normal period from 1941-1970. The growing season is approximately six and one-quarter months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on October 29 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are present in Garfield Township Wetlands #1 and #2 (U.S.G.S. quadrangle map, Engadine, Michigan, 1973; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

BIOTIC SETTING

LM 377-378

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Garfield Township Wetlands #1 and #2.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Garfield Township Wetlands #1 and #2.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Garfield Township Wetlands #1 and #2.

Reptiles and Amphibians

Appendix C-14 contains general information on reptiles and amphibians of Lake Section 14, but care should be exercised in the interpretation of the

relevance of this information to Garfield Township Wetlands #1 and #2. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in these wetlands.

Avifauna

Appendix D-31 contains general information on wetland birds of Lake Section 14, but care should be exercised in the interpretation of the relevance of this information to Garfield Township Wetlands #1 and #2. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing these wetlands.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting the Garfield Township Wetland Complex.

Endangered Species

The bald eagle (Haliaeetus leucocephalus) historically nested along the shoreline of Lake Section 14. The bald eagle currently is an uncommon summer resident of this area, but no nests exist near the shoreline (Postupalsky, University of Wisconsin-Madison, Department of Wildlife Ecology, personal communication).

The osprey (Pandion haliaetus), threatened in Michigan, nests on the western edge and central portion of Lake Section 14 (Postupalsky, 1977). The central group extends 15 to 20 miles inland in the Manistique Lakes area, near Garfield Township Wetlands #1 and #2. Postupalsky observed 12 osprey pairs in the area during 1971, and reported that this population was increasing in size.

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in the Garfield Township Wetland Complex by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of these wetlands.

Population

Garfield Township Wetlands #1 and #2 are located in Garfield Township of Mackinac County, Michigan. The county is sparsely populated, having a density of ten persons per square mile. Table 14-22 indicates that Mackinac County and Garfield Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that Mackinac County is expected to undergo moderate population growth in the future.

Table 14-22. Population Data for the Vicinity of Garfield Township Wetlands #1 and #2

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Mackinac County	10,714	10.9	12,208
Garfield Township	1,239	22.3	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Garfield Township Wetlands #1 and #2 and most of the surrounding area is rural wooded space (U.S.G.S. quadrangle map, Engadine, Michigan, 1973; Razaque and McNamara, 1976; Tremont, 1977). Garfield Township Wetland #1 is under mixed state, private, and federal ownership, while Garfield Township Wetland #2 is under a mixture of private and federal ownership (Rockford Map Publishers, Inc., 1972). The two wetlands are situated in an area that has been deemed suitable for extensive resort development (Razaque and McNamara, 1976), and it is possible that residential or resort development could occur along the shoreline of both wetlands since much of the shoreline is privately owned.

Recreation

Garfield Township Wetlands #1 and #2 lie within the Mackinac State Forest. Portions of both wetlands are state or federally owned. Although there are no known areas specifically designated for recreational use in the wetlands, all Michigan state forest lands are open for camping unless otherwise posted. Hunting and fishing are also major uses of state forest lands (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Mineral, Energy, and Forest Resources

Garfield Township Wetlands #1 and #2 lie within an area underlain by industrial-quality dolomites, but there are no operations in the vicinity of the wetlands exploiting these resources (Gere, 1977). No oil, gas, or coal resources are present in the wetlands (Michigan Geological Survey, 1977; Smith, 1915).

Garfield Township Wetlands #1 and #2 are wooded and lie within the Mackinac State Forest. State-owned forest lands in the coastal area are within a "water influence zone," in which water quality, water use, and aesthetic surroundings are the principal management concerns. Cover treatments are designed to maintain or enhance these concerns, and timber harvesting is conducted accordingly (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Garfield Township Wetlands #1 and #2 (U.S.G.S. quadrangle map, Engadine, Michigan, 1973).

Pollution Sources

There are no NPDES permit holders adjacent to Garfield Township Wetlands #1 and #2 (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Garfield Township Wetlands #1 and #2, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 377-378

The literature search identified no on-going or impending research projects pertaining to Garfield Township Wetlands #1 and #2.

Table 14-23. Data Gaps - Lake Section 14

Data Gap*		Wetland Number		347	348	349	350	351-354	355	356-362	363	374-366	367-368	369	370	371-372	373-374	375	376	377-378			
Physiographic Setting	Setting	Topography																					
		Surficial Geology																					
		Soils																					
		Hydrology	Water Level Fluctuations	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
			Groundwater	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Water Quality		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Depth		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Seasonal Changes		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Biotic Setting	Climate	Special Features																				
			Vegetation																				
		Fish	Major Species Distribution	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
			Major Species Composition	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
			Density/Productivity	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
			Relationship to Water Levels	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
			Invertebrates	Major species	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Species Composition				*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Seasonal Distribution				*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Spawning and Hatching Areas				*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Commercial/Recreational Use	*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Life Histories	*			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Food Sources	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
Amphibians/Reptiles	Species Composition	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
	Seasonal Distribution	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
	Density/Productivity	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
	Food Sources	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
	Relationship to Water Levels	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
	Avifauna	Major Species	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
		Seasonal Distribution	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
		Density/Productivity	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
		Recreational/Commercial Use	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
		Life Histories	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Food Sources		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
Relationship to Water Levels		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
Mammals	Major Species	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
	Seasonal Distribution	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
	Density/Productivity	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
	Recreational/Commercial Use	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
	Life Histories	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
	Food Sources	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
	Relationship to Water Levels	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
	Cultural Setting	Endangered Species																					
		Health	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
		Population																					
Land Use and Ownership																							
Recreation																							
Mineral, Energy, Forest Resources																							
Public Utilities/Facilities																							
Point Pollution Sources																							
Non-Point Pollution Sources	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
Historic Features																							
Archaeologic Features	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		

LAKE SECTION 15

INTRODUCTION

Lake Section 15 extends along the northern shoreline of Lake Michigan from an area west of Naubinway, Michigan, to Point St. Ignace near the Mackinac Bridge. The lake section is entirely within Mackinac County, which is sparsely populated. Most of the wetlands in Lake Section 15 lie on a low lacustrine plain which is located on the south-facing slope of the Niagara Cuesta. Large wetlands are common in low inland areas on this plain. The predominant shore type in the vicinity of the wetlands of Lake Section 15 is non-erodible low plain. Erodible low plain, low sand dunes, and erodible high bluff shore types are also present along portions of the shoreline (Great Lakes Basin Commission, 1975).

Figures 15-1 and 15-2 show the approximate location of the 39 wetlands in Lake Section 15. Latitude, longitude, acreage, and classification for each of these wetlands are presented in Table 15-1. The wetlands in Lake Section 15 have elevations ranging from 580 to 639 feet above sea level (lake level to 59 feet above the approximate mean elevation of Lake Michigan). Most of these wetlands appear to be lake influenced. Thirty of the wetlands in Lake Section 15 are Lacustrine Systems, and the other nine are Palustrine or Riverine Systems.

Information related to the physiographic and cultural features of the 39 wetlands is summarized in the individual wetland narratives presented in this chapter. Published sources lack site-specific information on the biotic characteristics of all of these wetlands except Epoufette Bay Wetland #2, and no information on the hydrologic characteristics of these wetlands was found in the literature.

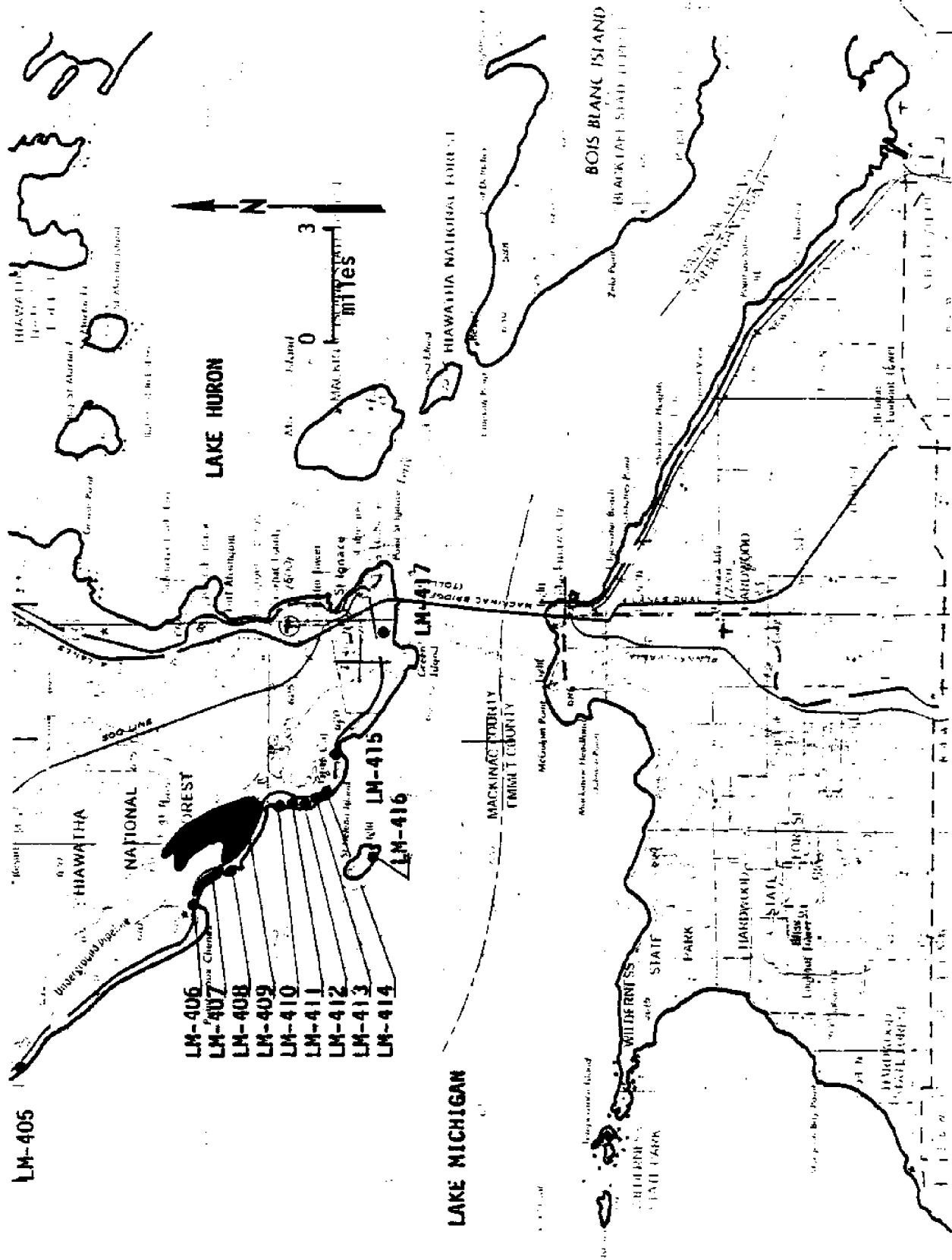


Figure 15-2. Lake Section 15 - Hiawatha National Forest Area

Table 15-1. Location, Acreage, and Classification of Wetlands
in Lake Section 15

Wetland Number	Wetland	Latitude	Longitude	Acreage	Classification ^a
379	Lower Millecoquins River Area Wetland	46°05'00"	85°28'40"	104	P
	MILLECOQUINS POINT AREA WETLAND COMPLEX				
380	Millecoquins Point Area Wetland	46°05'30"	85°27'40"	73	L
381	Millecoquins Point Wetland	46°05'20"	85°26'55"	14	L
	NAUBINWAY WETLAND COMPLEX				
382	Naubinway Wetland #1	46°05'55"	85°26'40"	3	P
383	Naubinway Wetland #2	46°06'04"	85°25'50"	3	P
384	West Mile Creek Wetland	46°06'20"	85°25'50"	32	P,R
385	Mattix Creek Wetland	46°06'00"	85°23'10"	1469	L,R
	BIDDLE POINT WETLAND COMPLEX				
386	Biddle Point Wetland #1	46°04'53"	85°22'40"	3	L
387	Biddle Point Wetland #2	46°04'55"	85°22'20"	3	L
388	Biddle Point Wetland #3	46°05'20"	85°22'00"	2	L
389	Biddle Point Wetland #4	46°05'23"	85°21'50"	4	L
	BLACK RIVER BAY WETLAND COMPLEX				
390	Black River Bay Wetland #1	46°05'35"	85°21'15"	6	L
391	Black River Bay Wetland #2	46°05'35"	85°20'55"	7	L
392	Black River Bay Wetland #3	46°05'40"	85°20'20"	5	R
393	Black River Bay Wetland #4	46°05'33"	85°19'45"	8	L
394	Hog Island Campground Wetland	46°05'00"	85°18'30"	4	L
	HOG ISLAND POINT AREA WETLAND COMPLEX				
395	Hog Island Point Wetland #1	46°04'10"	85°17'40"	6	L
396	Hog Island Point Wetland #2	46°04'00"	85°17'15"	37	L
	DAVENPORT CREEK AREA WETLAND COMPLEX				
397	Davenport Creek Area Wetland #1	46°04'10"	85°16'10"	12	L
398	Davenport Creek Area Wetland #2	45°04'00"	85°15'35"	16	L
399	Paquin Creek Wetland	46°04'10"	85°13'40"	415	L
	EPOUFETTE AREA WETLAND COMPLEX				
400	West Harbor Wetland	46°03'30"	85°12'30"	29	L
401	Kenyon Bay Wetland	46°03'21"	85°11'53"	16	L
402	Point Epoufette Wetland	46°03'30"	85°11'32"	9	L
403	Epoufette Bay Wetland #1	46°03'22"	85°11'40"	24	L
404	Epoufette Bay Wetland #2	46°03'00"	85°10'24"	13	L
405	Brevort Area Wetland	46°01'03"	85°02'00"	6	R
	POINTE AUX CHENES WETLAND COMPLEX				
406	Pointe Aux Chenes Bay Wetland #1	45°55'40"	84°53'30"	13	L
407	Pointe Aux Chenes Bay Wetland #2	45°55'20"	85°52'50"	69	L
408	Pointe Aux Chenes Bay Wetland #3	45°54'52"	85°52'33"	7	L
409	Pointe Aux Chenes Marshes	45°55'00"	84°51'00"	2949	L,R
	GROS CAP ROAD WETLAND COMPLEX				
410	Gros Cap Road Wetland #1	45°53'34"	84°50'20"	3	L
411	Gros Cap Road Wetland #2	45°53'22"	84°50'08"	9	L
412	Gros Cap Road Wetland #3	45°53'04"	84°50'10"	4	L
413	Gros Cap Road Wetland #4	45°52'59"	84°50'10"	4	L
414	Gros Cap Road Wetland #5	45°52'50"	85°50'08"	4	L
415	West Moran Bay Wetland	45°52'20"	85°46'50"	1290	L
416	St. Helena Island Wetland	45°51'20"	84°52'00"	5	L
417	Point St. Ignace Wetland	45°51'10"	84°44'10"	27	L

^aP=palustrine
L=lacustrine
R=riverine

LOWER MILLECOQUINS RIVER AREA WETLAND

PHYSIOGRAPHIC SETTING

LM 379

Setting

Lower Millecoquins River Area Wetland is located 0.2 mile from the northern shoreline of Lake Michigan in Mackinac County, Michigan, 0.8 mile west of the community of Naubinway. Lower Millecoquins River Area Wetland is a heavily wooded Palustrine System and occupies a raised site within the Mackinac State Forest (U.S.G.S. quadrangle map, Naubinway, Michigan, 1973).

Topography

The total relief of Lower Millecoquins River Area Wetland is 10 feet; wetland elevations range from 590 to 600 feet above sea level (10 to 20 feet above the approximate mean elevation of Lake Michigan). The wetland lies on a low lacustrine plain on the south-facing slope of the Niagara Cuesta. Large wetlands occupy low inland sites on this plain. The Great Lakes Basin Commission (1975) describes the shoreline near Lower Millecoquins River Area Wetland as low dunes with a sand and gravel beach.

Surficial Geology

The surficial geology of Lower Millecoquins River Area Wetland is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in Lower Millecoquin River Area Wetland is Eastport-Roscommon sand, which is generally found on beach ridges and stabilized dunes. This soil has a surface layer of black, partially decomposed leaf litter underlain by sand. Eastport-Roscommon sand has little available water capacity, rapid permeability, and low natural fertility (Berndt, 1977; Michigan Agricultural Experiment Station, 1952).

Hydrology

There are no streams flowing through Lower Millecoquins River Area Wetland but the Lower Millecoquins River is adjacent to the wetland (U.S.G.S. quadrangle map, Naubinway, Michigan, 1973). The literature search provided no site-specific data pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Lower Millecoquins River Area Wetland.

Climate

The closest weather station providing climatic data for Lower Millecoquins River Area Wetland is located in Kincheloe Air Force Base, Michigan. In 1975, the average monthly temperature was 42.7°F; the average daily low for January was 10.8°F and the average daily high in July was 80.3°F. The average annual precipitation is 31.79 inches, with a mean monthly precipitation of 1.94 inches in January and 2.97 inches in July based on the normal period from 1941-1970. The growing season is approximately six and one-quarter months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on October 29 (National Oceanic and Atmospheric Administration, 1975).

Special Features

Low beach ridges lie lakeward of the wetland as well (U.S.G.S. quadrangle map, Naubinway, Michigan, 1973).

BIOTIC SETTING

LM 379

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Lower Millecoquins River Area Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Lower Millecoquins River Area Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Lower Millecoquins River Area Wetland.

Reptiles and Amphibians

Appendix C-15 contains general information on reptiles and amphibians of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to Lower Millecoquins River Area Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Lower Millecoquins River Area Wetland lies within a coastal area that has significant value for fish and wildlife (U.S. Army Corps of Engineers, North Central Division, 1971). This area was included in the Michigan Shorelands Inventory (Michigan Shorelands Management Unit, 1975), which documented spring, summer, and fall utilization by dabbling and diving ducks, mergansers, geese, gulls, terns, shorebirds, and wading birds. The area is used for nesting, rearing, feeding and as a migration stopover.

Appendix D-32 contains general information on wetland birds of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to Lower Millecoquins River Area Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Lower Millecoquins River Area Wetland.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Lower Millecoquins River Area Wetland by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland.

CULTURAL SETTING

LM 379

Population

Lower Millecoquins River Area Wetland is located in Garfield Township of Mackinac County, Michigan. The county is sparsely populated, having a density of ten persons per square mile. Table 15-2 indicates that Mackinac County and Garfield Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that Mackinac County is expected to undergo moderate population growth in the future.

Table 15-2. Population Data for the Vicinity of Lower Millecoquins River Area Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Mackinac County	10,714	10.9	12,208
Garfield Township	1,239	22.3	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Lower Millecoquins River Area Wetland is rural wooded space. The surrounding area is primarily rural wooded space, with scattered residences on either bank of the Lower Millecoquins River south of the wetland. A primary highway separates Millecoquins River Area Wetland from the lake shore (U.S.G.S. quadrangle map, Naubinway, Michigan, 1973; Razaque and McNamara, 1976; Tremont, 1977). The wetland is primarily under the private ownership of the Hiawatha Sportsman's Club (Rockford Map Publishers, Inc., 1972). The area has been identified as suitable for intensive resort development (Razaque and McNamara, 1976), but since the Hiawatha Sportsman's Club uses the wetland for hunting, it is probably subject to low development pressures.

Recreation

Lower Millecoquins River Area Wetland is used by the Hiawatha Sportsman's Club for hunting.

Mineral, Energy, and Forest Resources

Lower Millecoquins River Area Wetland lies within an area underlain by industrial-quality dolomites, but there are no operations in the vicinity of the wetland exploiting this resource (Gere, 1977). No oil, gas, or coal resources are present in the wetland (Michigan Geological Survey, 1977; Smith, 1915).

Lower Millecoquins River Area Wetland is wooded and lies within the Mackinac State Forest (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978). State-owned forest lands within the coastal area are considered to be within a "water influence zone," in which water quality, water use, and aesthetic surroundings are the principal management concerns. Cover treatments are designed to maintain or enhance these concerns, and timber harvesting is conducted accordingly (Henry H. Webster, Michigan Department of Natural Resources, personal communication). An adjacent tract of land east of Lower Millecoquins River Area Wetland has recently been clear-cut.

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Lower Millecoquins River Area Wetland (U.S.G.S. quadrangle map, Naubinway, Michigan, 1973).

Pollution Sources

There are no NPDES permit holders adjacent to Lower Millecoquins River Area Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Lower Millecoquins River Area Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 379

The literature search identified no on-going or impending research projects pertaining to Lower Millecoquins River Area Wetland.

MILLECOQUINS POINT AREA WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LM 380-381

Setting

The Millecoquins Point Area Wetland Complex is comprised of Millecoquins Point Area Wetland and Millecoquins Point Wetland. Both wetlands lie adjacent to the Lake Michigan shoreline at the community of Naubinway, in Mackinac County, Michigan. Millecoquins Point Area Wetland is a heavily wooded Lacustrine System occupying a low site to the west of Millecoquins Point. Millecoquins Point Wetland is also a Lacustrine System, and occupies a low, partially wooded site. Both wetlands lie within the Mackinac State Forest (U.S.G.S. quadrangle map, Naubinway, Michigan, 1973; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

Topography

Millecoquins Point Area Wetland has a total relief of 20 feet; elevations range from lake level to 600 feet above sea level (20 feet above the approximate mean elevation of Lake Michigan). Millecoquins Point Wetland has a total relief of 8 feet, with elevations ranging from lake level to 588 feet above sea level. Both wetlands lie on a low Lacustrine plain on the south-facing slope of the Niagara Cuesta. Large wetlands occupy low inland sites on this plain. The Great Lakes Basin Commission (1975) describes the shoreline near Millecoquins Point Area Wetland and Millecoquins Point Wetland as low sand dunes with a sand and gravel beach.

Surficial Geology

The surficial geology of Millecoquins Point Area Wetland and Millecoquins Point Wetland is characterized by swamp complexes consisting of dunes, swales, sand ridges, and recessional bars and beaches on glacial lake beds (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in Millecoquin Point Wetland is Alpena, which has a surface layer of very dark brown, gravelly sandy loam. This soil is well-drained and has slow runoff, low available water capacity, and low natural fertility. Alpena soils are generally found on outwash plains and low beach ridges along Lake Michigan (Berndt, 1977; Michigan Agricultural Experiment Station).

In Millecoquins Point Area Wetland the soil type is Carbondale Muck-Rifle Peat. Rifle peat consists of dark brown, moderately decomposed woody peat over fibrous peat underlain by sand. This soil is high in organic matter and has very little mineral matter. Carbondale muck consists of dark-brown, moderately

decomposed woody material, which is high in ash content. This material is underlain by clayey till, sand, or limestone. Carbondale muck is wet and has areas that are highly decomposed (Brendt, 1977; Michigan Agricultural Experiment Station, 1952).

Hydrology

There are no streams flowing through Millecoquins Point Area Wetland or Millecoquins Point Wetland (U.S.G.S. quadrangle map, Naubinway, Michigan, 1973). The literature search provided no site-specific data pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in the Millecoquins Point Area Wetland Complex.

Climate

The closest weather station providing climatic data for the Millecoquins Point Area Wetland Complex is located in Kincheloe Air Force Base, Michigan. In 1975, the average monthly temperature was 42.7°F; the average daily low for January was 10.8°F and the average daily high in July was 80.3°F. The average annual precipitation is 31.79 inches, with a mean monthly precipitation of 1.94 inches in January and 2.97 inches in July based on the normal period from 1941-1970. The growing season is approximately six and one-quarter months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on October 29 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of the Millecoquins Point Area Wetland Complex (U.S.G.S. quadrangle map, Naubinway, Michigan, 1973).

BIOTIC SETTING

LM 380-381

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of the Millecoquins Point Area Wetland Complex.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in the Millecoquins Point Area Wetland Complex.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in the Millecoquins Point Area Wetland Complex.

Reptiles and Amphibians

Appendix C-15 contains general information on reptiles and amphibians of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to Millecoquins Point Area Wetland and Millecoquins Point Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in these wetlands.

Avifauna

Millecoquins Point Area Wetland and Millecoquins Point Wetland lie within a coastal area possessing significant value for fish and wildlife (U.S. Army Corps of Engineers, North Central Division, 1971). This area was included in the Michigan Shorelands Inventory (Michigan Shorelands Management Unit, 1975), which documented spring, summer, and fall utilization by dabbling and diving ducks, mergansers, geese, gulls, terns, shorebirds, and wading birds. The area is used for nesting, rearing, feeding and as a migration stopover.

Appendix D-32 contains general information on wetland birds of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to Millecoquins Point Area Wetland and Millecoquins Point Wetland.

The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing these wetlands.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting the Millecoquins Point Area Wetland Complex.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in the Millecoquins Point Area Wetland Complex by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of these wetlands.

CULTURAL SETTING

LM 380-381

Population

The Millecoquins Point Area Wetland Complex is located in Garfield Township of Mackinac County, Michigan. The county is sparsely populated, having a density of ten persons per square mile. Table 15-3 indicates that Mackinac County and Garfield Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that Mackinac County is expected to undergo moderate population growth in the future.

Table 15-3. Population Data for the Vicinity of the Millecoquins Point Area Wetland Complex

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Mackinac County	10,714	10.9	12,208
Garfield Township	1,239	22.3	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within the Millecoquins Point Area Wetland Complex and most of the surrounding area is rural wooded space. An area of residential and commercial development (the community of Naubinway) lies immediately east of Millecoquins Point Area Wetland and immediately north of Millecoquins Point Wetland. A cluster of shoreline residences is located between Millecoquins Point Area Wetland and Lake Michigan. An access road lies within Millecoquins Point Wetland, and a picnic area and boat ramp are located to the east along the lakeshore. An unimproved road crosses Millecoquins Point Area Wetland (U.S.G.S. quadrangle map, Naubinway, Michigan, 1973; Razaque and McNamara, 1976; Tremont, 1977). Both wetlands are privately owned. Millecoquins Point Wetland is entirely under the ownership of the Hiawatha Sportsman's Club; portions of Millecoquins Point Area Wetland are also owned by the club (Rockford Map Publishers, Inc., 1972). The wetlands lie in an area planned for low to medium density urban development (Razaque and McNamara, 1976). Should these plans be realized, both wetlands may face moderate to high development pressures.

Recreation

Portions of both Millecoquins Point Area Wetland and Millecoquins Point Wetland are used by the Hiawatha Sportsman's Club for hunting.

Mineral, Energy, and Forest Resources

Millecoquins Point Area Wetland and Millecoquins Point Wetland lie within an area underlain by industrial-quality dolomites, but there are no operations in the vicinity of the wetlands exploiting this resource (Gere, 1977). No oil, gas, or coal resources are present in the wetlands (Michigan Geological Survey, 1977; Smith, 1915).

Millecoquins Point Area Wetland and Millecoquins Point Wetland are wooded sites within the Mackinac State Forest. State forest lands in the coastal area are within a "water influence zone," in which water quality, water use, and aesthetic surroundings are the principal management concerns. Cover treatments are designed to maintain or enhance these concerns, and timber harvesting is conducted accordingly (Henry H. Webster, Michigan Department of Natural Resources, personal communication). An adjacent tract of land east of Lower Millecoquins River Area Wetland has recently been clear-cut.

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Millecoquins Point Area Wetland or Millecoquins Point Wetland (U.S.G.S. quadrangle map, Naubinway, Michigan, 1973).

Pollution Sources

There are no NPDES permit holders adjacent to Millecoquins Point Area Wetland or Millecoquins Point Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Millecoquins Point Area Wetland and Millecoquins Point Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 380-381

The literature search identified no on-going or impending research projects pertaining to the Millecoquins Point Area Wetland Complex.

NAUBINWAY WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LM 382-383

Setting

The Naubinway Wetland Complex, comprised of Naubinway Wetlands #1 and #2, is located near the northern shoreline of Lake Michigan in Mackinac County, Michigan. Naubinway Wetland #1 is situated 400 feet inland from the lakeshore and 0.2 mile northeast of the community of Naubinway; it is a Palustrine System, and occupies a wooded, raised site. Naubinway Wetland #2 lies 0.2 mile inland and 0.7 mile northeast of Naubinway. This Palustrine System is partially wooded, and occupies a raised site (U.S.G.S. quadrangle map, Naubinway, Michigan, 1973).

Topography

Naubinway Wetland #1 has a total relief of 5 feet, with elevations ranging from 585 to 590 feet above sea level, 5 to 10 feet above the approximate mean elevation of Lake Michigan. Naubinway Wetland #2 has a total relief of less than 5 feet, with elevations ranging from approximately 602 to 605 feet above sea level. Both wetlands lie on a low lacustrine plain on the south-facing slope of the Niagara Cuesta. Large wetlands occupy low inland sites on this plain. The Great Lakes Basin Commission (1975) describes the shoreline near Naubinway Wetlands #1 and #2 as an erodible low plain featuring a sand and gravel beach.

Surficial Geology

The surficial geology of Naubinway Wetlands #1 and #2 is characterized by swamp complexes consisting of dunes, swales, sand ridges, and recessional bars and beaches on glacial lake beds (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in Naubinway Wetlands #1 and #2 is Roscommon mucky sand-Carbondale muck. Carbondale muck consists of dark brown, moderately decomposed woody material which is high in ash content. This material is underlain by clayey till, sand, or limestone. Carbondale muck is wet and has areas that are highly decomposed. Roscommon mucky sand has a surface layer consisting of black muck underlain by sand. This soil has little available water capacity, rapid permeability, and low natural fertility (Berndt, 1977; Michigan Agricultural Experiment Station, 1952).

Hydrology

There are no streams flowing through Naubinway Wetlands #1 and #2 (U.S.G.S. quadrangle map, Naubinway, Michigan, 1973). The literature search provided no

site-specific data pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in these wetlands.

Climate

The closest weather station providing climatic data for the Naubinway Wetland Complex is located in Kinchelge Air Force Base, Michigan. In 1975, the average monthly temperature was 42.7°F; the average daily low for January was 10.8°F and the average daily high in July was 80.3°F. The average annual precipitation is 31.79 inches, with a mean monthly precipitation of 1.94 inches in January and 2.97 inches in July based on the normal period from 1941-1970. The growing season is approximately six and one-quarter months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on October 29 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Naubinway Wetlands #1 and #2 (U.S.G.S. quadrangle map, Naubinway, Michigan, 1973).

BIOTIC SETTING

LM 382-383

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Naubinway Wetlands #1 and #2.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Naubinway Wetlands #1 and #2.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Naubinway Wetlands #1 and #2.

Reptiles and Amphibians

Appendix C-15 contains general information on reptiles and amphibians of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to Naubinway Wetlands #1 and #2. The literature

search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in these wetlands.

Avifauna

Naubinway Wetlands #1 and #2 lie within a coastal area possessing significant value for fish and wildlife (U.S. Army Corps of Engineers, North Central Division, 1971). This area was included in the Michigan Shorelands Inventory (Michigan Shorelands Management Unit, 1975), which documented spring, summer, and fall utilization by dabbling and diving ducks, mergansers, geese, gulls, terns, shorebirds, and wading birds. The area is used for nesting, rearing, feeding and as a migration stopover.

Appendix D-32 contains general information on wetland birds of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to Naubinway Wetlands #1 and #2. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing these wetlands.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting the Naubinway Wetland Complex.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in the Naubinway Wetland Complex by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of these wetlands.

CULTURAL SETTING

LM 382-383

Population

Naubinway Wetlands #1 and #2 are located in Garfield Township of Mackinac County, Michigan. The county is sparsely populated, having a density of ten

persons per square mile. Table 15-4 indicates that Mackinac County and Garfield Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that Mackinac County is expected to undergo moderate population growth in the future.

Table 15-4. Population Data for the Vicinity of the Naubinway Wetland Complex

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Mackinac County	10,714	10.9	12,208
Garfield Township	1,239	22.3	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Naubinway Wetlands #1 and #2 is rural wooded space. The area surrounding the wetlands is primarily rural open space, with residential and commercial development (the community of Naubinway) situated southwest of Naubinway Wetland #1. There are scattered shoreline residences east of the wetlands. A primary highway lies between the lakeshore and Naubinway Wetlands #1 and #2 (U.S.G.S. quadrangle map, Naubinway, Michigan, 1973; Razaque and McNamara, 1976; Tremont, 1977). Naubinway Wetland #1 lies within an area of small tracts of private ownership, and Naubinway Wetland #2 is owned by the Hiawatha Sportsman's Club (Rockford Map Publishers, Inc., 1972).

The presence of existing commercial and residential development and small tract ownership suggest that moderate development pressures exist in Naubinway Wetland #1. Development pressures on Naubinway Wetland #2 appear to be low since the wetland is owned and used by the Hiawatha Sportsman's Club for hunting.

Recreation

Naubinway Wetland #2 is used by the Hiawatha Sportsman's Club for hunting.

Mineral, Energy, and Forest Resources

Naubinway Wetlands #1 and #2 lie within an area underlain by industrial-quality dolomites, but there are no operations in the vicinity of the wetlands exploiting this resource (Gere, 1977). No oil, gas, or coal resources are present in the wetlands (Michigan Geological Survey, 1977; Smith, 1915).

Naubinway Wetlands #1 and #2 are wooded and lie within the Mackinac State Forest. State forest lands in the coastal area are within a "water influence zone," in which water quality, water use, and aesthetic surroundings are the principal management concerns. Cover treatments are designed to maintain or enhance these concerns, and timber harvesting is conducted accordingly (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Naubinway Wetlands #1 or #2 (U.S.G.S. quadrangle map, Naubinway, Michigan, 1973).

Pollution Sources

There are no NPDES permit holders adjacent to Naubinway Wetlands #1 or #2 (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Naubinway Wetlands #1 and #2 (Peebles and Black, 1976). However, the Michigan Coastal Zone Inventory indicates that one archaeological site is present in the vicinity of the wetlands. Site 20-MK-25 is a cemetery of an unknown culture and date (Peebles and Black, 1976). Further information regarding the field research and exact location of this site can be obtained from the Michigan History Division.

RESEARCH PROJECTS

LM 382-383

The literature search identified no on-going or impending research projects pertaining to Naubinway Wetland #1 and #2.

WEST MILE CREEK WETLAND

PHYSIOGRAPHIC SETTING

LM 384

Setting

West Mile Creek Wetland is located 0.2 mile from the northern shoreline of Lake Michigan in Mackinac County, Michigan, 0.8 mile northeast of the community of Naubinway. West Mile Creek Wetland is a Riverine and Palustrine System; it occupies a wooded, raised site within the Mackinac State Forest (U.S.G.S. quadrangle map, Naubinway, Michigan, 1973).

Topography

The total relief of West Mile Creek Wetland is 20 feet. Wetland elevations range from 590 to 610 feet above sea level, 10 to 30 feet above the approximate mean elevation of Lake Michigan. The wetland lies on a low lacustrine plain on the south-facing slope of the Niagara Cuesta. Large wetlands occupy low inland sites on this plain. The Great Lakes Basin Commission (1975) describes the shoreline near West Mile Creek Wetland as an erodible low plain featuring a sand and gravel beach.

Surficial Geology

The surficial geology of West Mile Creek Wetland is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in West Mile Creek Wetland is Eastport-Roscommon sand, which has a surface layer of black, partially decomposed leaf litter underlain by sand. Eastport-Roscommon sand has little available water capacity, rapid permeability, and low natural fertility (Berndt, 1977; Michigan Agricultural Experiment Station, 1952).

Hydrology

West Mile Creek flows through the western edge of West Mile Creek Wetland. The creek has little elevational change as it travels through the wetland. The literature search provided no site-specific data pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in West Mile Creek Wetland.

Climate

The closest weather station providing climatic data for West Mile Creek Wetland is located in Kincheloe Air Force Base, Michigan. In 1975, the average monthly temperature was 42.7°F; the average daily low for January was 10.8°F and

the average daily high in July was 80.3°F. The average annual precipitation is 31.79 inches, with a mean monthly precipitation of 1.94 inches in January and 2.97 inches in July based on the normal period from 1941-1970. The growing season is approximately six and one-quarter months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on October 29 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are present in or near West Mile Creek Wetland (U.S.G.S. quadrangle map, Naubinway, Michigan, 1973; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

BIOTIC SETTING

LM 384

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of West Mile Creek Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in West Mile Creek Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in West Mile Creek Wetland.

Reptiles and Amphibians

Appendix C-15 contains general information on reptiles and amphibians of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to West Mile Creek Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Appendix D-32 contains general information on wetland birds of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to West Mile Creek Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and

productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting West Mile Creek Wetland.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in West Mile Creek Wetland by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland.

CULTURAL SETTING

LM 384

Population

West Mile Creek Wetland is located in Garfield Township of Mackinac County, Michigan. The county is sparsely populated, having a density of ten persons per square mile. Table 15-5 indicates that Mackinac County and Garfield Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that Mackinac County is expected to undergo moderate population growth in the future.

Table 15-5. Population Data for the Vicinity of West Mile Creek Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Mackinac County	10,714	10.9	12,208
Garfield Township	1,239	22.3	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within West Mile Creek Wetland and most of the surrounding area is rural wooded space, but scattered shoreline residences lie along Lake Michigan south of the wetland (U.S.G.S. quadrangle map, Naubinway, Michigan, 1973; Razaque and McNamara, 1976; Tremont, 1977). The wetland is owned by the Hiawatha Sportsman's Club (Rockford Map Publishers, Inc., 1972). Although it lies in an area which has been identified as suitable for intensive resort development (Razaque and McNamara, 1976), use and ownership of the wetland by the Hiawatha Sportsman's Club suggests that developmental pressures may be low.

Recreation

West Mile Creek Wetland is used by the Hiawatha Sportsman's Club for hunting.

Mineral, Energy, and Forest Resources

West Mile Creek Wetland lies within an area underlain by industrial-quality dolomites, but there are no operations in the vicinity of the wetland exploiting this resource (Gere, 1977). No oil, gas, or coal resources are present in the wetland (Michigan Geological Survey, 1977; Smith, 1915).

West Mile Creek Wetland is wooded and lies within the Mackinac State Forest. State forest lands in the coastal area are within a "water influence zone," in which water quality, water use, and aesthetic surroundings are the principal management concerns. Cover treatments are designed to maintain or enhance these concerns, and timber harvesting is conducted accordingly (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of West Mile Creek Wetland (U.S.G.S. quadrangle map, Naubinway, Michigan, 1973).

Pollution Sources

There are no NPDES permit holders adjacent to West Mile Creek Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of West Mile Creek Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Pebbles and Black, 1976).

RESEARCH PROJECTS

LM 384

The literature search identified no on-going or impending research projects pertaining to West Mile Creek Wetland.

MATTIX CREEK WETLAND

PHYSIOGRAPHIC SETTING

LM 385

Setting

Mattix Creek Wetland is located adjacent to the northern shoreline of Lake Michigan in Mackinac County, Michigan, 1.9 miles east of the community of Naubinway. The shoreline adjacent to Mattix Creek Wetland features a sand beach; a steep bluffline, 90 feet high, rises on the inland side of the wetland. Mattix Creek Wetland is a Lacustrine and Riverine System, and occupies a low, partially wooded site within the Mackinac State Forest (U.S.G.S. quadrangle maps, Naubinway, Michigan, 1973, and Hog Island Point, Michigan, 1973; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

Topography

The total relief of Mattix Creek Wetland is 50 feet. Wetland elevations range from 580 to 630 feet above sea level (lake level to 50 feet above the approximate mean elevation of Lake Michigan). The wetland lies on a low Lacustrine plain on the south-facing slope of the Niagara Cuesta. Large wetlands occupy low inland sites on this plain. The Great Lakes Basin Commission (1975) describes the shoreline near Mattix Creek Wetland as an erodible low plain featuring a sand and gravel beach.

Surficial Geology

The surficial geology of Mattix Creek Wetland is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in Mattix Creek Wetland is predominantly Eastport-Roscommon sand; Alpena soil is present near Mattix Creek. Eastport-Roscommon sand has a surface layer of black, partially decomposed leaf litter underlain by sand; it has little available water capacity, rapid permeability, and low natural fertility. Alpena soil has a surface layer of very dark brown, gravelly sandy loam. It is well-drained and has slow runoff, low natural fertility, and low available water capacity (Berndt, 1977; Michigan Agricultural Experiment Station, 1952).

Hydrology

Mattix Creek flows through the eastern part of Mattix Creek Wetland. An intermittent stream (a tributary to East Nine Mile Creek) flows through the western part of the wetland. There are at least two small ponds located in the eastern part of the wetland and one located in the south-central part (U.S.G.S. quadrangle map, Naubinway, Michigan, 1973). The literature search provided no

site-specific data pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Mattix Creek Wetland.

Climate

The closest weather station providing climatic data for Mattix Creek Wetland is located in Kincheloe Air Force Base, Michigan. In 1975, the average monthly temperature was 42.7°F; the average daily low for January was 10.8°F and the average daily high in July was 80.3°F. The average annual precipitation is 31.79 inches, with a mean monthly precipitation of 1.94 inches in January and 2.97 inches in July based on the normal period from 1941-1970. The growing season is approximately six and one-quarter months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on October 29 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Mattix Creek Wetland (U.S.G.S. quadrangle maps, Naubinway, Michigan, 1973; Hog Island Point, Michigan, 1973).

BIOTIC SETTING

LM 385

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Mattix Creek Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Mattix Creek Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Mattix Creek Wetland.

Reptiles and Amphibians

Appendix C-15 contains general information on reptiles and amphibians of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to Mattix Creek Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life

histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Mattix Creek Wetland lies within a coastal area that has significant value for fish and wildlife (U.S. Army Corps of Engineers, North Central Division, 1971). This area was included in the Michigan Shorelands Inventory (Michigan Shorelands Management Unit, 1975), which documented spring, summer, and fall utilization by dabbling and diving ducks, mergansers, geese, gulls, terns, shorebirds, and wading birds. The area is used for nesting, rearing, feeding and as a migration stopover.

Appendix D-32 contains general information on wetland birds of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to Mattix Creek Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Mattix Creek Wetland.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Mattix Creek Wetland by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland.

CULTURAL SETTING

LM 385

Population

Mattix Creek Wetland is located in Garfield Township of Mackinac County, Michigan. The county is sparsely populated, having a density of ten persons per square mile. Table 15-6 indicates that Mackinac County and Garfield Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that Mackinac County is expected to undergo moderate population growth in the future.

Table 15-6. Population Data for the Vicinity of Mattix Creek Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Mackinac County	10,714	10.9	12,208
Garfield Township	1,239	22.3	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Mattix Creek Wetland and most of the surrounding area is rural wooded space. Occasional clusters of shoreline residences lie between the wetland and the Lake Michigan shore. A wooded area south of Mattix Creek Wetland has recently been clear-cut. A primary highway crosses through the wetland and a roadside park lies to the south (U.S.G.S. quadrangle maps, Naubinway, Michigan, 1973; Hog Island Point, Michigan, 1973; Razaque and McNamara, 1976; Tremont, 1977). The wetland is under mixed state and private ownership (Rockford Map Publishers, Inc., 1972), in an area which has been identified as suitable for intensive resort development (Razaque and McNamara, 1976). The proximity of the wetland to the shoreline, the availability of natural resources, and the presence of residential development suggests that development pressures on Mattix Creek Wetland may be low to moderate.

Recreation

Mattix Creek Wetland lies within the Mackinac State Forest, and portions of the wetland are state owned. Although there are no known areas specifically designated for recreational use in or near the wetland, all Michigan state forest lands are open for camping unless otherwise posted. Hunting and fishing are also major uses of state forest lands (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Mineral, Energy, and Forest Resources

Mattix Creek Wetland lies within an area underlain by industrial-quality dolomites, but there are no operations in the vicinity of the wetland exploiting this resource (Gere, 1977). No oil, gas, or coal resources are present in the wetland (Michigan Geological Survey, 1977; Smith, 1915).

Mattix Creek Wetland is wooded and lies within Mackinac State Forest. State forest lands in the coastal area are within a "water influence zone," in which water quality, water use, and aesthetic surroundings are the principal

management concerns. Cover treatments are designed to maintain or enhance these concerns, and timber harvesting is conducted accordingly (Henry H. Webster, Michigan Department of Natural Resources, personal communication). An area south of Mattix Creek Wetland has recently been clear-cut.

Public Utilities and Facilities

Pipelines are situated to the north of Mattix Creek Wetland (U.S.G.S. quadrangle maps, Naubinway, Michigan, 1973; Hog Island Point, Michigan, 1973).

Pollution Sources

There are no NPDES permit holders adjacent to Mattix Creek Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Mattix Creek Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 385

The literature search identified no on-going or impending research projects pertaining to Mattix Creek Wetland.

BIDDLE POINT WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LM 386-389

Setting

The Biddle Point Wetland Complex, comprised of Biddle Point Wetlands #1-#4, is located on the northern shoreline of Lake Michigan in Mackinac County, Michigan. The distances of these wetlands relative to the lakeshore and to the community of Naubinway are indicated in Table 15-7.

Table 15-7. Location of Individual Wetlands in the Biddle Point Wetland Complex

	Distance to lakeshore (miles)	Distance to Naubinway, Michigan
Biddle Point Wetland #1	0.1	3.2 miles east
Biddle Point Wetland #2	0.3	3.2 miles east
Biddle Point Wetland #3	0.1	3.5 miles east
Biddle Point Wetland #4	adjacent	3.7 miles east

Biddle Point Wetland #1 is located 0.3 mile north of the southernmost tip of Biddle Point. Biddle Point Wetland #2 is north of Biddle Point Wetland #1. A small lake lies adjacent to this wetland and a clear-cut area lies to the south. Biddle Point Wetlands #3 and #4 are northeast of Biddle Point Wetland #2. All four of these wetlands are Lacustrine Systems and occupy low wooded sites within the Mackinac State Forest (U.S.G.S. quadrangle map, Hog Island Point, Michigan, 1973).

Topography

Elevations and total relief of individual wetlands in the Biddle Point Wetland Complex are listed in Table 15-8.

Table 15-8. Elevations and Total Relief of Individual Wetlands in the Biddle Point Wetland Complex

	Minimum elevation (feet) ^a	Maximum elevation (feet) ^a	Total relief (feet)
Biddle Point Wetland #1	580	585	5
Biddle Point Wetland #2	586	589	3
Biddle Point Wetland #3	383	590	5
Biddle Point Wetland #4	580	585	5

^a Elevations measured in feet above sea level; the approximate mean elevation of Lake Michigan is 580 feet above sea level.

Biddle Point Wetlands #1-#4 lie on a low lacustrine plain on the south-facing slope of the Niagara Cuesta. Large wetlands occupy low inland sites on this plain. The Great Lakes Basin Commission (1975) describes the shoreline near Biddle Point Wetlands #1-#4 as an erodible low plain featuring a sand and gravel beach.

Surficial Geology

The surficial geology of Biddle Point Wetlands #1-#4 is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in Biddle Point Wetlands #1 and #2 is Alpena; in Biddle Point Wetlands #3 and #4 it is Eastport-Roscommon sand. Alpena soils have a surface layer of very dark brown, gravelly sandy loam. They are well-drained and have slow runoff, low natural fertility, and low available water capacity. Eastport-Roscommon sand has a surface layer of black, partially decomposed leaf litter underlain by sand. This soil has little available water capacity, rapid permeability, and low natural fertility (Berndt, 1977; Michigan Agricultural Experiment Station, 1952).

Hydrology

There are no streams flowing through Biddle Point Wetlands #1-#4 (U.S.G.S. quadrangle map, Hog Island Point, Michigan, 1973). The literature search provided no site-specific data pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Biddle Point Wetlands #1-#4.

Climate

The closest weather station providing climatic data for the Biddle Point Wetland Complex is located in Kincheloe Air Force Base, Michigan. In 1975, the average monthly temperature was 42.7^oF; the average daily low for January was 10.8^oF and the average daily high in July was 80.3^oF. The average annual precipitation is 31.79 inches, with a mean monthly precipitation of 1.94 inches in January and 2.97 inches in July based on the normal period from 1941-1970. The growing season is approximately six and one-quarter months long, with the last killing frost (28^oF) in 1975 occurring on April 21 and the first killing frost on October 29 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are present in or near Biddle Point Wetlands #1-#4 (U.S.G.S. quadrangle maps, Hog Island Point, Michigan, 1973).

BIOTIC SETTING

LM 386-389

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Biddle Point Wetlands #1-#4.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Biddle Point Wetlands #1-#4.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Biddle Point Wetlands #1-#4.

Reptiles and Amphibians

Appendix C-15 contains general information on reptiles and amphibians of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to Biddle Point Wetlands #1-#4. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in these wetlands.

Avifauna

Biddle Point Wetlands #1-#4 lie within a coastal area possessing significant value for fish and wildlife (U.S. Army Corps of Engineers, North Central Division, 1971). This area was included in the Michigan Shorelands Inventory (Michigan Shorelands Management Unit, 1975), which documented spring, summer, and fall utilization by dabbling and diving ducks, mergansers, geese, gulls, terns, shorebirds, and wading birds. The area is used for nesting, rearing, feeding and as a migration stopover.

Appendix D-32 contains general information on wetland birds of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to Biddle Point Wetlands #1-#4. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing these wetlands.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Biddle Point Wetlands #1-#4.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Biddle Point Wetlands #1-#4 by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of these wetlands.

CULTURAL SETTING

LM 386-389

Population

Biddle Point Wetlands #1-#4 are located in Garfield Township of Mackinac County, Michigan. The county is sparsely populated, having a density of ten persons per square mile. Table 15-9 indicates that Mackinac County and Garfield Township experienced a rapid rate of population growth between 1970 and 1975. Projections for 1990 indicate that Mackinac County is expected to undergo moderate population growth in the future.

Table 15-9. Population Data for the Vicinity of Biddle Point Wetlands #1-#4

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Mackinac County	10,714	10.9	12,208
Garfield Township	1,239	22.3	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Biddle Point Wetlands #1-#4 and most of the surrounding area is rural wooded space. A few residences are located northeast of Biddle Point Wetland #4 (U.S.G.S. quadrangle map, Hog Island Point, Michigan, 1973; Razaque and McNamara, 1976; Tremont, 1977). Biddle Point Wetlands #1 and #2 are owned by the Lawrence Institute of Technology; Biddle Point Wetland #3 is under mixed ownership of the Institute and a private party; Biddle Point Wetland #4 is under state ownership (Rockford Map Publishers, Inc., 1972). The area in which the wetlands are situated has been identified as suitable for intensive resort development (Razaque and McNamara, 1976).

Development pressures are probably low for Biddle Point Wetland #4, which is under state ownership. Development pressures for the other wetlands will be dictated by future plans of the Lawrence Institute of Technology.

Recreation

Biddle Point Wetlands #1-#4 lie within the Mackinac State Forest, but only Biddle Point Wetland #4 is state owned. Although there are no known areas specifically designated for recreational use in or near Biddle Point Wetland #4, all Michigan state forest lands are open for camping unless otherwise posted. Hunting and fishing are also major uses of state forest lands (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Mineral, Energy, and Forest Resources

Biddle Point Wetlands #1-#4 lie within an area underlain by industrial-quality dolomites, but there are no operations in the vicinity of the wetland exploiting this resource (Gere, 1977). No oil, gas, or coal resources are present in the wetland (Michigan Geological Survey, 1977; Smith, 1915).

Biddle Point Wetlands #1-#4 are wooded and lie within the Mackinac State Forest. State forest lands in the coastal area are within a "water influence zone," in which water quality, water use, and aesthetic surroundings are the principal management concerns. Cover treatments are designed to maintain or

enhance these concerns, and timber harvesting is conducted accordingly (Henry H. Webster, Michigan Department of Natural Resources, personal communication). A clear-cut area lies to the south of Biddle Point Wetland #2.

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Biddle Point Wetlands #1-#4 (U.S.G.S. quadrangle maps, Naubinway, Michigan, 1973; Hog Island Point, Michigan, 1973).

Pollution Sources

There are no NPDES permit holders adjacent to Biddle Point Wetlands #1-#4 (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Biddle Point Wetlands #1-#4, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 386-389

The literature search identified no on-going or impending research projects pertaining to Biddle Point Wetlands #1-#4.

BLACK RIVER BAY WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LM 390-393

Setting

The Black River Bay Wetland Complex, comprised of Black River Bay Wetlands #1-#4, is located on the northern shoreline of Lake Michigan, between Biddle Point and Hog Island Point, in Mackinac County, Michigan. The distances of these wetlands relative to the lakeshore and the community of Naubinway are presented in Table 15-10.

Table 15-10. Locations of Individual Wetlands in the Black River Bay Wetland Complex

	Distance to lakeshore	Distance to Naubinway, Michigan
Black River Bay Wetland #1	adjacent	4.3 miles east
Black River Bay Wetland #2	adjacent	4.4 miles east
Black River Bay Wetland #3	0.1 mile	4.9 miles east
Black River Bay Wetland #4	350 feet	5.2 miles east

Black River Bay Wetland #1 is located approximately 1.5 miles northeast of Biddle Point. An area north of the wetland has recently been clear-cut. The beach near the wetland is sandy. Black River Bay Wetland #2 lies to the east of Black River Bay Wetland #1. Black River Bay Wetland #3 lies adjacent to Borgstrom Creek, north of a primary highway, while Black River Bay Wetland #4 is situated east of Borgstrom Creek. Black River Bay Wetlands #1, #2, and #4 are low, wooded, Lacustrine Systems. Black River Bay Wetland #3 is a low, wooded Riverine System. All four of the wetlands in the Black River Bay Wetland Complex are within the Mackinac State Forest (U.S.G.S. quadrangle map, Hog Island Point, Michigan, 1973; Indiana University, Environmental Systems Application Center, aerial reconnaissance, 1978).

Topography

The elevations of individual wetlands in the Black River Bay Wetland Complex are listed in Table 15-11.

Table 15-11. Elevations and Total Relief of Individual Wetlands in the Black River Bay Wetland Complex

	Minimum elevation (feet) ^a	Maximum elevation (feet) ^a	Total relief (feet)
Black River Bay Wetland #1	580	588	8
Black River Bay Wetland #2	580	585	5
Black River Bay Wetland #3	585	587	2
Black River Bay Wetland #4	585	587	3

^a Elevations measured in feet above sea level; the approximate mean elevation of Lake Michigan is 580 feet above sea level.

Black River Bay Wetlands #1-#4 lie on a low lacustrine plain on the south-facing slope of the Niagara Cuesta. Large wetlands occupy low inland sites on this plain. The Great Lakes Basin Commission (1975) describes the shoreline near Black River Bay Wetlands #1-#4 as a non-erodible low plain featuring sand and gravel beach.

Surficial Geology

The surficial geology of Black River Bay Wetlands #1-#4 is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in Black River Bay Wetlands #1-#4 is Eastport-Roscommon sand. This soil has a surface layer of black, partially decomposed leaf litter underlain by sand; it has little available water capacity, rapid permeability, and low natural fertility (Berndt, 1977; Michigan Agricultural Experiment Station, 1952).

Hydrology

A short, unnamed stream flows through Black River Bay Wetland #1. There are no streams flowing through Black River Bay Wetlands #2-#4. Black River Bay Wetland #3 is adjacent to an unnamed small lake (U.S.G.S. quadrangle map, Hog Island Point, Michigan, 1973). The literature search provided no site-specific data pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Black River Bay Wetlands #1-#4.

Climate

The closest weather station providing climatic data for the Black River Bay Wetland Complex is located in Kincheloe Air Force Base, Michigan. In 1975, the average monthly temperature was 42.7^oF; the average daily low for January was 10.8^oF and the average daily high in July was 80.3^oF. The average annual precipitation is 31.79 inches, with a mean monthly precipitation of 1.94 inches in January and 2.97 inches in July based on the normal period from 1941-1970. The growing season is approximately six and one-quarter months long, with the last killing frost (28^oF) in 1975 occurring on April 21 and the first killing frost on October 29 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of the Black River Bay Wetland Complex (U.S.G.S. quadrangle map, Hog Island Point, Michigan, 1973).

BIOTIC SETTING

LM 390-393

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Black River Bay Wetlands #1-#4.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Black River Bay Wetlands #1-#4.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Black River Bay Wetlands #1-#4.

Reptiles and Amphibians

Appendix C-15 contains general information on reptiles and amphibians of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to Black River Bay Wetlands #1-#4. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in these wetlands.

Avifauna

Black River Bay Wetlands #1-#4 lie within a coastal area possessing significant value for fish and wildlife (U.S. Army Corps of Engineers, North Central Division, 1971). This area was included in the Michigan Shorelands Inventory (Michigan Shorelands Management Unit, 1975), which documented spring, summer, and fall utilization by dabbling and diving ducks, mergansers, geese, gulls, terns, shorebirds, and wading birds. The area is used for nesting, rearing, feeding and as a migration stopover.

Appendix D-32 contains general information on wetland birds of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to Black River Bay Wetlands #1-#4. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing these wetlands.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Black River Bay Wetlands #1-#4.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Black River Bay Wetlands #1-#4 by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of these wetlands.

CULTURAL SETTING

LM 390-393

Population

Black River Bay Wetlands #1-#4 are located in Hudson Township of Mackinac County, Michigan. The county is sparsely populated, having a density of ten persons per square mile. Table 15-12 indicates that Mackinac County experienced a rapid rate of population growth between 1970 and 1975, but Hudson Township had a rapid decline in population during the same time period. Projections for 1990 indicate that Mackinac County is expected to undergo moderate population growth in the future.

Table 15-12. Population Data for the Vicinity of Black River Bay Wetlands #1-#4

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Mackinac County	10,714	10.9	12,208
Hudson Township	100	-27.5	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Black River Bay Wetlands #1-#4 and most of the surrounding area is rural wooded space. There is limited residential development west of Black River Bay Wetland #1, east of Black River Bay Wetland #2, and abutting Black River Bay Wetland #3. A primary highway lies near Black River Bay Wetlands #1, #3, and #4, and cuts through Black River Bay Wetland #2 (U.S.G.S. quadrangle map, Hog Island Point, Michigan, 1973; Razaque and McNamara, 1976; Tremont, 1977). Black River Bay Wetlands #1, #2, and #4 are under mixed state and private ownership, while Black River Bay Wetland #3 is entirely under private ownership (Rockford Map Publishers, Inc., 1972). The area in which the four wetlands are located has been identified as suitable for intensive resort development (Razaque and McNamara, 1976). The proximity of these wetlands to the shoreline, the availability of natural resources, and the presence of residential units suggest that development pressures may be low to moderate.

Recreation

Black River Bay Wetlands #1-#4 lie within the Mackinac State Forest, and Black River Wetlands #1, #2, and #4 are state owned. Although there are no known areas specifically designated for recreational use in or near these wetlands, all Michigan state forest lands are open for camping unless otherwise posted. Hunting and fishing are also major uses of state forest lands (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Mineral, Energy, and Forest Resources

Black River Bay Wetlands #1-#4 lie within an area underlain by industrial-quality dolomites, but there are no operations in the vicinity of the wetland exploiting this resource (Gere, 1977). No oil, gas, or coal resources are present in the wetland (Michigan Geological Survey, 1977; Smith, 1915).

Black River Bay Wetlands #1-#4 are wooded and lie within Mackinac State Forest. State forest lands in the coastal area are within a "water influence zone," in which water quality, water use, and aesthetic surroundings are the principal management concerns. Cover treatments are designed to maintain or

enhance these concerns, and timber harvesting is conducted accordingly (Henry H. Webster, Michigan Department of Natural Resources, personal communication). An area north of Black River Bay Wetland #1 has recently been clear-cut.

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Black River Bay Wetlands #1-#4 (U.S.G.S. quadrangle map, Hog Island Point, Michigan, 1973).

Pollution Sources

There are no NPDES permit holders adjacent to Black River Bay Wetlands #1-#4 (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Black River Bay Wetlands #1-#4, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Pebbles and Black, 1976).

RESEARCH PROJECTS

LM 390-393

The literature search identified no on-going or impending research projects pertaining to Black River Bay Wetlands #1-#4.

HOG ISLAND CAMPGROUND WETLAND

PHYSIOGRAPHIC SETTING

LM 394

Setting

Hog Island Campground Wetland is located 0.1 mile from the northern shoreline of Lake Michigan in Mackinac County, Michigan, 6.6 miles west of the community of Epoufette. Hog Island Campground Wetland is within the Mackinac State Forest and is situated northeast of Hog Island Campground. The wetland is a Lacustrine System and occupies a raised, wooded site (U.S.G.S. quadrangle map, Hog Island Point, Michigan, 1973).

Topography

The total relief of Hog Island Campground Wetland is less than 5 feet. Wetland elevations range from approximately 585 to 590 feet above sea level, 5 to 10 feet above the approximate mean elevation of Lake Michigan. The wetland lies on a low lacustrine plain on the south-facing slope of the Niagara Cuesta. Large wetlands occupy low inland sites on this plain. The Great Lakes Basin Commission (1975) describes the shoreline near Hog Island Campground Wetland as a non-erodible low plain.

Surficial Geology

The surficial geology of Hog Island Campground Wetland is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in Hog Island Campground Wetland is Alpena, which has a surface layer of very dark brown, gravelly sandy loam. This soil is well-drained and has slow runoff, low natural fertility, and low available water capacity (Berndt, 1977; Michigan Agricultural Experiment Station, 1952).

Hydrology

There are no streams flowing through Hog Island Campground Wetland (U.S.G.S. quadrangle map, Hog Island Point, Michigan, 1973). The literature search provided no site-specific data pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in this wetland.

Climate

The closest weather station providing climatic data for Hog Island Campground Wetland is located in Kincheloe Air Force Base, Michigan. In 1975, the average monthly temperature was 42.7°F; the average daily low for January

was 10.8°F and the average daily high in July was 80.3°F. The average annual precipitation is 31.79 inches, with a mean monthly precipitation of 1.94 inches in January and 2.97 inches in July based on the normal period from 1941-1970. The growing season is approximately six and one-quarter months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on October 29 (National Oceanic and Atmospheric Administration, 1975).

Special Features

A primary highway lies to the south, separating the wetland from Lake Michigan (U.S.G.S. quadrangle map, Hog Island Point, Michigan, 1973; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

BIOTIC SETTING

LM 394

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Hog Island Campground Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Hog Island Campground Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Hog Island Campground Wetland.

Reptiles and Amphibians

Appendix C-15 contains general information on reptiles and amphibians of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to Hog Island Campground Wetland.

The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Hog Island Campground Wetland lies within a coastal area possessing significant value for fish and wildlife (U.S. Army Corps of Engineers, 1976). This area was included in the Michigan Shorelands Inventory (Michigan

Shorelands Management Unit, 1975), which documented spring, summer, and fall utilization by dabbling and diving ducks, mergansers, geese, gulls, terns, shorebirds, and wading birds. The area is used for nesting, rearing, feeding and as a migration stopover.

Appendix D-32 contains general information on wetland birds of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to Hog Island Campground Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Hog Island Campground Wetland.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Hog Island Campground Wetland by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland.

CULTURAL SETTING

LM 394

Population

Hog Island Campground Wetland is located in Hudson Township of Mackinac County, Michigan. The county is sparsely populated, having a density of ten persons per square mile. Table 15-13 indicates that Mackinac County experienced a rapid rate of population growth between 1970 and 1975, but Hudson Township had a rapid decline in population during the same time period. Projections for 1990 indicate that Mackinac County is expected to undergo moderate population growth in the future.

Table 15-13. Population Data for the Vicinity of Hog Island Campground Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Mackinac County	10,714	10.9	12,208
Hudson Township	100	-27.5	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Hog Island Campground Wetland and most of the surrounding area is rural wooded space. There is an area of recreational development immediately southwest of the wetland. A primary highway lies to the south, separating the wetland from Lake Michigan (U.S.G.S. quadrangle map, Hog Island Point, Michigan, 1973; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978; Razaque and McNamara, 1976; Tremont, 1977). Hog Island Campground Wetland is under state ownership (Rockford Map Publishers, Inc., 1972). Although the wetland is situated in an area classified as suitable for intensive resort development (Razaque and McNamara, 1976), development pressures are probably low owing to the location of the wetland within the Mackinac State Forest. In general, state forest lands in coastal areas are considered to be "water influence zones." Development within these zones is intended to be limited for purposes of environmental quality, but timber harvest, mineral extraction, and recreational development may be permitted. At present, there are no known plans for the development of this wetland.

Recreation

Hog Island Campground Wetland is located in Mackinac State Forest near Hog Island Campground. This campground has approximately 35 camping spaces (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Mineral, Energy, and Forest Resources

Hog Island Campground Wetland lies within an area underlain by industrial-quality dolomites, but there are no operations in the vicinity of the wetland exploiting this resource (Gere, 1977). No oil, gas, or coal resources are present in the wetland (Michigan Geological Survey, 1977; Smith, 1915).

Hog Island Campground Wetland is wooded and lies within Mackinac State Forest. State forest lands in the coastal area are within a "water influence zone," in which water quality, water use, and aesthetic surroundings are the principal management concerns. Cover treatments are designed to maintain or

enhance these concerns, and timber harvesting is conducted accordingly (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Hog Island Campground Wetland (U.S.G.S. quadrangle map, Hog Island Point, Michigan, 1973).

Pollution Sources

There are no NPDES permit holders adjacent to Hog Island Campground Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Hog Island Campground Wetlands, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 394

The literature search identified no on-going or impending research projects pertaining to Hog Island Campground Wetland.

HOG ISLAND POINT WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LM 395-396

Setting

The Hog Island Point Wetland Complex, comprised of Hog Island Point Wetlands #1 and #2, is located on the northern shoreline of Lake Michigan in Mackinac County, Michigan. These wetlands lie close to one another on either side of Hog Island Point. Both wetlands are adjacent to Lake Michigan, approximately 6.5 miles west of the community of Epoufette. The wetlands are low Lacustrine Systems; Hog Island Point Wetland #1 is non-wooded and Hog Island Point Wetland #2 is partially wooded. Both wetlands are situated in the Mackinac State Forest (U.S.G.S. quadrangle map, Hog Island Point, Michigan, 1973; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

Topography

Hog Island Point Wetlands #1 and #2 each have a total relief of 10 feet, with elevations ranging from 580 to 590 feet above sea level (lake level to 10 feet above the approximate mean elevation of Lake Michigan). The wetlands lie on a low lacustrine plain on the south-facing slope of the Niagara Cuesta. Large wetlands occupy low inland sites on this plain. The Great Lakes Basin Commission (1975) describes the shoreline near the Hog Island Point Wetlands #1 and #2 as a non-erodible low plain.

Surficial Geology

The surficial geology of Hog Island Point Wetlands #1 and #2 is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in Hog Island Point Wetlands #1 and #2 is Eastport-Roscommon sand. This soil has a surface layer of black, partially decomposed leaf litter underlain by sand; it has little available water capacity, rapid permeability, and low natural fertility (Berndt, 1977; Michigan Agricultural Experiment Station, 1952).

Hydrology

There are no streams flowing through Hog Island Wetlands #1 and #2. Hog Island Point Wetland #2 contains four small, ponded areas. Both are adjacent to Lake Michigan (U.S.G.S. quadrangle map, Hog Island Point, Michigan, 1973). The literature search provided no site-specific data pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in these wetlands.

Climate

The closest weather station providing climatic data for the Hog Island Point Wetland Complex is located in Kincheloe Air Force Base, Michigan. In 1975, the average monthly temperature was 42.7°F; the average daily low for January was 10.8°F and the average daily high in July was 80.3°F. The average annual precipitation is 31.79 inches, with a mean monthly precipitation of 1.94 inches in January and 2.97 inches in July based on the normal period from 1941-1970. The growing season is approximately six and one-quarter months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on October 29 (National Oceanic and Atmospheric Administration, 1975).

Special Features

Little Hog Island lies offshore from this wetland (U.S.G.S. quadrangle map, Hog Island Point, Michigan, 1973; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

BIOTIC SETTING

LM 395-396

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Hog Island Point Wetlands #1 and #2.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Hog Island Point Wetlands #1 and #2.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Hog Island Point Wetlands #1 and #2.

Reptiles and Amphibians

Appendix C-15 contains general information on reptiles and amphibians of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to Hog Island Point Wetlands #1 and #2. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in these wetlands.

Avifauna

Hog Island Point Wetlands #1 and #2 lie within a coastal area possessing significant value for fish and wildlife (U.S. Army Corps of Engineers, 1971). This area was included in the Michigan Shorelands Inventory (Michigan Shorelands Management Unit, 1975), which documented spring, summer, and fall utilization by dabbling and diving ducks, mergansers, geese, gulls, terns, shorebirds, and wading birds. The area is used for nesting, rearing, feeding and as a migration stopover.

Appendix D-32 contains general information on wetland birds of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to Hog Island Point Wetlands #1 and #2. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing these wetlands.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting the Hog Island Point Wetland Complex.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in the Hog Island Point Wetland Complex by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of these wetlands.

CULTURAL SETTING

LM 395-396

Population

Hog Island Point Wetlands #1 and #2 are located in Hudson Township of Mackinac County, Michigan. The county is sparsely populated, having a density of ten persons per square mile. Table 15-14 indicates that Mackinac County experienced a rapid rate of population growth between 1970 and 1975, but Hudson Township had a rapid decline in population during the same time period. Projections for 1990 indicate that Mackinac County is expected to undergo moderate population growth in the future.

Table 15-14. Population Data for the Vicinity of Hog Island Point Wetlands #1 and #2

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Mackinac County	10,714	10.9	12,208
Hudson Township	100	-27.5	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Hog Island Point Wetlands #1 and #2 and most of the surrounding area is rural open space. A primary highway crosses through Hog Island Point Wetland #2 (U.S.G.S. quadrangle map, Hog Island Point, Michigan, 1973; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978; Razaque and McNamara, 1976; Tremont, 1977). The wetlands are under state ownership (Rockford Map Publishers, Inc., 1972) and are situated in an area classified suitable for intensive resort development (Razaque and McNamara, 1976).

In general, state forest lands in coastal areas are considered to be "water influence zones." Development within these zones is intended to be limited for purposes of environmental quality; however, timber harvest, mineral extraction, and recreational development may be permitted. At present, there are no known plans for the development of these wetlands.

Recreation

Hog Island Point Wetlands #1 and #2 lie within the Mackinac State Forest. Although there are no known areas specifically designated for recreational use in or near these wetlands, all Michigan state forest lands are open for camping unless otherwise posted. Hunting and fishing are also major uses of state forest lands (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Mineral, Energy, and Forest Resources

Hog Island Point Wetlands #1 and #2 lie within an area underlain by industrial-quality dolomites, but there are no operations in the vicinity of the wetland exploiting this resource (Gere, 1977). No oil, gas, or coal resources are present in the wetland (Michigan Geological Survey, 1977; Smith, 1915).

Hog Island Point Wetland #1 is non-wooded. Hog Island Point Wetland #2 is partially wooded and lies within Mackinac State Forest. State forest lands in the coastal area are within a "water influence zone," in which water quality, water use, and aesthetic surroundings are the principal management concerns. Cover treatments are designed to maintain or enhance these concerns, and timber harvesting is conducted accordingly (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Hog Island Point Wetlands #1 or #2 (U.S.G.S. quadrangle map, Hog Island Point, Michigan, 1973).

Pollution Sources

There are no NPDES permit holders adjacent to Hog Island Point Wetlands #1 or #2 (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Hog Island Point Wetlands #1 and #2, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 395-396

The literature search identified no on-going or impending research projects pertaining to Hog Island Point Wetlands #1 and #2.

DAVENPORT CREEK AREA WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LM 397-398

Setting

The Davenport Creek Area Wetland Complex, comprised of Davenport Creek Area Wetlands #1 and #2, is located 0.1 mile from the northern shoreline of Lake Michigan in Mackinac County, Michigan, approximately 5.2 miles west of the community of Epoufette. Davenport Creek flows southward into Lake Michigan, between the two wetlands. Davenport Creek Area Wetlands #1 and #2 are Lacustrine Systems and occupy low, wooded sites within the Mackinac State Forest (U.S.G.S. quadrangle map, Hog Island Point, 1973; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

Topography

Davenport Creek Area Wetlands #1 and #2 have slight relief. Elevations of these wetlands range from 585 to 590 feet above sea level, 5 to 10 feet above the approximate mean elevation of Lake Michigan. Both wetlands lie on a low lacustrine plain on the south-facing slope of the Niagara Cuesta. Large wetlands occupy low inland sites on this plain. The Great Lakes Basin Commission (1975) describes the shoreline near Davenport Creek Area Wetlands #1 and #2 as a non-erodible low plain.

Surficial Geology

The surficial geology of Davenport Creek Area Wetland #1 and #2 is characterized by moraine formations deposited by glacial action. These deposits usually consist of till. Moraine formations are uncommon along the Lake Michigan shoreline of Michigan's Upper Peninsula (Martin, 1957; Door and Eschman, 1970).

Soils

The soil type in Davenport Creek Area Wetlands #1 and #2 is Eastport-Roscommon sand, which has a surface layer of black, partially decomposed leaf litter underlain by sand. This soil has little available water capacity, rapid permeability, and low natural fertility (Berndt, 1977; Michigan Agricultural Experiment Station, 1952).

Hydrology

There are no streams flowing through Davenport Creek Area Wetlands #1 and #2 (U.S.G.S. quadrangle map, Hog Island Point, Michigan, 1973). The literature search provided no site-specific data pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in these wetlands.

Climate

The closest weather station providing climatic data for the Davenport Creek Area Wetland Complex is located in Kincheloe Air Force Base, Michigan. In 1975, the average monthly temperature was 42.7°F; the average daily low for January was 10.8°F and the average daily high in July was 80.3°F. The average annual precipitation is 31.79 inches, with a mean monthly precipitation of 1.94 inches in January and 2.97 inches in July based on the normal period from 1941-1970. The growing season is approximately six and one-quarter months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on October 29 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Davenport Creek Area Wetlands #1 and #2 (U.S.G.S. quadrangle map, Hog Island Point, Michigan, 1973; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

BIOTIC SETTING

LM 397-398

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Davenport Creek Area Wetlands #1 and #2.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Davenport Creek Area Wetlands #1 and #2.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Davenport Creek Area Wetlands #1 and #2.

Reptiles and Amphibians

Appendix C-15 contains general information on reptiles and amphibians of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to Davenport Creek Area Wetlands #1 and #2. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and

commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in these wetlands.

Avifauna

Davenport Creek Area Wetlands #1 and #2 lie in a coastal area possessing significant value for fish and wildlife (U.S. Army Corps of Engineers, 1971). This area was included in the Michigan Shorelands Inventory (Michigan Shorelands Management Unit, 1975), which documented spring, summer, and fall utilization by dabbling and diving ducks, mergansers, geese, gulls, terns, shorebirds, and wading birds. The area is used for nesting, rearing, feeding and as a migration stopover.

Appendix D-32 contains general information on wetland birds of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to Davenport Creek Area Wetlands #1 and #2. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing these wetlands.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting the Davenport Creek Area Wetland Complex.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in the Davenport Creek Area Wetland Complex by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of these wetlands.

CULTURAL SETTING

LM 397-398

Population

Davenport Creek Area Wetlands #1 and #2 are located in Hudson Township of Mackinac County, Michigan. The county is sparsely populated, having a density of ten persons per square mile. Table 15-15 indicates that Mackinac County experienced a rapid rate of population growth between 1970 and 1975, but Hudson Township had a rapid decline in population during the same time period.

Projections for 1990 indicate that Mackinac County is expected to undergo moderate population growth in the future.

Table 15-15. Population Data for the Vicinity of Davenport Creek Area Wetlands #1 and #2

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Mackinac County	10,714	10.9	12,208
Hudson Township	100	-27.5	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Davenport Creek Area Wetlands #1 and #2 and most of the surrounding area is rural wooded space. A few residences are located immediately west of Davenport Creek Area Wetland #1. A primary highway crosses Davenport Creek Area Wetlands #1 and #2 (U.S.G.S. quadrangle map, Hog Island Point, Michigan, 1973; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978; Razaque and McNamara, 1976; Tremont, 1977). Davenport Creek Area Wetland #1 is under private ownership, while Davenport Creek Area Wetland #2 is under mixed state and private ownership (Rockford Map Publishers, Inc., 1972). The wetlands are situated in an area which has been classified as suitable for intensive resort development (Razaque and McNamara, 1976).

The proximity of the wetlands to the shoreline, the availability of natural resources, and the presence of residential units suggest that development pressures may be low to moderate.

Recreation

Davenport Creek Area Wetlands #1 and #2 lie within the Mackinac State Forest, and portions of Davenport Creek Area Wetland #2 are state owned. Although there are no known areas specifically designated for recreational use in or near these wetlands, all Michigan state forest lands are open for camping unless otherwise posted. Hunting and fishing are also major uses of state forest lands (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Mineral, Energy, and Forest Resources

Davenport Creek Area Wetlands #1 and #2 lie within an area underlain by industrial-quality dolomites, but there are no operations in the vicinity of the

wetland exploiting this resource (Gere, 1977). No known oil, gas, or coal resources are present in the wetland (Michigan Geological Survey, 1977; Smith, 1915).

Davenport Creek Area Wetlands #1 and #2 are wooded and lie within Mackinac State Forest. State forest lands in the coastal area are within a "water influence zone," in which water quality, water use, and aesthetic surroundings are the principal management concerns. Cover treatments are designed to maintain or enhance these concerns, and timber harvesting is conducted accordingly (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Davenport Creek Area Wetlands #1 or #2 (U.S.G.S. quadrangle map, Hog Island Point, Michigan, 1973).

Pollution Sources

There are no NPDES permit holders adjacent to Davenport Creek Area Wetlands #1 or #2 (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Davenport Creek Area Wetlands #1 and #2, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 397-398

The literature search identified no on-going or impending research projects pertaining to Davenport Creek Area Wetlands #1 and #2.

PAQUIN CREEK WETLAND

PHYSIOGRAPHIC SETTING

LM 399

Setting

Paquin Creek Wetland is located adjacent to the northern shoreline of Lake Michigan in Mackinac County, Michigan, 4.2 miles west of the community of Epoufette. The wetland is a low, partially wooded, Lacustrine System lying within the Mackinac State Forest (U.S.G.S. quadrangle map, Epoufette, Michigan, 1964; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

Topography

The total relief of Paquin Creek Wetland is 10 feet. Wetland elevations range from 580 to 590 feet above sea level (lake level to 10 feet above the approximate mean elevation of Lake Michigan). The wetland lies on a low lacustrine plain on the south-facing slope of the Niagara Cuesta. Large wetlands occupy low inland sites on this plain. The Great Lakes Basin Commission (1975) describes the shoreline near Paquin Creek Wetland as a non-erodible low plain.

Surficial Geology

The surficial geology of Paquin Creek Wetland is characterized by outwash and glacial channels. Outwash formations are sorted and stratified materials deposited by streams of glacial meltwater, and consist of sand and gravel (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in Paquin Creek Wetland is predominantly Carbondale muck-Rifle peat; Eastport-Roscommon sand is present along the Lake Michigan shore. Carbondale muck consists of dark brown, moderately decomposed woody material, which is high in ash content. This material is underlain by clayey till, sand, or limestone. Carbondale muck is wet and has areas that are highly decomposed. Rifle peat consists of dark brown, moderately decomposed woody peat over fibrous peat underlain by sand. This soil is high in organic matter and has very little mineral matter. Eastport-Roscommon sand has a surface layer of black, partially decomposed leaf litter underlain by sand; it has little available water capacity, rapid permeability, and low natural fertility (Berndt, 1977; Michigan Agricultural Experiment Station, 1952).

Hydrology

Paquin Creek and its tributaries flow through Paquin Creek Wetland. Paquin Creek has a change in elevation of approximately eight feet as it flows through the wetland. The longest tributary of Paquin Creek has an elevational change of approximately 15 feet as it joins the creek; another tributary has a change of

approximately 12 feet in elevation. Paquin Creek Wetland is adjacent to Lake Michigan. The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Paquin Creek Wetland.

Climate

The closest weather station providing climatic data for Paquin Creek Wetland is located in Kincheloe Air Force Base, Michigan. In 1975, the average monthly temperature was 42.7°F; the average daily low for January was 10.8°F and the average daily high in July was 80.3°F. The average annual precipitation is 31.79 inches, with a mean monthly precipitation of 1.94 inches in January and 2.97 inches in July based on the normal period from 1941-1970. The growing season is approximately six and one-quarter months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on October 29 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Paquin Creek Wetland (U.S.G.S. quadrangle map, Epoufette, Michigan, 1964; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

BIOTIC SETTING

LM 399

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Paquin Creek Wetland.

Fish

Paquin Creek Wetland lies in a coastal area possessing significant value for fish and wildlife (U.S. Army Corps of Engineers, 1971). However, a search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in this wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Paquin Creek Wetland.

Reptiles and Amphibians

Appendix C-15 contains general information on reptiles and amphibians of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to Paquin Creek Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Appendix D-32 contains general information on wetland birds of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to Paquin Creek Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Paquin Creek Wetland.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Paquin Creek Wetland by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland.

CULTURAL SETTING

LM 399

Population

Paquin Creek Wetland is located in Hudson Township of Mackinac County, Michigan. The county is sparsely populated, having a density of ten persons per square mile. Table 15-16 indicates that Mackinac County experienced a rapid rate of population growth between 1970 and 1975, but Hudson Township had a rapid decline in population during the same time period. Projections for 1990 indicate that Mackinac County is expected to undergo moderate population growth in the future.

Table 15-16. Population Data for the Vicinity of Paquin Creek Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Mackinac County	10,714	10.9	12,208
Hudson Township	100	-27.5	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Paquin Creek Wetland and most of the surrounding area is rural open space. A primary highway crosses Paquin Creek Wetland (U.S.G.S. quadrangle map, Epoufette, Michigan, 1964; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978; Razaque and McNamara, 1976; Tremont, 1977). The wetland is under mixed private, state, and federal ownership (Rockford Map Publishers, Inc., 1972), and is situated in an area which has been identified as suitable for intensive resort development (Razaque and McNamara, 1976). The proximity of the wetland to the shoreline, the availability of natural resources, and the presence of residential development suggest that development pressures may be low to moderate.

Recreation

Paquin Creek Wetland lies within the Mackinac State Forest. Although there are no known areas specifically designated for recreational use near the wetlands, all Michigan state forest lands are open for camping unless otherwise posted. Hunting and fishing are also major uses of state forest lands (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Mineral, Energy, and Forest Resources

Paquin Creek Wetland lies within an area underlain by industrial-quality dolomites, but there are no operations in the vicinity of the wetland exploiting this resource (Gere, 1977). No known oil, gas, or coal resources are present in the wetland (Michigan Geological Survey, 1977; Smith, 1915).

Paquin Creek Wetland is partially wooded and lies within Mackinac State Forest. State forest lands in the coastal area are within a "water influence zone," in which water quality, water use, and aesthetic surroundings are the principal management concerns. Cover treatments are designed to maintain or enhance these concerns, and timber harvesting is conducted accordingly (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Public Utilities and Facilities

The U.S.G.S. quadrangle map for Hog Island Point, Michigan (1973) indicates that a pipeline lies north of Paquin Creek Wetland. However, the quadrangle map containing the wetland (U.S.G.S. quadrangle map, Epoufette, Michigan, 1964) does not show the pipeline.

Pollution Sources

There are no NPDES permit holders adjacent to Paquin Creek Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Paquin Creek Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 399

The literature search identified no on-going or impending research projects pertaining to Paquin Creek Wetland.

EPOUFETTE AREA WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LM 400-404

Setting

The Epoufette Area Wetland Complex is comprised of West Harbor Wetland, Kenyon Bay Wetland, Point Epoufette Wetland, and Epoufette Bay Wetlands #1 and #2. These five wetlands are located adjacent to the northern shoreline of Lake Michigan in Mackinac County, Michigan. The distances of these wetlands relative to the community of Epoufette, Michigan, are indicated in Table 15-17.

Table 15-17. Location of Individual Wetlands of the Epoufette Area Wetland Complex

	Distance to Epoufette
West Harbor Wetland	1.7 miles west
Kenyon Bay Wetland	1.2 miles west
Point Epoufette Wetland	1.2 miles west
Epoufette Bay Wetland #1	0.9 mile west
Epoufette Bay Wetland #2	0.2 mile west

The Epoufette Area Wetland Complex generally parallels the shoreline for a distance of two to three miles, beginning at West Harbor and extending eastward to a point just west of the community of Epoufette. This area includes the shoreline of West Harbor, Kenyon Bay, Point Epoufette, and Epoufette Bay. A steep bluffline, up to 120 feet high, lies 0.1 mile inland from the wetland complex, marking the western extent of a glacial moraine. Epoufette Island and several small, unnamed islands lie offshore from the wetlands. All of the wetlands in the Epoufette Area Wetland Complex are Lacustrine Systems; they occupy low, non-wooded sites within the Mackinac State Forest. Much of these wetlands consists of emergent vegetation growing in shallow offshore depths (U.S.G.S. quadrangle map, Epoufette, Michigan, 1964; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

Topography

Elevations within all of the wetlands in the Epoufette Area Wetland Complex range from 580 to 585 feet above sea level (lake level to 5 feet above the approximate mean elevation of Lake Michigan). The total relief of these wetlands is approximately 5 feet. The Epoufette Area Wetland Complex lies on a low lacustrine plain on the south-facing slope of the Niagara Cuesta. Large wetlands occupy low inland sites on this plain. The Great Lakes Basin Commission (1975) describes the shoreline near the wetland complex as a non-erodible low plain.

Surficial Geology

The surficial geology of the five wetlands in the Epoufette Area Wetland Complex is characterized by outwash and glacial channels. Outwash formations are sorted and stratified materials deposited by streams of glacial meltwater. These deposits consist of sand and gravel (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in the five wetlands of the Epoufette Area Wetland Complex is Eastport-Roscommon sand. This soil has a surface layer of black, partially decomposed leaf litter underlain by sand; it has little available water capacity, rapid permeability, and low natural fertility (Berndt, 1977; Michigan Agricultural Experiment Station, 1952).

Hydrology

There are no streams flowing through any of the wetlands in the Epoufette Area Wetland Complex, but the five wetlands are adjacent to Lake Michigan (U.S.G.S. quadrangle map, Epoufette, Michigan, 1964). The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in these wetlands.

Climate

The closest weather station providing climatic data for the Epoufette Area Wetland Complex is located in Kincheloe Air Force Base, Michigan. In 1975, the average monthly temperature was 42.7°F; the average daily low for January was 10.8°F and the average daily high in July was 80.3°F. The average annual precipitation is 31.79 inches, with a mean monthly precipitation of 1.94 inches in January and 2.97 inches in July based on the normal period from 1941-1970. The growing season is approximately six and one-quarter months long, with the last killing frost (28°F) in 1975 occurring on April 21 and the first killing frost on October 29 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of the Epoufette Area Wetland Complex (U.S.G.S. quadrangle map, Epoufette, Michigan, 1964; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of the Epoufette Area Wetland Complex.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in the Epoufette Area Wetland Complex.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in the Epoufette Area Wetland Complex.

Reptiles and Amphibians

Appendix C-15 contains general information on reptiles and amphibians of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to the Epoufette Area Wetland Complex.

The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in these wetlands.

Avifauna

Epoufette Bay Wetland #2 is included in the Mississippi Flyway Waterfowl Habitat Reconnaissance (Martz, 1976) as an area of inadequately protected high quality waterfowl habitat. Table 15-18 lists the breeders and migratory waterfowl of this wetland. The Reconnaissance also describes the wetland as significant habitat for wading birds and shore birds, and as a feeding area for eagle and osprey.

Table 15-18. Waterfowl of Epoufette Bay Wetland #2^a

Species	Waterfowl Use	
	Migration	Breeding
mallard	x	x
black duck	x	x
blue-winged teal	x	x
pintail	x	
wood duck	x	x
redhead	x	
canvasback	x	
scaup spp.	x	
ring-necked duck	x	
goldeneye/bufflehead	x	x
red-breasted merganser	x	x
hooded merganser	x	x
snow goose	x	
Canada goose	x	
whistling swan	x	

^a Martz (1976)

Point Epoufette Wetland, Epoufette Bay Wetland #1, and Epoufette Bay Wetland #2 lie within a larger area included in the Michigan Shorelands Inventory (Michigan Shorelands Management Unit 1975). Data from this inventory document spring, summer, and fall utilization by dabbling and diving ducks, mergansers, terns, shore birds, and wading birds. The area is used for nesting, staging, feeding, rearing, and resting.

All of the wetlands in the Epoufette Area Wetland Complex lie within a coastal area possessing significant value for fish and wildlife (U.S. Army Corps of Engineers, North Central Division, 1971).

Appendix D-32 contains general information on wetland birds of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to the Epoufette Area Wetland Complex. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing these wetlands.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting the Epoufette Area Wetland Complex.

Endangered Species

The bald eagle (Haliaeetus leucocephalus) and the osprey (Pandion haliaetus) are known to feed in the Epoufette Bay area (Martz, 1976; Jaworski and Raphael, 1978). The eagle is on the federal list of endangered species, and the osprey is threatened in Michigan. The proximity of the Epoufette Area Wetland Complex to Epoufette Bay suggests that these species may also be present in these wetlands. However, no plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in the Epoufette Area Wetland Complex by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of these wetlands. However, the Mississippi Flyway Waterfowl Habitat Reconnaissance describes Epoufette Bay Wetland #2 as significant habitat for wading birds and shore birds, and as a feeding area for eagle and osprey.

CULTURAL SETTING

LM 400-404

Population

The Epoufette Area Wetland Complex is located in Hendricks Township of Mackinac County, Michigan. The county is sparsely populated, having a density of ten persons per square mile. Table 15-19 indicates that Mackinac County experienced a rapid rate of population growth between 1970 and 1975, but Hendricks Township had a rapid decline in population during the same time period. Projections for 1990 indicate that Mackinac County is expected to undergo moderate population growth in the future.

Table 15-19. Population Data for the Vicinity of the Epoufette Area Wetland Complex

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Mackinac County	10,714	10.9	12,208
Hendricks Township	91	-6.2	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within the five wetlands of the Epoufette Area Wetland Complex and most of the surrounding area is rural open space. An area of residential and commercial development (the community of Epoufette) is southeast of Epoufette Bay Wetland #2. An access road and a primary highway lie inland from all of the wetlands in the Epoufette Area Wetland Complex. A campground is located adjacent to Epoufette Bay Wetland #2 (U.S.G.S. quadrangle map, Epoufette, Michigan, 1964; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978; Razaque and McNamara, 1976; Tremont, 1977). Epoufette Bay Wetland #1 and West Harbor Wetland are under mixed state and private ownership, while Point Epoufette Wetland, Epoufette Bay Wetland #2, and Kenyon Bay Wetland are entirely under private ownership (Rockford Map Publishers, Inc., 1972).

Point Epoufette Wetland, Epoufette Bay Wetlands #1 and #2, and Kenyon Bay Wetland lie in an area projected for use as low to medium density urban development (Razaque and McNamara, 1976). Should these plans be realized, these wetlands may face moderate to heavy developmental pressures in the future.

There are no known development plans for West Harbor Wetland. However, the proximity of the wetland to the shoreline, the availability of natural resources, and the presence of residential development suggest that development pressures may be low to moderate.

Recreation

The Epoufette Area Wetland Complex is located within the Mackinac State Forest, and portions of Epoufette Bay Wetland #1 and West Harbor Wetland are state owned. Although there are no known areas specifically designated for recreational use near the wetlands, all Michigan state forest lands are open for camping unless otherwise posted. Hunting and fishing are also major uses of state forest lands (Henry H. Webster, Michigan Department of Natural Resources, personal communication).

Mineral, Energy, and Forest Resources

The five wetlands of the Epoufette Area Wetland Complex lie within an area underlain by industrial-quality dolomites, but there are no operations in the vicinity of the wetlands exploiting this resource (Gere, 1977). No known oil, gas, or coal resources are present in the wetlands (Michigan Geological Survey, 1977; Smith, 1915).

There are no significant forest resources present in any of the wetlands in the Epoufette Area Wetland Complex (U.S.G.S. quadrangle map, Epoufette, Michigan 1964; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of the Epoufette Area Wetland Complex (U.S.G.S. quadrangle map, Epoufette, Michigan, 1964).

Pollution Sources

There are no NPDES permit holders adjacent to the wetlands comprising the Epoufette Area Wetland Complex (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of the Epoufette Area Wetland Complex (Peebles and Black, 1976). However, the Michigan Coastal Zone Inventory indicates that one archaeological site (20-MK-30) is present in the vicinity of the wetlands. The site is a habitation of an unknown culture and date (Peebles and Black, 1976). Further information regarding the field research and exact location of this site can be obtained from the Michigan History Division.

RESEARCH PROJECTS

LM 400-404

The literature search identified no on-going or impending research projects pertaining to the Epoufette Area Wetland Complex.

BREVORT AREA WETLAND

PHYSIOGRAPHIC SETTING

LM 405

Setting

Brevort Area Wetland is located 0.2 mile from the northern shoreline of Lake Michigan in Mackinac County, Michigan, 0.2 mile east of the community of Brevort. It is likely that Brevort Area Wetland was connected to a larger inland wetland at one time, but a primary highway now separates the two areas. Brevort Area Wetland is a non-wooded, intermittent Riverine System; it occupies a raised site within the Mackinac State Forest (U.S.G.S. quadrangle map, Brevort, Michigan, 1975).

Topography

The total relief of Brevort Area Wetland is less than 5 feet; wetland elevations range from approximately 635 to 639 feet above sea level (55 to 59 feet above the approximate mean elevation of Lake Michigan). The wetland lies behind a coastal bluffline which marks the southern extent of a glacial moraine. Large inland wetlands occupy low sites within this area. The Great Lakes basin Commission (1975) describes the shoreline near Brevort Area Wetland as an erodible high bluff featuring a sand and gravel beach.

Surficial Geology

The surficial geology of Brevort Area Wetland is characterized by outwash and glacial channels. Outwash formations are sorted and stratified materials deposited by streams of glacial meltwater. These deposits consist of sand and gravel (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in Brevort Area Wetland is Roscommon mucky sand, which has a surface layer consisting of black muck underlain by sand. This soil has little available water, rapid permeability, and low natural fertility (Berndt, 1977; Michigan Agricultural Experiment Station, 1952).

Hydrology

An unnamed intermittent stream flows through Brevort Area Wetland with little change in elevation (U.S.G.S. quadrangle map, Brevort, Michigan, 1964). The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Brevort Area Wetland.

Climate

The closest weather station providing climatic data for Brevort Area Wetland is located in Mackinaw City, Michigan. Based on the normal period from

1931-1960, the mean monthly low for January is 14.6°F and the mean monthly high for July is 66.9°F. The average annual precipitation is 28.88 inches, with a mean monthly precipitation of 15.9 inches in January and 2.37 inches in July. The first killing frost (28°F) in 1972 occurred on October 10. Average annual temperature and freeze data are not readily available for this station (National Oceanic and Atmospheric Administration, 1972).

Special Features

No natural special features are found in the vicinity of Brevort Area Wetland (U.S.G.S. quadrangle map, Brevort, Michigan, 1975; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

BIOTIC SETTING

LM 405

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Brevort Area Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Brevort Area Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Brevort Area Wetland.

Reptiles and Amphibians

Appendix C-15 contains general information on reptiles and amphibians of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to Brevort Area Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Appendix D-32 contains general information on wetland birds of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to Brevort Area Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories,

relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Brevort Area Wetland.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Brevort Area Wetland by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland.

CULTURAL SETTING

LM 405

Population

Brevort Area Wetland is located in Moran Township of Mackinac County, Michigan. The county is sparsely populated, having a density of ten persons per square mile. Table 15-20 indicates that Mackinac County experienced a rapid rate of population growth between 1970 and 1975, but Moran Township had a slow decline in population during the same time period. Projections for 1990 indicate that Mackinac County is expected to undergo moderate population growth in the future.

Table 15-20. Population Data for the Vicinity of Brevort Area Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Mackinac County	10,714	10.9	12,208
Moran Township	770	-1.2	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Brevort Area Wetland and most of the surrounding area is rural open space. An area of residential and commercial development (the community of Brevort) is located west of the wetland (U.S.G.S. quadrangle map, Brevort, Michigan, 1975; Razaque and McNamara, 1976; Tremont, 1977). The wetland is under private ownership (Rockford Map Publishers, Inc., 1972). Brevort Area Wetland lies within an area projected for use as low density urban development (Razaque and McNamara, 1976). Should these plans be realized, the wetland may face moderate developmental pressures in the future.

Recreation

Although Brevort Area Wetland lies within the Mackinac State Forest, it is privately owned. Therefore, any recreational use of the wetland would be dependent upon permission of the owner.

Mineral, Energy, and Forest Resources

No information was found to indicate the presence of any economically viable mineral deposits in or near Brevort Area Wetland. There are no oil, gas, or coal resources in the wetland (Michigan Geological Survey, 1977; Smith, 1915). No significant forest resources are present (U.S.G.S. quadrangle map, Brevort, Michigan 1975).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Brevort Area Wetland (U.S.G.S. quadrangle map, Brevort, Michigan, 1975).

Pollution Sources

There are no NPDES permit holders adjacent to Brevort Area Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Brevort Area Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 405

The literature search identified no on-going or impending research projects pertaining to Brevort Area Wetland.

POINTE AUX CHENES WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LM 406-409

Setting

The Pointe Aux Chenes Wetland Complex, comprised of Pointe Aux Chenes Bay Wetlands #1-#3 and Pointe Aux Chenes Marshes, is located on the northern shoreline of Lake Michigan in Mackinac County, Michigan, within the Hiawatha National Forest. The distances of these wetlands relative to the shoreline and to the city of St. Ignace are presented in Table 15-21.

Table 15-21. Location of Individual Wetlands in the Pointe Aux Chenes Wetland Complex

	Distance to shoreline	Distance to St. Ignace, Michigan
Pointe Aux Chenes Bay Wetland #1	350 feet	8.5 miles west
Pointe Aux Chenes Bay Wetland #2	adjacent	8.4 miles west
Pointe Aux Chenes Bay Wetland #3	adjacent	7.4 miles west
Pointe Aux Chenes Marshes	adjacent	5.0 miles west

The Pointe Aux Chenes Wetland Complex is located between Pointe Aux Chenes and Poupard Bay. A large system of coastal beach ridges occupies this area, and open water is located within the swales. Pointe Aux Chenes Bay Wetlands #1-#3 are Lacustrine Systems occupying low, non-wooded sites. Pointe Aux Chenes Marshes is a Riverine and Lacustrine System. This wetland occupies a low, partially wooded site (U.S.G.S. quadrangle maps, Pointe Aux Chenes, Michigan, 1964, and Moran, Michigan, 1964; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

Topography

Elevations within the Pointe Aux Chenes Wetland Complex range from lake level to 620 feet above sea level. The elevations and total relief of the individual wetlands in the Pointe Aux Chenes Wetland Complex are listed in Table 15-22.

Table 15-22. Elevations and Total Relief of Individual Wetlands in the Pointe Aux Chenes Wetland Complex

	Minimum elevation (feet) ^a	Maximum elevation (feet) ^a	Total relief (feet)
Pointe Aux Chenes Bay Wetland #1	582	590	8
Pointe Aux Chenes Bay Wetland #2	580	585	5
Pointe Aux Chenes Bay Wetland #3	580	582	2
Pointe Aux Chenes Marshes	580	620	40

^a Elevations measured in feet above sea level; the approximate mean elevation of Lake Michigan is 580 feet above sea level.

The Pointe Aux Chenes Wetland Complex lies on a low lacustrine plain on the south-facing slope of the Niagara Cuesta. Large wetlands occupy low inland sites on this plain. The Great Lakes Basin Commission (1975) describes the shoreline near the wetland complex as a non-erodible low plain featuring a sand and gravel beach.

Surficial Geology

The surficial geology of Pointe Aux Chenes Wetland #1 and #2 is characterized by sand dunes, while the surficial geology for Pointe Aux Chenes Bay Wetland #3 and Pointe Aux Chenes Marshes is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

There are four soil types present in the Pointe Aux Chenes Wetland Complex: Alpena soil, Eastport-Roscommon sand, Roscommon mucky sand, and Carbondale muck-Rifle peat. Alpena soils have a surface layer of very dark brown, gravelly sandy loam; they are well-drained and have slow runoff, low natural fertility, and low available water capacity (Berndt, 1977; Michigan Agricultural Experiment Station, 1952).

Carbondale muck consists of dark brown, moderately decomposed woody material, which is high in ash content. This material is underlain by clayey till, sand, or limestone. Carbondale muck is wet and has areas that are highly decomposed. Rifle peat consists of dark brown, moderately decomposed woody peat over fibrous peat underlain by sand. This soil is high in organic matter and has very little mineral matter. Roscommon mucky sand has a surface layer consisting of black muck underlain by sand. This soil has little available water capacity, rapid permeability, and low natural fertility. Eastport-Roscommon sand has a surface layer of black, partially decomposed leaf litter

underlain by sand. Eastport-Roscommon sand has little available water capacity, rapid permeability, and low natural fertility (Berndt, 1977; Michigan Agricultural Experiment Station, 1952).

Hydrology

The Pointe Aux Chenes River flows through Pointe Aux Chenes Marshes. A major branch of this river flows southward from Round Lake north of the wetland to an unnamed lake in the western part of Pointe Aux Chenes Marshes. The branch has an elevational change of 15 feet. A second major branch of the Pointe Aux Chenes River flows south to an unnamed lake in the eastern part of the wetland; this branch has an elevational change of nearly 20 feet. Kitchens Creek originates at the eastern edge of Pointe Aux Chenes marshes and flows west for approximately one mile before flowing south to Poupard Bay. Kitchens Creek has three intermittent streams joining it. There are over 40 unnamed ponds located in the swales of Pointe Aux Chenes Marshes. Many of these ponds and small lakes are connected by unnamed streams. There are no streams flowing through Pointe Aux Chenes Bay Wetlands #1-#3; however, Pointe Aux Chenes Bay Wetlands #2 and #3 are adjacent to Pointe Aux Chenes Bay. Pointe Aux Chenes Marshes is adjacent to Lake Michigan at the central and eastern part of the wetland (U.S.G.S. quadrangle maps, Pointe Aux Chenes, Michigan, 1964; Moran, Michigan, 1964).

The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Pointe Aux Chenes Bay Wetlands #1-#3 and Pointe Aux Chenes Marshes.

Climate

The closest weather station providing climatic data for the four wetlands of the Pointe Aux Chenes Wetland Complex is located in Mackinaw City, Michigan. Based on the normal period from 1931-1960, the mean monthly low for January is 14.6°F and the mean monthly high for July is 66.9°F. The average annual precipitation is 28.88 inches, with a mean monthly precipitation of 15.9 inches in January and 2.37 inches in July. The first killing frost (28°F) in 1972 occurred on October 10. Average annual temperature and freeze data are not readily available for this station (National Oceanic and Atmospheric Administration, 1972).

Special Features

No natural special features are found in the vicinity of the Pointe Aux Chenes Wetland Complex (U.S.G.S. quadrangle maps, Pointe Aux Chenes, Michigan, 1964; Moran, Michigan, 1964; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

BIOTIC SETTING

LM 406-409

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or

relationship to water levels of the vegetation of the Pointe Aux Chenes Wetland Complex.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in the Pointe Aux Chenes Wetland Complex.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in the Pointe Aux Chenes Wetland Complex.

Reptiles and Amphibians

Appendix C-15 contains general information on reptiles and amphibians of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to Pointe Aux Chenes Marshes and Pointe Aux Chenes Bay Wetlands #1-#3. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in these wetlands.

Avifauna

Appendix D-32 contains general information on wetland birds of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to the four wetlands of the Pointe Aux Chenes Wetland Complex. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing these wetlands.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting the Pointe Aux Chenes Wetland Complex.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in the Pointe Aux Chenes Wetland Complex by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of these wetlands. However, the Mississippi Flyway Waterfowl Habitat Reconnaissance describes the Pointe Aux Chenes Wetland Complex as significant habitat for wading birds and shore birds(Martz, 1976).

CULTURAL SETTING

LM 406-409

Population

The Pointe Aux Chenes Wetland Complex is located in Moran Township of Mackinac County, Michigan. The county is sparsely populated, having a density of ten persons per square mile. Table 15-23 indicates that Mackinac County experienced a rapid rate of population growth between 1970 and 1975, but Moran Township had a slow decline in population during the same time period. Projections for 1990 indicate that Mackinac County is expected to undergo moderate population growth in the future.

Table 15-23. Population Data for the Vicinity of the Pointe Aux Chenes Wetland Complex

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Mackinac County	10,714	10.9	12,208
Moran Township	770	-1.2	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Pointe Aux Chenes Bay Wetlands #1-#3 and Pointe Aux Chenes Marshes is rural open space. The area surrounding these wetlands is predominantly in rural open space uses, with scattered areas of residential development along U.S. Highway 2 and along the Lake Michigan shore. A primary highway lies within or adjacent to all of the wetlands in the Pointe Aux Chenes Wetland Complex. An active sand and gravel pit is located northwest of Pointe Aux Chenes Bay Wetland #1 (U.S.G.S. quadrangle maps, Pointe Aux Chenes, Michigan, 1964; Moran, Michigan, 1964; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978; Razaque and McNamara, 1976; Tremont, 1977). Pointe Aux Chenes Bay Wetland #3 is under private

ownership; the other wetlands are under mixed private and federal ownership (Rockford Map Publishers, Inc., 1972). The wetlands are located in an area classified as suitable for intensive resort development (Razaque and McNamara, 1976).

There are no known development plans for the wetlands of the Pointe Aux Chenes Wetland Complex, but the proximity of the wetlands to the shoreline, the availability of natural resources, and the presence of residential development suggest that development pressures may be low to moderate.

Recreation

The Point Aux Chenes Wetland Complex lies within the Hiawatha National Forest, and portions of Pointe Aux Chenes Bay Wetlands #1 and #2 and Pointe Aux Chenes Marshes are federally owned. Although there are no known areas specifically designated for recreational use in or near the wetlands, all of the forest lands are open (unless otherwise posted) for a variety of recreational uses, including hunting, fishing, and camping (U.S. Forest Service, 1978).

Mineral, Energy, and Forest Resources

An active sand and gravel operation is located northwest of Pointe Aux Chenes Bay Wetland #1 (Michigan Department of State Highways and Transportation aerial photograph, 1973). There are no known oil, gas, or coal resources in the wetlands (Michigan Geological Survey, 1977; Smith, 1915).

Pointe Aux Chenes Bay Wetlands #1-#3 contain no significant forest resources. Pointe Aux Chenes Marshes is partially wooded and lies within the Hiawatha National Forest (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978). Specific information on the commercial value of forest resources and operations for harvesting these resources was not obtained through the literature search for Pointe Aux Chenes Marshes. However, any harvest of timber would be subject to Forest Service policy that actions affecting a wetland require interdisciplinary review (U.S. Forest Service, 1978).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Pointe Aux Chenes Marshes and Pointe Aux Chenes Bay Wetlands #1-#3 (U.S.G.S. quadrangle maps, Moran, Michigan, 1964; Pointe Aux Chenes, Michigan, 1964).

Pollution Sources

There are no NPDES permit holders adjacent to Pointe Aux Chenes Marshes and Pointe Aux Chenes Bay Wetlands #1-#3 (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Pointe Aux Chenes Wetlands #1-#3 and Pointe Aux Chenes Marshes, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 406-409

The literature search identified no on-going or impending research projects pertaining to the Pointe Aux Chenes Wetland Complex.

GROS CAP ROAD WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LM 410-414

Setting

The Gros Cap Road Wetland Complex, comprised of Gros Cap Road Wetlands #1-#5, is adjacent to the northern shoreline of Lake Michigan in Mackinac County, Michigan, within the Hiawatha National Forest. The distances of these wetlands relative to the city of St. Ignace are presented in Table 15-24.

Table 15-24. Locations of Individual Wetlands in the Gros Cap Road Wetland Complex

	Distance to St. Ignace, Michigan
Gros Cap Road Wetland #1	5.3 miles west-northwest
Gros Cap Road Wetland #2	5.1 miles west-northwest
Gros Cap Road Wetland #3	5.2 miles west-northwest
Gros Cap Road Wetland #4	5.2 miles west-northwest
Gros Cap Road Wetland #5	5.1 miles west-northwest

Gros Cap Road Wetlands #1-#5 are Lacustrine Systems and occupy low sites. Gros Cap Road Wetlands #2 and #5 are non-wooded, and the remainder of the wetlands in the complex are partially wooded (U.S.G.S. quadrangle map, Moran, Michigan, 1964).

Topography

Gros Cap Road Wetland #1 has a total relief of less than 5 feet, with elevations ranging from 580 to approximately 582 feet above sea level (lake level to 2 feet above the approximate mean elevation of Lake Michigan). Gros Cap Road Wetlands #2-#5 have total relief ranging from 5 to 10 feet above lake level. The wetlands lie lakeward of a steep bluffline which is 140 feet high. This bluffline marks the western extent of a gently rolling till plain which occupies a relatively small area and is surrounded by a low lacustrine plain. Both of these areas are located on the south-facing slope of the Niagara Cuesta. Large inland wetlands occupy low sites nearby.

Surficial Geology

The surficial geology of Gros Cap Road Wetlands #1-#5 is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type for Gros Cap Road Wetlands #1-#5 is Alpena, which has a surface layer of very dark brown gravelly sandy loam. This soil is well-drained and has slow runoff, low natural fertility, and low available water capacity (Berndt, 1977; Michigan Agricultural Experiment Station, 1952).

Hydrology

There are no streams flowing through Gros Cap Road Wetlands #1-#5, but all of the wetlands are adjacent to Lake Michigan (U.S.G.S. quadrangle map, Moran, Michigan, 1954). The literature search provided no site-specific information pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Gros Cap Road Wetlands #1-#5.

Climate

The closest weather station providing climatic data for Gros Cap Road Wetlands #1-#5 is located in Mackinaw City, Michigan. Based on the normal period from 1931-1960, the mean monthly low for January is 14.6^oF and the mean monthly high for July is 66.9^oF. The average annual precipitation is 28.88 inches, with a mean monthly precipitation of 15.9 inches in January and 2.37 inches in July. The first killing frost (28^oF) in 1972 occurred on October 10. Average annual temperature and freeze data are not readily available for this station (National Oceanic and Atmospheric Administration, 1972).

Special Features

No natural special features are found in the vicinity of the Gros Cap Road Wetland Complex (U.S.G.S. quadrangle map, Moran, Michigan, 1964).

BIOTIC SETTING

LM 410-414

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of the Gros Cap Road Wetland Complex.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in the Gros Cap Road Wetland Complex.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity,

food sources, or relationship to water levels of the invertebrates present in the Gros Cap Road Wetland Complex.

Reptiles and Amphibians

Appendix C-15 contains general information on reptiles and amphibians of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to Gros Cap Road Wetlands #1-#5. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in these wetlands.

Avifauna

Appendix D-32 contains general information on wetland birds of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to Gros Cap Road Wetlands #1-#5. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing these wetlands.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting the Gros Cap Road Wetland Complex.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in the Gros Cap Road Wetland Complex by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of these wetlands. However, the Mississippi Flyway Waterfowl Habitat Reconnaissance describes the Gros Cap Road Wetland Complex as significant habitat for wading birds and shore birds (Martz, 1976).

CULTURAL SETTING

LM 410-414

Population

Gros Cap Road Wetlands #1-#5 are located in Moran Township of Mackinac County, Michigan. The county is sparsely populated, having a density of ten persons per square mile. Table 15-25 indicates that Mackinac County experienced

a rapid rate of population growth between 1970 and 1975, but Moran Township had a slow decline in population during the same time period. Projections for 1990 indicate that Mackinac County is expected to undergo moderate population growth in the future.

Table 15-25. Population Data for the Vicinity of Gros Cap Road Wetlands #1-#5

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Mackinac County	10,714	10.9	12,208
Moran Township	770	-1.2	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Gros Cap Road Wetlands #1-#5 is rural open space. The area surrounding the wetlands is primarily in rural open space uses, although residences are located immediately east of Gros Cap Road Wetland #1 and west of Gros Cap Road Wetland #2. An access road lies adjacent to Gros Cap Road Wetland #1 and a secondary road lies adjacent to the rest of the wetlands in the Gros Cap Road Wetland Complex. A roadside park is located on the bluff overlooking Gros Cap Road Wetlands #2 and #3; St. Helena Island lies offshore from the wetland complex (U.S.G.S. quadrangle map, Moran, Michigan, 1964; Razaque and McNamara, 1976; Tremont, 1977). All five of the wetlands are under private ownership (Rockford Map Publishers, Inc., 1972), and are situated in an area which has been classified as suitable for extensive resort development (Razaque and McNamara, 1976).

The proximity of the wetlands to the shoreline, the presence of residential development and the fact that the wetlands are privately owned suggest that development pressures may be low to moderate.

Recreation

Although Gros Cap Road Wetlands #1-#5 lie within the Hiawatha National Forest, they are privately owned. Therefore, any recreational use of these wetlands would be dependent upon permission of the owner.

Mineral, Energy, and Forest Resources

No information was found to indicate the presence of any economically viable mineral deposits in or near Gros Cap Road Wetlands #1-#5. There are no known oil, gas, or coal resources in the wetlands (Michigan Geological Survey, 1977; Smith, 1915).

No significant forest resources are present in Gros Cap Road Wetlands #2 and #5. Gros Cap Road Wetlands #1, #3, and #4 are partially wooded, but since they lie within the Hiawatha National Forest (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978), any harvest of timber would be subject to Forest Service policy that actions affecting a wetland require interdisciplinary review (U.S. Forest Service, 1978).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Gros Cap Road Wetlands #1-#5 (U.S.G.S. quadrangle map, Moran, Michigan, 1964).

Pollution Sources

There are no NPDES permit holders adjacent to Gros Cap Road Wetlands #1-#5 (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Gros Cap Road Wetlands #1-#5, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 410-414

The literature search identified no on-going or impending research projects pertaining to Gros Cap Road Wetlands #1-#5.

WEST MORAN BAY WETLAND

PHYSIOGRAPHIC SETTING

LM 415

Setting

West Moran Bay Wetland is located adjacent to the northern shoreline of Lake Michigan, in Mackinac County, Michigan, 3.5 miles west of the city of St. Ignace. West Moran Bay Wetland is a Lacustrine System; it occupies a low, partially wooded site (U.S.G.S. quadrangle map, McGulpin Point, Michigan, 1964).

Topography

West Moran Bay Wetland has a total relief of approximately 5 feet, with elevations ranging from 580 to 585 feet above sea level (lake level to 5 feet above the approximate mean elevation of Lake Michigan). The wetland lies in a low gap which separates two higher areas of rolling till plain. This low gap is part of a lacustrine plain which lies on the south-facing slope of the Niagara Cuesta. Large wetlands occupy low inland sites on this plain. The Great Lakes Basin Commission (1975) describes the shoreline near West Moran Bay Wetland as a non-erodible low plain.

Surficial Geology

The surficial geology of West Moran Bay Wetland is characterized by lake beds comprised mainly of sand. These glaciolacustrine sediments consist of fine-grained products of glacial erosion (Martin, 1957; Dorr and Eschman, 1970).

Soils

The soil type in West Moran Bay Wetland is Eastport-Roscommon sand, which has a surface layer of black, partially decomposed leaf litter underlain by sand. This soil has little available water capacity, rapid permeability, and low natural fertility (Berndt, 1977; Michigan Agricultural Experiment Station, 1952).

Hydrology

There are no streams flowing through West Moran Bay Wetland, but the wetland is adjacent to Lake Michigan (U.S.G.S. quadrangle map, McGulpin Point, Michigan, 1964). The literature search provided no site-specific data pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in West Moran Bay Wetland.

Climate

The closest weather station providing climatic data for West Moran Bay Wetland is located in Mackinaw City, Michigan. Based on the normal period from

1931-1960, the mean monthly low for January is 14.6°F and the mean monthly high for July is 66.9°F. The average annual precipitation is 28.88 inches, with a mean monthly precipitation of 15.9 inches in January and 2.37 inches in July. The first killing frost (28°F) in 1972 occurred on October 10. Average annual temperature and freeze data are not readily available for this station (National Oceanic and Atmospheric Administration, 1972).

Special Features

There are no natural special features present in West Moran Bay Wetland (U.S.G.S. quadrangle map, McGulpin Point, Michigan, 1964; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

BIOTIC SETTING

LM 415

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of West Moran Bay Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in West Moran Bay Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in West Moran Bay Wetland.

Reptiles and Amphibians

Appendix C-15 contains general information on reptiles and amphibians of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to West Moran Bay Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Appendix D-32 contains general information on wetland birds of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to West Moran Bay Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and

productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting West Moran Bay Wetland.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in West Moran Bay Wetland by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland. However, the Mississippi Flyway Waterfowl Habitat Reconnaissance describes West Moran Bay Wetland as significant habitat for wading birds and shore birds (Martz, 1976).

CULTURAL SETTING

LM 415

Population

West Moran Bay Wetland is located in Moran Township of Mackinac County, Michigan. The county is sparsely populated, having a density of ten persons per square mile. Table 15-26 indicates that Mackinac County experienced a rapid rate of population growth between 1970 and 1975, but Moran Township had a slow decline in population during the same time period. Projections for 1990 indicate that Mackinac County is expected to undergo moderate population growth in the future.

Table 15-26. Population Data for the Vicinity of West Moran Bay Wetland

	Estimated Population 1975 ^a	Estimated % Δ 1970-1975 ^a	Projected Population 1990 ^b
Mackinac County	10,714	10.9	12,208
Moran Township	770	-1.2	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within West Moran Bay Wetland is rural open space. With the exception of a cluster of residences located immediately west, the area surrounding the wetland is primarily in rural open space uses (U.S.G.S. quadrangle map, McGulpin Point, Michigan, 1964; Michigan Department of State Highways and Transportation aerial photograph, 1973; Razaque and McNamara, 1976; Tremont, 1977). The wetland is under private ownership (Rockford Map Publishers, Inc., 1972), and is situated in an area which has been classified as suitable for extensive resort development (Razaque and McNamara, 1976). The proximity of the wetland to the shoreline, the presence of residential development, and the fact that the wetland is privately owned suggest that development pressures may be low to moderate.

Recreation

There are no known state or federal recreational facilities in the vicinity of West Moran Bay Wetland.

Mineral, Energy, and Forest Resources

No information was found to indicate the presence of any economically viable mineral deposits in or near West Moran Bay Wetland. There are no oil, gas, or coal resources in the wetland (Michigan Geological Survey, 1977; Smith, 1915).

West Moran Bay Wetland is partially wooded (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978), but specific information on the commercial value of forest resources and operations for harvesting these resources in the wetland was not identified through the literature search.

Public Utilities and Facilities

There are no public utilities within 0.5 mile of West Moran Bay Wetland (U.S.G.S. quadrangle map, McGulpin Point, Michigan, 1964).

Pollution Sources

There are no NPDES permit holders adjacent to West Moran Bay Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of West Moran Bay Wetland (Peebles and Black, 1976). However, the Michigan Coastal Zone Inventory indicates that two archaeological sites are present in the vicinity of West

Moran Bay Wetland. Site 20-MK-35 is an historical Ottawa village; site 20-MK-46 is a trading post (Peebles and Black, 1976). Further information regarding the field research and exact location of these sites can be obtained from the Michigan History Division.

RESEARCH PROJECTS

LM 415

The literature search identified no on-going or impending research projects pertaining to West Moran Bay Wetland.

ST. HELENA ISLAND WETLAND

PHYSIOGRAPHIC SETTING

LM 416

Setting

St. Helena Island Wetland is located on the southeastern portion of St. Helena Island, adjacent to the Lake Michigan shoreline and seven miles west of the city of St. Ignace, Michigan. St. Helena Island Wetland is a Lacustrine System occupying a low, partially wooded site (U.S.G.S. quadrangle map, McGulpin, Michigan, 1964).

Topography

St. Helena Island Wetland lies in a slight depression; wetland elevations are at or slightly below 590 feet above sea level (10 feet above the approximate mean elevation of Lake Michigan). St. Helena is a small island; its topography is low and rolling.

Surficial Geology

The surficial geology of St. Helena Island Wetland consists of bedrock at or near the surface (Tremont, 1977).

Soils

The soil type in St. Helena Island Wetland is Alpena. Alpena soils have a surface layer of very dark brown, gravelly sandy loam. They are well-drained and have slow runoff, low natural fertility, and low available water capacity (Berndt, 1977; Michigan Agricultural Experiment Station, 1952).

Hydrology

There are no streams flowing through St. Helena Island Wetland, but the wetland is adjacent to Lake Michigan (U.S.G.S. quadrangle map, McGulpin Point, Michigan, 1964). The literature search provided no site-specific data pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in St. Helena Island Wetland.

Climate

The closest weather station providing climatic data for St. Helena Island Wetland is located in Mackinaw City, Michigan. Based on the normal period from 1931-1960, the mean monthly low for January is 14.6°F and the mean monthly high for July is 66.9°F. The average annual precipitation is 28.88 inches, with a mean monthly precipitation of 15.9 inches in January and 2.37 inches in July. The first killing frost (28°F) in 1972 occurred on October 10. Average annual temperature and freeze data are not readily available for this station (National Oceanic and Atmospheric Administration, 1972).

Special Features

No natural special features are found in the vicinity of St. Helena Island Wetland (U.S.G.S. quadrangle map, McGulpin Point, Michigan, 1964).

BIOTIC SETTING

LM 416

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of St. Helena Island Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in St. Helena Island Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in St. Helena Island Wetland.

Reptiles and Amphibians

Appendix C-15 contains general information on reptiles and amphibians of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to St. Helena Island Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Appendix D-32 contains general information on wetland birds of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to St. Helena Island Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting St. Helena Island Wetland.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in St. Helena Island Wetland by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland. However, the Mississippi Flyway Waterfowl Habitat Reconnaissance describes St. Helena Island Wetland as significant habitat for wading birds and shore birds (Martz, 1976).

CULTURAL SETTING

LM 416

Population

St. Helena Island Wetland is believed to be unpopulated, with the exception of some seasonal visitation.

Land Use and Ownership

Land use within and surrounding St. Helena Island Wetland is rural open space (U.S.G.S. quadrangle map, McGulpin Point, Michigan, 1964; Razaque and McNamara, 1976; Tremont, 1977). The wetland is under private ownership (Rockford Map Publishers, Inc., 1972), but its location on an uninhabited island suggests that development pressures are minimal.

Recreation

There are no known state or federal recreational facilities in the vicinity of St. Helena Island Wetland.

Mineral, Energy, and Forest Resources

No site-specific information was located through the literature search pertaining to the nature and distribution of mineral resources in St. Helena Island Wetland, or to any operations exploiting those resources. There are no oil, gas, or coal resources in or near the wetland (Michigan Geological Survey, 1977; Smith, 1915).

St. Helena Island Wetland contains no significant forest resources (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of St. Helena Island Wetland (U.S.G.S. quadrangle map, McGulpin Point, Michigan, 1964).

Pollution Sources

There are no NPDES permit holders adjacent to St. Helena Island Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of St. Helena Island Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Peebles and Black, 1976).

RESEARCH PROJECTS

LM 416

The literature search identified no on-going or impending research projects pertaining to St. Helena Island Wetland.

POINT ST. IGNACE WETLAND

PHYSIOGRAPHIC SETTING

LM 417

Setting

Point St. Ignace Wetland is adjacent to the northern shoreline of Lake Michigan in Mackinac County, Michigan, one mile west of the city of St. Ignace. Point St. Ignace Wetland is situated to the east of Point La Barbe; much of the wetland consists of emergent vegetation extending into the shallow water along the lakeshore. The wetland is a Lacustrine System, and occupies a low, partially wooded site (U.S.G.S. quadrangle map, St. Ignace, Michigan, 1964).

Topography

The total relief of Point St. Ignace Wetland is 10 feet; wetland elevations range from 580 to 590 feet above sea level (lake level to 10 feet above the approximate mean elevation of Lake Michigan). The wetland lies on a rolling till plain on the south-facing slope of the Niagara Cuesta. The Great Lakes Basin Commission (1975) describes the shoreline near Point St. Ignace Wetland as a non-erodible low plain.

Surficial Geology

The surficial geology of Point St. Ignace Wetland consists of rock at or near the surface (Martin, 1957).

Soils

The soil type in Point St. Ignace Wetland is Eastport-Roscommon sand, which has a surface layer of black, partially decomposed leaf litter underlain by sand. This soil has little available water capacity, rapid permeability, and low natural fertility (Berndt, 1977; Michigan Agricultural Experiment Station, 1952).

Hydrology

There are no streams flowing through Point St. Ignace Wetland, but the wetland is adjacent to the lake shore (U.S.G.S. quadrangle map, St. Ignace, Michigan, 1964). The literature search provided no site-specific data pertaining to water level influences, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Point St. Ignace Wetland.

Climate

The closest weather station providing climatic data for Point St. Ignace Wetland is located in Mackinaw City, Michigan. Based on the normal period from 1931-1960, the mean monthly low for January is 14.6°F and the mean monthly high for July is 66.9°F. The average annual precipitation is 28.88 inches, with a mean monthly precipitation of 15.9 inches in January and 2.37 inches in July.

The first killing frost (28⁰F) in 1972 occurred on October 10. Average annual temperature and freeze data are not readily available for this station (National Oceanic and Atmospheric Administration, 1972).

Special Features

No natural special features are found in the vicinity of Point St. Ignace Wetland (U.S.G.S. quadrangle map, St. Ignace, Michigan, 1964; Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

BIOTIC SETTING

LM 417

Vegetation

The literature search yielded no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Point St. Ignace Wetland.

Fish

A search of the literature provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, recreational and commercial use, or food sources of the fish populations in Point St. Ignace Wetland.

Invertebrates

The literature search produced no site-specific data pertaining to species composition, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in Point St. Ignace Wetland.

Reptiles and Amphibians

Appendix C-15 contains general information on reptiles and amphibians of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to Point St. Ignace Wetland. The literature search yielded no site-specific information pertaining to major species, seasonal distribution and abundance, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in this wetland.

Avifauna

Appendix D-32 contains general information on wetland birds of Lake Section 15, but care should be exercised in the interpretation of the relevance of these studies to Point St. Ignace Wetland. The literature search provided no site-specific information pertaining to seasonal abundance, density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing this wetland.

Mammals

The literature search provided no site-specific data pertaining to major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, food sources, or relationship to water levels of the mammals inhabiting Point St. Ignace Wetland.

Endangered Species

No plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Michigan Endangered and Threatened Species Program, 1976) were documented in Point St. Ignace Wetland by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland. However, the Mississippi Flyway Waterfowl Habitat Reconnaissance describes Point St. Ignace Wetland as significant habitat for wading birds and shore birds (Martz, 1976).

CULTURAL SETTING

LM 417

Population

Point St. Ignace Wetland is located in Moran Township of Mackinac County, Michigan. The county is sparsely populated, having a density of ten persons per square mile. Table 15-27 indicates that Mackinac County experienced a rapid rate of population growth between 1970 and 1975, but Moran Township had a slow decline in population during the same time period. Projections for 1990 indicate that Mackinac County is expected to undergo moderate population growth in the future.

Table 15-27. Population Data for the Vicinity of Point St. Ignace Wetland

	Estimated Population 1975 ^a	Estimated %Δ 1970-1975 ^a	Projected Population 1990 ^b
Mackinac County	10,714	10.9	12,208
Moran Township	770	-1.2	--

^a U.S. Bureau of the Census (1977)

^b Michigan Department of Management and Budget (1977)

Land Use and Ownership

Land use within Point St. Ignace Wetland is rural open space. The immediate surroundings of the wetland are rural open space, but an area of residential, commercial, and industrial development (the city of St. Ignace) lies to the northeast of the wetland (U.S.G.S. quadrangle map, St. Ignace, Michigan, 1964; Razaque and McNamara, 1976; Tremont, 1977). The wetland is under private ownership (Rockford Map Publishers, Inc., 1972), and lies within an area planned for use as medium to high density urban development (Razaque and McNamara, 1976). Should these plans be realized, the wetland may face moderate to high development pressures.

Recreation

There are no known state or federal recreational facilities in the vicinity of Point St. Ignace Wetland.

Mineral, Energy, and Forest Resources

An active sand and gravel operation is located north of Point St. Ignace Wetland (Michigan Department of State Highways and Transportation aerial photograph, 1973). There are no oil, gas, or coal resources near the wetland (Michigan Geological Survey, 1977; Smith, 1915). Point St. Ignace Wetland contains no significant forest resources (Indiana University, Environmental Systems Application Center aerial reconnaissance, 1978).

Public Utilities and Facilities

There are no public utilities within 0.5 mile of Point St. Ignace Wetland (U.S.G.S. quadrangle map, St. Ignace, Michigan, 1964).

Pollution Sources

There are no NPDES permit holders adjacent to Point St. Ignace Wetland (Michigan Water Quality Division, 1978). No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical sites exist within 500 feet of Point St. Ignace Wetland, nor are there any known archaeological sites in the vicinity. However, the area has not been systematically surveyed by a professional archaeologist (Pebbles and Black, 1976).

RESEARCH PROJECTS

LM 417

The literature search identified no on-going or impending research projects pertaining to Point St. Ignace Wetland.

Table 15-28. Data Gaps - Lake Section 15

Data Gap*		Wetland Number																		
		379	380-381	382-383	384	385	386-389	390-393	394	395-396	397-398	399	400-404	405	406-409	410-414	415	416	417	
Physiographic Setting	Setting																			
	Topography																			
	Surficial Geology																			
	Soils																			
	Hydrology	Water Level Fluctuations	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		Groundwater	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		Water Quality	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		Depth	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		Seasonal Changes	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	Climate	Climate																		
Special Features																				
Vegetation	Major Species Distribution	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Major Species Composition	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Density/Productivity	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Relationship to Water Levels	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Fish	Major species	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Species Composition	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Seasonal Distribution	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Spawning and Hatching Areas	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Commercial/Recreational Use	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Life Histories	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Food Sources	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Relationship to Water Levels	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Invertebrates	Species Composition	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Seasonal Distribution	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Density/Productivity	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Food Sources	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Relationship to Water Levels	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Amphibians/Reptiles	Major Species	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		Seasonal Distribution	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		Density/Productivity	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		Recreational/Commercial Use	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		Life Histories	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Food Sources		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Avifauna	Major Species	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Seasonal Distribution	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Density/Productivity	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Recreational/Commercial Use	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Life Histories	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Food Sources	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Mammals	Major Species	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Seasonal Distribution	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Density/Productivity	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Recreational/Commercial Use	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Life Histories	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Food Sources	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Cultural Setting	Relationship to Water Levels	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Endangered Species																			
	Health	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
	Population																			
	Land Use and Ownership																			
	Recreation																			
	Mineral, Energy, Forest Resource																			
	Public Utilities/Facilities																			
	Point Pollution Sources																			
	Non-Point Pollution Sources	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Historic Features																				
Archaeologic Features	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		

SUMMARY

PHYSIOGRAPHIC SETTING

The information necessary to prepare the setting, topography, surficial geology, soil, hydrology, climate, and special features elements for each wetland description was gathered from U.S.G.S. quadrangle maps and publications of the Argonne National Laboratory, Great Lakes Basin Commission, National Oceanographic and Atmospheric Administration and various agencies of the states of Illinois, Indiana, Michigan, and Wisconsin. The majority of coastal wetlands of Lake Michigan are Lacustrine Systems and frequently are wooded or partially wooded. These areas typically have little relief and are likely to be influenced by water level fluctuations in Lake Michigan. Lake sands underlie most wetlands; the remainder are underlain by lacustrine sediments and/or glacial till. A diversity of soil types occurs within these wetlands. Mean surface temperatures range from 42.8°F (6°C) in the north to 50°F (10°C) in the south. The mean annual precipitation ranges from 31.5 to 35.4 inches within the Lake Michigan basin.

BIOTIC SETTING

Vegetation

The available literature provides little current site-specific information regarding major species composition, density and productivity, or relationship of vegetation to water levels in the coastal wetlands of Lake Michigan. However, for a few wetland areas, primarily those in the vicinity of Chicago, the literature provides current species composition and vegetational analyses. The scarcity of current site-specific information does not indicate a lack of botanical literature; a wealth of vegetation studies exists from the early part of the twentieth century. Some of this literature is very general in scope, but some is species or topic-specific.

The wetland flora of Lake Michigan's coastal zone is very rich. On the south shore dune-swale, wet prairie, swamp-forest, and shoreline marshes contribute to overall habitat diversity and to related species diversity. Farther north, the deciduous forest gives way to conifer forest and more boreal plant communities such as those found in Bailey's Harbor-Ephraim Swamp. In this region, bogs and conifer swamps are common. Perhaps the most striking feature of these northern wetlands is the diversity of orchids present. However, coastal wetlands tend to be less rich in orchid flora than the extensive inland swamp-forest-bog wetlands.

While much is known regarding plant distribution and general community composition in the Lake Michigan coastal zone, large expanses of coastal wetland areas and their inland extensions are virtually unknown botanically, and should provide a major challenge to the botanist for years to come.

Fish

There has been no systematic survey of the fishes in coastal wetlands of Lake Michigan. However, it is possible to extrapolate the species likely to exist in some of the wetlands by using existing surveys of adjacent deepwater habitats (i.e. lakes, ponds, rivers) to identify species in the vicinities of the wetlands and, knowing the habitat preferences of these species, to predict the utilization of the wetlands by certain species.

In the state of Michigan, fishery surveys of rivers, lakes, and nearshore waters adjacent to coastal wetlands are found primarily in unpublished reports of the Institute for Fisheries Research of the Michigan Department of Natural Resources. Secondary sources are environmental impact assessment surveys regarding coastal operations of the U.S. Army Corps of Engineers. No site-specific information regarding the fishes of the coastal wetlands in Indiana was located during the literature search. However, regional information (Carline, 1977; Texas Instruments Incorporated, 1975, 1976, 1977; Northern Indiana Public Service Company, 1977; Downing, 1922) pertaining to the fishes of marshes, bogs, swamps, and intradunal ponds in the Indiana Dunes area, particularly those surrounding the Bailly Electric Generating Station, permitted inference of the species compositions of similar coastal wetlands.

The Illinois fisheries data base was found to be the most extensive for any coastal area in Lake Michigan. Most of the information was dated and consisted primarily of ichthyological and fishery surveys of the Calumet drainage system by the Illinois Natural History Survey, Illinois Department of Conservation, U.S. Fish Commission, and the Chicago Museum of Natural History. However, recent site-specific information regarding the fishes of Illinois Beach State Park and its coastal wetlands was available (Tichacek and Wight, 1972; Illinois Beach Management Plan Task Force, 1973; Evers and Page, 1977).

The state of Wisconsin has developed a mapping and inventory program for fish and wildlife habitat in its coastal zone. The fisheries component of this program relies heavily on lists of species from tributaries, lakes, ponds, swamps, and marshes of the coastal zone as presented in the "Surface Water Resources" series developed for each county by the Wisconsin Department of Natural Resources. This series provided the primary data base of fisheries information on coastal wetlands in Wisconsin.

Many species of fish utilize coastal wetlands, but comparatively few species are strongly dependent on aquatic vegetation for spawning or cover. The more common wetland-dependent species found in the Lake Michigan basin (Table 4) include longnose gar (Lepisosteus osseus), bowfin (Amia calva), central mudminnow (Umbra limi), northern pike (Esox lucius), grass pickerel (Esox americanus), goldenshiner (Notemigonus crysoleucas), blacknose shiner (Notropis heterolepis), blackchin shiner (Notropis heterodon), tadpole madtom (Noturus gyrinus), brook stickleback (Culaea inconstans), banded killifish (Fundulus diaphanus), and Iowa darter (Etheostoma exile). Several other species are largely restricted to vegetated waters and are either uncommon or rare in the Lake Michigan basin. These are the spotted gar (Lepisosteus oculatus), muskellunge (Esox masquinongy), pugnose shiner (Notropis anogenus), pugnose

minnow (Notropis emiliae), weed shiner (Notropis texanus), redbfin shiner (Notropis umbratilis), pirate perch (Aphredoderus sayanus), and starhead topminnow (Fundulus notti) (Becker, 1976; Trautman, 1957). The northern pike, muskellunge, and pumpkinseed are important game fishes in the Lake Michigan basin, including coastal wetlands, bays, and tributaries, although the muskellunge is uncommon and is apparently maintained largely by stocking (Becker, 1976).

Several fish species found in the Lake Michigan basin are common to abundant in wetlands and adjacent waters, although they are often found in other habitats as well. The gizzard shad (Dorosoma cepedianum), goldfish (Carassius auratus), carp (Cyprinus carpio), fathead minnow (Pimephales promelas), bluntnose minnow (Pimephales notatus), white sucker (Catostomus commersoni), black bullhead (Ictalurus melas), brown bullhead (Ictalurus nebulosus), yellow bullhead (Ictalurus natalis), bluegill (Lepomis macrochirus), largemouth bass (Micropterus salmoides), white crappie (Pomoxis annularis), and black crappie (Pomoxis nigromaculatus), prefer quiet, low-gradient waters with bottoms of mud or clay. These species are generally cover-oriented and may be encountered in sheltered riverine and lacustrine coastal wetlands along Lake Michigan. All except the gizzard shad, goldfish, and bluntnose and fathead minnows are significant game species (Becker, 1976).

The smallmouth bass (Micropterus dolomieu), brassy minnow (Hybognathus hankinsoni), mimic shiner (Notropis volucellus), lake chubsucker (Erimyzon sucetta), spotted sucker (Minytrema melanops), rock bass (Ambloplites rupestris), green sunfish (Lepomis cyanellus), johnny darter (Etheostoma nigrum), logperch (Percina caprodes), and mottled sculpin (Cottus bairdi) are generally associated with lotic waters and clean, sand or gravel bottoms. These species are commonly found in rivers and streams, but they are also common in coastal lake waters, where they probably utilize deep lacustrine and riverine wetlands with sand or gravel bottoms. The green sunfish, smallmouth bass, and rock bass are significant game species. Among commercial and game species, the walleye (Stizostedion vitreum) and most salmonids apparently have little direct association with coastal wetlands. Other species of commercial or recreational importance, including yellow perch (Perca flavescens), white bass (Morone chrysops), and freshwater drum (Aplodinotus grunniens) are ubiquitous in most of the coastal zone, particularly in river mouths and estuaries, and may be locally common in some coastal wetlands (Becker, 1976; Trautman, 1957).

Beyond a general knowledge of species composition and recreational use of the fish fauna of Lake Michigan coastal wetlands, little is known about the actual relationships of the species to the wetlands in terms of their utilization for spawning, nursery, and feeding areas, or fish community structure, niche occupation, and interspecific relationships within wetlands. The coastal wetlands of Lake Michigan support a mixed fish fauna of coldwater-warmwater species. At least 19 species, including three game species, are largely dependent on wetlands for spawning, juvenile cover, and adult habitat. In addition to these species, many species common in other coastal habitats, including at least 12 game species, are also common in coastal wetlands, depending on conditions of shelter, bottom type, water clarity, and water depth, and density of vegetation. The more extensive lacustrine and riverine wetlands are clearly of greater importance in terms of the biomass and diversity of

economically important species, including forage fish, which they support. However, large palustrine wetlands, given sufficient winter oxygen levels or at least seasonal surface connections to tributary streams or Lake Michigan itself, can be significant fish habitat units. It is apparent that the removal of coastal wetland along Lake Michigan would result in the degradation of fish habitat, a decline in abundance of many species, and deterioration of recreational fishing quality. Given the scarcity of site-specific information, few value judgements are possible for individual wetlands in terms of their importance to fish production for profit or recreation or as preserves for unique fish species or communities.

Invertebrates

The invertebrate fauna of Lake Michigan wetlands is poorly documented. The basis for the paucity of information is twofold. First, the invertebrate fauna of these wetlands frequently must be inferred from studies specifically concerned with the fauna of the nearshore zone, harbors, and/or tributaries, and sampling programs for these efforts normally restrict the number of study sites within wetland boundaries.

Secondly, wetland habitats are diverse. The diversity of species is exceeded only by the complexity of sampling procedures required to properly assess their numbers. The taxonomy and systematics of many groups of organisms common to wetlands has been poorly studied. The latter problem alone is sufficient to deter all but the most intrepid ecologist. The knowledge required to properly identify the diversity of wetland invertebrates is scattered among several score of taxonomic specialists. These problems combine to prevent any comprehensive characterization of the invertebrate fauna of wetlands. In contrast, open water habitats in the nearshore zone, harbors and stream channels are relatively easy to sample and the fauna is relatively well known.

Overall environmental impact statements of harbor improvements have provided distribution data for macrobenthic indicator species. The remainder of the information reported in this volume was gleaned from regional and watershed surveys, which represent historical rather than current sources.

Reptiles and Amphibians

Sources of information pertaining to the herpetofauna of coastal wetlands of Lake Michigan are scarce. State agencies concerned with natural resources do not generally collect data on reptiles and amphibians, and such literature that exists is largely academic in origin and general in nature, covering broad geographical areas and pertaining to abundance, distribution, and life history characteristics. Sources of general information include Pentecost and Vogt (1976), who provided summaries of life histories, distribution, and status of species in the entire Lake Michigan basin. Minton (1972) provided general information on the herpetofauna of Indiana, and Vogt (1976) recently completed a similar survey for Wisconsin. Somewhat older surveys were presented by Smith (1961) for Illinois, Ruthven et al. (1928) for Michigan and Pope (1944) and Pope and Dickinson (1928) for Wisconsin. Endangered and threatened reptiles and amphibians in Michigan were discussed by Tinkle and Hensley (1975).

Sixty-four species and subspecies of reptiles and amphibians are thought to occur in the Lake Michigan basin (Table 5). Not all these forms are indigenous to wetland habitat. For example, while all amphibians require moist conditions for breeding and are potential wetland utilizers from this standpoint, several, including Fowler's toad (Bufo woodhousei fowleri) and the red-backed salamander (Plethodon cinereus), are primarily moist upland or xeric area inhabitants and are thus only seasonally important in lowland wet areas. The central newt (Notophthalmus viridescens louisianensis), mudpuppy (Necturus maculosus), and western lesser siren (Siren intermedia nettingi) are largely aquatic species which may occur in coastal wetlands or adjacent deepwater habitat within their respective ranges. The majority of amphibians are seldom found far from standing water and are thus likely to occur in coastal marshes, bogs, or swamp forest, depending on their preferences for wooded or open habitat. The more abundant amphibians likely to be found in the coastal wetlands of Lake Michigan are the blue-spotted salamander (Ambystoma laterale), spotted salamander (Ambystoma maculatum), eastern tiger salamander (Ambystoma tigrinum tigrinum), American toad (Bufo americanus), Blanchard's cricket frog (Acris crepitans blanchardi), northern spring peeper (Hyla crucifer crucifer), gray treefrog (Hyla versicolor), western chorus frog (Pseudacris triseriata triseriata), bullfrog (Rana catesbeiana), green frog (Rana clamitans melanota), northern leopard frog (Rana pipiens), mink frog (Rana septentrionalis), and wood frog (Rana sylvatica) (Conant, 1975; Pentecost and Vogt, 1976).

Many reptiles found in the Lake Michigan basin are inhabitants of upland forests, fields, or prairies and are not generally considered wetland forms, although they may commonly occur in wetland borders or drier types of wetlands. These include the lizards, the eastern box turtle (Terrapene carolina carolina), blue racer (Coluber constrictor foxi), eastern hognose snake (Heterodon platyrhinos), eastern and western smooth green snakes (Opheodrys vernalis vernalis and O. v. blanchardi), black rat snake (Elaphe obsoleta obsoleta), bullsnake (Pituophis melanoleucus sayi), eastern milk snake (Lampropeltis triangulum triangulum), and northern ringneck snake (Diadophis punctatus edwardsi). Most of the remaining snakes and turtles are aquatic or semi-aquatic and are likely to be found in coastal wetlands, as well as in open water or moist terrestrial habitats. The western fox snake (Elaphe vulpina vulpina) in particular is largely restricted to extensive marshlands (Conant, 1975; Pentecost and Vogt, 1976). The more abundant reptiles likely to be found in the coastal wetlands of Lake Michigan include the snapping turtle (Chelydra serpentina), stinkpot (Sternotherus odoratus), map turtle (Graptemys geographica), midland and western painted turtles (Chrysemys picta marginata and C. p. belli), Blanding's turtle (Emydoidea blandingi), eastern spiny softshell (Trionyx spiniferus spiniferus), northern water snake (Natrix sipedon sipedon), northern and midland brown snakes (Storeria dekayi dekayi and S. d. wrightorum), northern red-bellied snake (Storeria occipitomaculata occipitomaculata), eastern garter snake (Thamnophis sirtalis sirtalis), and western fox snake. The eastern massasauga (Sistrurus catenatus catenatus), although rare, is most often found in bog or swamp conditions.

Except for the western fox snake, most of the reptiles and amphibians probably found in the coastal wetlands of Lake Michigan are species which are indigenous to a broad range of wet to moist habitats, and as such they are not entirely dependent on coastal wetlands for survival within the Lake Michigan

basin as a whole. However, the continued abundance of most of these species within the actual coastal zone probably depends on extensive, undisturbed coastal wetlands. The presence of water, food, and cover, and relative isolation from the cultural development pressing on more accessible coastal areas are among the factors which contribute to the importance of the coastal wetlands in maintaining the coastal zone herpetofauna. No published information was found pertaining to the recreational or commercial use of the herpetofauna, but the bullfrog, green frog, and snapping turtle are abundant and potentially harvestable species. Beyond a general idea of the occurrence of reptiles and amphibians in the coastal zone, little information pertaining to population and community characteristics of the herpetofauna of coastal wetlands was found. Reptiles and amphibians in the coastal wetlands probably serve as food sources for many species of fish, birds, and mammals frequenting the wetlands. A scarcity of site-specific information precludes a general statement regarding the condition and value of reptiles and amphibians in the coastal wetlands of Lake Michigan, although the size and isolation of many of the wetlands would hint at a diverse and abundant herpetofauna in many areas.

Avifauna

Published, site-specific information pertaining to the avifauna of the coastal wetlands of Lake Michigan is scarce. Reports such as those describing Grand Mere by the Grand Mere Association (1973) and Green Bay by Bertrand, et al. (1976), were quite valuable. Interviews with various field biologists were useful. Overall, the majority of the information used to compose the avifauna elements of each wetland description was obtained from studies conducted by personnel of the several state departments of natural resources.

The approximately 150 species of birds known to inhabit the coastal wetlands of Lake Michigan range from those requiring wetland habitat during some portion of their life history to those utilizing wetland habitat only occasionally. Coastal wetlands serve as important concentration areas for migratory waterfowl. A number of species of raptors assigned threatened or endangered status may utilize wetland habitat during migration. In particular, large numbers of hawks concentrate along the shores of Lake Michigan during the fall migration period. Localized drainage programs, urban expansion, and coastal flooding accompanying above average lake levels have resulted in the loss of a significant amount of habitat critical to the maintenance of wetland associated birds. According to Jaworski and Rafael (1978), 1,473 acres of wetland in the Bay de Noc area (50% of the total) were lost between 1910 and 1958).

Mammals

Literature sources provided much general information but contained little site-specific information concerning the mammals of the Lake Michigan wetlands. General works, including recent regional surveys (Long 1974; Krekeler, 1975; Brewer, 1976; Illinois Natural History Survey, 1976), technical reports (Bertrand et al., 1976), and studies of island mammalian faunas (Hatt et al., 1923; Phillips et al., 1965; Long, 1978), were useful in establishing the key and major species of numerous wetlands. Assessments of the value of coastal wetlands (Bertrand et al., 1976; Jaworski and Raphael, 1978) provided

information relating to the commercial and recreational use of wetland mammals. Site-specific information was found chiefly in nature preserve pamphlets, management plans, and some environmental impact statements. Open file reports and data sheets of the Wisconsin Department of Natural Resources, from the wetland classification program (Thompson et al., 1976) and Scientific Areas Preservation Council, and of the Michigan Department of Natural Resources, from the Wildlife Division and the Coastal Zone Management Program, contain a wealth of site-specific information. Although some information from these sources has been included in this document, complete analyses of these sources were beyond the scope of this study.

The coastal wetlands of Lake Michigan may be utilized by a variety of mammals (Table 6). Since the plant communities in the Lake Michigan basin can be separated along the Wisconsin moraine into northern and southern groupings (Long, 1974; Stearns and Kobriger, 1975), the mammalian species of the basin may also be divided into northern and southern complexes. Raccoons (Procyon lotor) and striped skunks (Mephitis mephitis) are observed most frequently in the western portion of the drainage basin. Franklin's ground squirrel (Spermophilus franklinii) is restricted to wetlands in the dunes area of southern Lake Michigan. The little brown myotis (Myotis lucifugus) is the most common of the bat species found in the Lake Michigan drainage basin (Long, 1974) and would be the most likely bat observed foraging in coastal wetlands. The diversity of mammals in island wetlands is usually lower than the diversity in mainland wetlands. The utilization of wetlands varies greatly among mammalian species (Table 6).

The arctic shrew (Sorex arcticus), beaver, muskrat (Ondatra zibethicus), mink (Mustela vison), and river otter (Lutra canadensis) have the greatest dependence on wetlands. Furbearers are an important resource in most wetlands of Lake Michigan, particularly in the Green Bay area, Little Bay de Noc, and Big Bay de Noc, and in the larger coastal wetlands associated with rivers.

Table 6. The Abundance and Wetland Usage of Mammalian Species, by Region, in the Lake Michigan Drainage Basin^a

Common name	Abundance in Basin	Wetland Usage ^b
Associated only with southern plant communities		
Franklin's ground squirrel	rare	primary
Associated only with northern plant communities		
water shrew	rare	major-(S)
artic shrew	uncommon	primary-(S)
star-nosed mole	common	major-S
snowshoe hare	abundant	major-(S)
deer mouse (Woodland) ^c	abundant	minor-S
Gapper's red-backed mouse	abundant	major-S

woodland jumping mouse	rare	major
porcupine	uncommon	minor-S
black bear	rare	foraging area
river otter ^d	uncommon	primary
bobcat ^{d,e}	uncommon	foraging area-(S)

Associated with both types

masked shrew	abundant	major
short-tailed shrew	abundant	major
eastern cottontail	abundant	minor
red squirrel	abundant	minor-S
beaver	common	primary
white-footed mouse	abundant	minor
meadow vole	abundant	major
muskrat	abundant	primary
meadow jumping mouse	abundant	major
coyote	uncommon	foraging area
red fox	abundant	foraging area
raccoon	uncommon	foraging area
long-tailed weasel	rare	minor
ermine	common	major
least weasel	rare	major
mink	uncommon	primary
striped skunk	abundant	foraging area
white-tailed deer	abundant	foraging area

^a from Long (1974)

^b Based on whether wetlands are primary, major, or minor habitats for breeding, nesting, raising of young, and foraging. S = only found in swamps or wooded wetlands. (S) = swamps and wooded wetlands are preferred wetland type.

^c Peromyscus maniculatus gracilis, one of the two distinctive geographic races of deer mouse found in the Lake Michigan region.

^d On Indiana endangered species list.

^e On Illinois threatened species list.

Endangered Species

Eleven species of birds observed in the Lake Michigan wetlands are on the state or federal lists of threatened or endangered species. The bald eagle (Haliaeetus leucocephalus) and the peregrine falcon (Falco peregrinus) are on the federal list of species threatened in Michigan. The peregrine falcon is on the federal endangered species list for Indiana. Three historic nesting sites for the bald eagle occur in Lake Michigan: Big Stone Pond Wetland, Gull Island Wetland, and Beaver Island Wetland. The osprey (Pandion haliaetus) is on the Illinois and Wisconsin lists of endangered species; the Cooper's hawk (Accipiter cooperii) is listed as threatened in Wisconsin and Michigan, and is considered endangered in Illinois. The piping plover (Charadrius melodus), the double-crested cormorant (Phalacrocorax auritus), and the red-shouldered hawk

(Buteo lineatus) are on the threatened list for Wisconsin and Michigan. The marsh hawk (Circus cyaneus) is on the endangered list in Illinois and the threatened list in Michigan. The great egret (Casmerodius albus) and the American bittern (Botaurus lentiginous) are endangered in Illinois.

Fish species having a known or suspected association with the coastal wetlands of Lake Michigan and listed by adjacent states as rare, threatened, or endangered (Appendix F-1) include the western sand darter (Ammocrypta clara), pugnose shiner (Notropis anogenus), blacknose shiner (Notropis heterolepis), weed shiner (Notropis texanus), redbfin shiner (Notropis umbratilis), starhead topminnow (Fundulus notti), pugnose minnow (Notropis emiliae), banded killifish (Fundulus diaphanus), lake chubsucker (Erimyzon sucetta), and pirate perch (Aphredoderus sayanus). The lake sturgeon (Acipenser fulvescens), lake whitefish (Coregonus clupeaformis), cisco (Coregonus artedii), pugnose shiner, blacknose shiner, and long nose sucker (Catostomus catostomus) have been placed on the Illinois threatened species list.

Several species of reptiles and amphibians found in the Lake Michigan basin are listed as endangered, threatened, or rare, or have been placed on watch status in states adjoining Lake Michigan (Table E-5). The queen snake (Natrix septemvittata), pickerel frog (Rana palustris) and the wood turtle (Clemmys insculpta) are on the Wisconsin endangered species list. The Illinois mud turtle (Kinosternon flavescens spooneri) and pickerel frog are generally rare within the Lake Michigan basin. Other listed species reach the periphery of their ranges in one or more of the states adjoining Lake Michigan and are consequently protected in those states, although they are common in other areas of the Lake Michigan basin or in their range as a whole. Species listed in Appendix F-1, not indicated in Table 5 in the Reptiles and Amphibians summary, are not found in the Lake Michigan drainages of the states concerned.

The gray wolf (Canis lupus) is listed as an endangered species in all portions of the Lake Michigan drainage basin. Although the gray wolf may be found in the northern area of Lake Michigan (Long 1974), no records were found to indicate that gray wolves utilize the coastal wetlands as foraging areas.

CULTURAL SETTING

The information necessary to prepare the population data for each wetland description was gathered from publications of the various regional planning agencies; the states of Indiana, Illinois, Michigan, and Wisconsin; and the U.S. Census Bureau. With the exception of wetlands located in Lake County (Indiana), Cook County (Illinois), and Milwaukee County (Wisconsin), areas in the vicinity of coastal wetlands are sparsely to moderately populated. With some regional differences, population growth is expected to parallel the national average. Many coastal wetlands are subject to impact by seasonal residents from the greater Chicago and Detroit metropolitan areas.

The remaining elements of each wetland description were prepared from personal interviews, correspondence interrogatories, various federal, private, and state registers, publications of regional and state planning agencies and U.S.G.S. quadrangle maps. Coastal wetlands typically exist as rural open space

or rural wooded space under mixed private-public ownership. In these instances, the wetlands are subject to low or moderate development pressure. When subject to residential development or urban expansion, pressure is high to severe in nature. Roadways and railroads within or along the borders of wetlands are the most frequently encountered feature likely to have an impact on the physical and biological status of the wetlands. Public ownership is typically represented by wetlands wholly or partially within the confines of state forests, game areas, natural areas, or parks. Little information is available concerning recreation facilities within a wetland proper, but such facilities are probably limited in scope.

The majority of coastal wetlands bordering Lake Michigan contain mineral deposits and forest resources. Energy resources in the form of oil and gas are present in the northwestern portion of the Lower Peninsula of Michigan. Wetlands are often crossed by electric transmission lines, telephone lines, and pipelines. No point source discharges of pollutants were pinpointed within the limits of a coastal wetland. The impact of closely adjacent discharges was impossible to determine from available sources. No historical or archaeological sites were documented, although there is reason to believe that archaeological sites may be present. There are few wetland research efforts presently under way in Lake Michigan coastal wetlands.

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Appendix A-1. Fish Species Found in Hamlin Lake, Mason County,
Michigan^a

Use category and common name	Use category and common name
<u>Game Species</u>	<u>Forage Species</u>
yellow perch ^b	mimic shiner
bluegill ^b	bluntnose minnow ^b
largemouth bass ^b	sand shiner
rock bass	johnny darter ^b
pumpkinseed ^b	logperch ^b
black crappie ^b	Iowa darter ^b
northern pike ^b	goldenshiner ^b
walleye	blackchin shiner ^b
smallmouth bass	spottail shiner
muskellunge ^b	banded killifish ^b
rainbow trout	brook stickleback ^b
white bass	brook silverside ^b
	blacknose shiner ^b
<u>Coarse Species</u>	central mudminnow ^b
white sucker ^b	tadpole madtom ^b
brown bullhead ^b	least darter
shorthead redhorse	<u>Obnoxious Species</u>
freshwater drum	longnose gar ^b
black bullhead ^b	bowfin ^b
golden redhorse	carp ^b
yellow bullhead ^b	
longear sunfish	

^afrom Brown and Kilpela (1942), species in decreasing order of abundance within each use category, categorization by the authors

^bspecies most likely occurring in wetlands (Becker, 1976; Trautman, 1957)

Appendix A-2. Fish Species Found in Muskegon Lake and Muskegon River,
Muskegon County, Michigan^a

Use category and common name	Use category and common name
<u>Game Species</u>	<u>Forage Species</u>
bluegill ^b	bluntnose minnow ^b
yellow perch ^b	blacknose shiner ^b
pumpkinseed ^b	goldenshiner ^b
black crappie ^b	banded killifish ^b
rock bass	Iowa darter ^b
largemouth bass ^b	brook silverside
northern pike ^b	logperch ^b
walleye	tadpole madtom ^b
pumpkinseed x bluegill hybrid ^b	
sauger	<u>Obnoxious Species</u>
white bass	longnose gar ^b
smallmouth bass	bowfin ^b
warmouth ^b	carp ^b
pumpkinseed x warmouth hybrid ^b	
<u>Coarse Species</u>	
white sucker ^b	
black bullhead ^b	
redhorse (<u>Moxostoma</u> sp.)	
brown bullhead ^b	
freshwater drum ^b	
yellow bullhead ^b	
channel catfish	

^afrom Peterson (1951), species in decreasing order of abundance within each use category, categorization by the author

^bspecies often associated with wetlands (Becker, 1976; Trautman, 1957)

Appendix B-1. Mosquitoes of Indiana^a

Aedes cinereus

A. excrucians

A. stimulans

A. fitchii

A. grossbecki

A. vexans

A. canadensis C.

Culex erraticus

C. pipiens p.

C. territans

C. salinarius

Culiseta inornata

C. morsitans dyari

C. silvestris minnesotae

Psorophora confinnis

P. ferox

Coquillettidia (Mansonia) perturbans

Uranotaenia sapphirina

^aTaken from Siverly (1972)

Appendix B-2. Aquatic Oligochaetes, Tricoptera and Diptera
of the Illinois Shoreline of
Lake Michigan

Classification	Status
Aquatic Oligochaetes	
Haplotaxidae	
<u>Haplotaxis gordioides</u> 2	U
Lumbriculidae	
<u>Lumbriculus variegatus</u> 2	U
Naididae	
<u>Aulophorus furcatus</u> 2	R
<u>A. vagus</u> 2	R
<u>Chaetogaster diaphanus</u> 2	C
<u>Dero digitata</u> 2	R
<u>Nais barbata</u> 2	C
<u>N. communis</u> 2	C
<u>N. pardalis</u> 2	U
<u>N. pseudobtusa</u> 2	C
<u>N. simplex</u> 2	C
<u>Pristina breviseta</u> 2	C
<u>P. idrensis</u> 2	U
<u>P. longiseta leidy</u> 2	C
<u>Slavina appendiculata</u> 2	U
<u>Stylaria fossularis</u> 2	U
<u>S. lacustris</u> 2	U
Tubificidae	
<u>Branchiura sowerbyi</u> 2	U
<u>Limnodrilus angustipenis</u> 2	R
<u>L. cervix</u> 2	R
<u>L. claparedeianus</u> 2	U
<u>L. hoffmeisteri</u> 2	C
<u>L. udekemianus</u> 2	U
<u>Pelosclex multisetosus</u> 2	C
<u>P. variegatus</u> 2	C
<u>Potamothrix moldaviensis</u> 2	R
<u>P. vejovskyi</u> 2	U
<u>Psammoryctides curvisetosus</u> 2	U
<u>Rhyacodrilus coccineus</u> 2	R
<u>Tubifex tubifex</u> 2	C
Tricoptera	
Hydroptilidae	
<u>Agraylea multipunctata</u> 1	U
<u>Hydroptila armata</u> 1	U
<u>H. hamata</u> 2	U
<u>H. spatulata</u> 2	C
<u>H. waubesiana</u> 2	C

-continued-
-1480-

Appendix B-2. (continued)

Classification	Status
Hydroptilidae	
<u>Ochrotrichia eliaga</u> 1	C
<u>O. tarsalis</u> 1	U
<u>O. americana</u> 2	U
<u>O. cristata</u> 1	U
<u>Oxyethira pallida</u> 2	C
<u>O. serrata</u> 1	U
Leptoceridae	
<u>Ceraclea alagmus</u> 2	U
<u>C. ancyllus</u> 1	U
<u>Leptocella albida</u> 1	U
<u>L. americanus</u> 2	C
<u>Nectopsyche albida</u> 1	C
<u>Oecetis cinerascens</u> 2	C
<u>O. inconspicua</u> 2	C
<u>Trienodes aba</u> 2	C
<u>T. baris</u> 1	R
<u>T. injusta</u> 1	C
<u>T. marginata</u> 1	U
<u>T. tarda</u>	C
Molannidae	
<u>Molanna uniophila</u> 1	U
Limnephilidae	
<u>Limnephilus conscius</u> 1	U
<u>L. hyalinus</u> 1	U
<u>L. ornatus</u> 1	U
<u>L. sericeus</u> 1	U
Phrygaenidae	
<u>Agryphia vestita</u> 1	C
<u>Banksiola crotchi</u> 2	C
<u>Fabria inornata</u> 1	R
<u>Phryganea cinerea</u> 1	C
<u>P. sayi</u> 2	C
<u>Ptilostomis semifasciata</u> 2	C
Philopotamidae	
<u>Neureclipsis bimaculata</u> 1	U
Polycentropodidae	
<u>Polycentropus cinereus</u> 1	C
<u>P. crassicornis</u> 1	U
<u>P. flavus</u> 1	U
<u>P. interruptus</u> 1	C
<u>P. remotus</u> 1	R

-continued-

Appendix B-2. (concluded)

Classification	Status
Diptera	
Chironomidae	
<u>Ablabesmyia illinoensis</u> 1	P
<u>Harnischia curtilamellatus</u> 1	P
<u>Polypedilum halterale</u> 2	C
<u>P. illinoense</u> 2	P
<u>P. scalaenum</u> 2	C
<u>Procladius bellus</u> 2	C
<u>Tanypus neopunctipennis</u> 2	P
<u>T. stellatus</u> 2	P
<u>Tanytarsus</u> 2	C
Culicidae	
<u>Aedes abserratus</u> 1	P
<u>A. aurifer</u> 1	P
<u>A. cinereus</u> 1	P
<u>A. excrucians</u> 1	P
<u>A. fitchii</u> 1	P
<u>A. flavescens</u> 1	P
<u>A. punctor</u> 1	P
<u>Anopheles punctipennis</u> 1	P
<u>A. quadrimaculatus</u> 1	P
<u>Culex apicalis</u> 1	P
<u>C. salinarius</u> 1	P
<u>C. tarsalis</u> 1	P
<u>Culiseta inornata</u> 1	P
<u>C. melanura</u> 1	P
<u>C. morsitans</u> 1	P
<u>Uranotaenia sapphirina</u> 1	P

1 known to occur, documented sighting
 2 presence verified during this inventory

C=common

U=uncommon, but likely to be observed

R=rare, within the range of species, but seldom observed

P=present, abundance not determined

^aTaken from Illinois Coastal Zone Management Program: A component study of biological communities. Illinois Coastal Zone Management Program, Illinois Department of Transportation, Division of Water Resources. Vol. 2, 186 pp.

Appendix B-3. Oligochaetes Collected from Southern Green Bay^a

Lumbriculidae

Styiodrilus heringianus

Naididae

Arcteonais lomondi

Dero digitata

Nais sp.

N. eilinguis

Ophidonais serpentina

Piquetiella michiganensis

Slavina appendiculata

Specaria josinae

S. lacustris

Uncinais uncinata

Tubificidae (cont'd)

Peloscolex ferox

P. freyi

P. multisetosus multisetosus

P. multisetosus longidentus

P. hammoniensis

P. moldaviensis

P. vejnovskyi

Tubifex kessleri americanus

T. tubifex

Tubificidae

Aulodrilus americanus

A. limnobius

A. piqueti

A. pluriseti

Ilyodrilus templetoni

Limnodrilus cervix

L. claparedeanus

L. hoffmeisteri

L. maumeensis

L. udekemianus

^a Howmiller et al., 1970

Appendix B-4. Relative Abundance of Aquatic Acari in Littoral
Habitat in the Great Lakes^a

Trombidiformes

Hydracarina

<u>Arrenurus americanus</u>	P
<u>A. apetiolata</u>	P
<u>A. manubriator</u>	P
<u>Arrenurus sp.</u>	R
<u>Atractides indistinctus</u>	P
<u>Axonopsis sp.</u>	P
<u>Eylais desecta</u>	P
<u>E. extendens</u>	R
<u>Hygrobatas longipalpis</u>	C
<u>Lebertia porosa</u>	R
<u>Limnesia fulgida</u>	C
<u>L. histrionica</u>	C
<u>L. maculata</u>	R
<u>L. paucispina</u>	P
<u>L. undulata</u>	R
<u>Limnesiopsis anomala</u>	P
<u>Piona crassa</u>	R
<u>P. inconstans</u>	P
<u>P. media</u>	P
<u>P. pugilis</u>	P
<u>P. reighardi</u>	C
<u>P. rotunda</u>	C
<u>P. turgida</u>	P
<u>Piona sp.</u>	R
<u>Sperchon glandulosus</u>	C
<u>Torrenticola indistincta</u>	C
<u>T. bittikoferae</u>	P
<u>Tyrrellia circularis</u>	P
<u>Unionicola anormipes</u>	P
<u>U. crassipes</u>	P
<u>Unionicola sp.</u>	C

C=common

R=rare

P=present in collections of other investigators

^aModlin et al., 1973

Appendix C-1. Amphibians and Reptiles of Emmet County, Michigan^a

Species	Species
central newt	midland painted turtle
red-backed salamander	northern ringneck snake
mudpuppy	eastern milk snake
American toad	northern water snake
northern spring peeper	eastern smooth green snake
green frog	northern brown snake
northern leopard frog	midland brown snake
wood frog	redbelly snake
	northern ribbon snake
	eastern garter snake

^afrom Pentecost and Vogt (1976) and Conant (1975)

Appendix C-2. Amphibians and Reptiles of Emmet, Charlevoix, Antrim, Grand Traverse, and Leelanau Counties^a

	Emmet	Charlevoix	Antrim	Grant Traverse	Leelanau
blue-spotted salamander		X			
spotted salamander		X	X		
four-toed salamander					X
mudpuppy	X	X	X	X	X
central newt	X	X			X
red-backed salamander	X	X	X	X	
American toad	X	X	X	X	X
northern spring peeper	X	X		X	X
gray treefrog			X	X	
bullfrog		X	X	X	X
green frog	X	X	X	X	X
pickereel frog		X		X	
northern leopard frog	X	X	X	X	X
wood frog	X	X		X	X
snapping turtle		X	X	X	X
midland painted turtle	X	X	X	X	X
wood turtle				X	
Blanding's turtle				X	
map turtle				X	
eastern spiny softshell				X	
five-lined skink				X	
blue racer				X	
northern ringneck snake	X	X			X
eastern milk snake	X	X	X	X	X
northern water snake	X	X	X	X	X
eastern smooth green snake	X		X		X
queen snake				X	
midland brown snake	X	X		X	X
northern brown snake	X	X		X	X
northern red-bellied snake	X	X		X	
northern ribbon snake	X	X	X	X	X
eastern garter snake	X	X	X	X	X

^aPentecost and Vogt (1977); Douglass (1977); Conant (1975)

Appendix C-3. Amphibians and Reptiles of Leelanau, Benzie, and Manistee Counties^a

Species	Occurrence		
	Leelanau County	Benzie County	Manistee County
blue-spotted salamander			X
spotted salamander			X
tiger salamander			X
four-toed salamander	X		
mudpuppy	X		
newt	X	X	X
red-backed salamander		X	X
American toad	X		X
northern spring peeper	X		X
bullfrog	X		X
green frog	X	X	X
pickereel frog		X	X
northern leopard frog	X	X	X
wood frog	X	X	X
snapping turtle	X		X
midland painted turtle	X		X
wood turtle			X
Blanding's turtle			X
eastern box turtle		X	
five-lined skink		X	X
racer			X
ringneck snake	X		X
eastern hognose snake			X
milk snake	X	X	X
northern water snake	X	X	X
smooth green snake	X	X	X
queen snake			X
brown snake	X	X	X

^aPentecost and Vogt (1976) and Conant (1975)

Appendix C-4. Amphibians and Reptiles of the Islands of Eastern Lake Michigan^a

Species	Species
Jefferson salamander ^b	snapping turtle
central newt	midland painted turtle
red-backed salamander	northern ringneck snake
American toad	eastern milk snake
northern spring peeper	northern water snake
gray treefrog	eastern smooth green snake
bullfrog	midland brown snake
green frog	northern brown snake
northern leopard frog	redbelly snake
wood frog	northern ribbon snake
	eastern garter snake

^aBased on Ruthven et al. (1928), Hatt et al. (1948), Scharf (1973), and Conant (1975)

^bPerhaps either Tremblay's salamander or blue-spotted salamander

Appendix C-5. Amphibians and Reptiles of Manistee, Mason,
Oceana and Muskegon Counties^a

Species	Occurrence			
	Manistee	Maxon	Oceana	Muskegon
blue-spotted salamander	x	x		x
spotted salamander	x	x	x	
eastern tiger salamander	x			
four-toed salamander				x
mudpuppy				x
central newt	x	x	x	x
red-backed salamander	x	x	x	x
American toad	x	x	x	x
Fowler's toad				x
northern spring peeper	x	x	x	x
gray treefrog	x			x
western chorus frog				x
bullfrog		x		x
green frog	x	x	x	x
pickereel frog		x	x	x
northern leopard frog	x	x	x	x
wood frog	x	x	x	x
snapping turtle	x	x	x	x
midland painted turtle	x	x		x
red-eared turtle				x
spotted turtle				x
wood turtle	x	x	x	x
Blanding's turtle	x	x		x
map turtle		x		x
stinkpot				x
eastern box turtle			x	x
eastern spiny softshell			x	x
five-lined skink	x			x
blue racer	x	x	x	x
northern ringneck snake	x	x		x
black rat snake			x	x
eastern hognose snake	x	x	x	x
eastern milk snake	x	x	x	x
northern water snake	x	x	x	x
eastern smooth green snake	x	x		
queen snake	x	x		
eastern massasauga		x		x
northern brown snake		x		
midland brown snake	x			x
redbelly snake		x		
northern ribbon snake		x	x	x
eastern garter snake	x	x	x	x

^aPentecost and Vogt (1977) and Conant (1975)

Appendix C-6. Characteristic Amphibians and Reptiles of Wetland Habitats in the Kalamazoo-Black-Macatawa-Paw Paw River Basin, Allegan, Muskegon and Ottawa Counties^a

Species	Lakes, ponds, and streams				Open bog	Wet meadow	Hydric forest	Occurrence ^b
	Lakes, ponds, and streams	Marsh						
central newt	x							Allegan, Muskegon
blue-spotted salamander							x	Allegan, Muskegon
spotted salamander					x		x	Allegan
marbled salamander							x	Allegan
eastern tiger salamander							x	Muskegon
four-toed salamander				x			x	Allegan, Ottawa, Muskegon
red-backed salamander							x	Muskegon
mudpuppy	x							Allegan
western lesser siren	x							Allegan, Ottawa, Muskegon
American toad	x			x			x	Allegan, Ottawa, Muskegon
Fowler's toad	x			x				Allegan, Ottawa
Blanchard's cricket frog	x			x				Allegan, Ottawa
northern spring peeper								Allegan, Muskegon
gray treefrog							x	Muskegon
western chorus frog								Allegan, Muskegon
bullfrog	x							Allegan, Ottawa, Muskegon
green frog	x							Allegan, Ottawa, Muskegon
pickereil frog	x							Allegan, Ottawa, Muskegon
northern leopard frog				x				Allegan, Ottawa, Muskegon
wood frog							x	Allegan, Ottawa, Muskegon
five-lined skink								Allegan, Muskegon
snapping turtle	x							Allegan, Ottawa, Muskegon

(Continued)

Appendix C-6. (continued)

Species	Lakes, ponds and streams	Marsh	Open bog	Wet meadow	Hydric forest	Occurrence b
midland painted turtle	x	x				Allegan, Ottawa, Muskegon
red-eared turtle	x	x				Muskegon
spotted turtle	x	x	x		x	Allegan, Ottawa, Muskegon
wood turtle						Allegan, Muskegon
Blanding's turtle	x	x				Allegan, Ottawa, Muskegon
map turtle	x					Allegan, Ottawa, Muskegon
eastern box turtle						Allegan, Muskegon
stinkpot	x	x				Ottawa, Muskegon
eastern spiny softshell	x					Allegan, Ottawa, Muskegon
blue racer						Allegan, Ottawa, Muskegon
northern ringneck snake					x	Allegan, Muskegon
western fox snake						
black rat snake					x	Allegan, Muskegon
eastern hognose snake	x			x		Allegan, Muskegon
eastern milk snake	x					Allegan, Muskegon
northern copperbelly	x		x		x	Allegan, Ottawa, Muskegon
Kirtland's water snake	x	x				Allegan, Ottawa, Muskegon
queen snake	x					Allegan, Ottawa, Muskegon
northern water snake	x	x				Allegan, Ottawa, Muskegon
eastern smooth green snake						Allegan
northern brown snake		x	x	x	x	Muskegon
midland brown snake						
northern red-bellied snake			x	x		Allegan
Butler's garter snake	x	x		x		

(continued)

Appendix C-6. (concluded)

Species	Lakes, ponds and streams	Marsh	Open bog	Wet meadow	Hydric forest	Occurrence ^b
northern ribbon snake	x	x			x	Allegan, Muskegon
eastern garter snake	x				x	Allegan, Ottawa
eastern massasauga	x	x	x	x	x	Allegan, Muskegon

^aWestern Michigan University, 1976

^bPantecost and Vogt (1976) and Conant (1975)

Appendix C-7. Characteristic Amphibians and Reptiles of Wetland Habitats in the Kalamazoo-Black-Macatawa-Paw Paw River Basin, Berrien and Van Buren Counties

Species	Lakes, ponds and streams				Marsh	Open bog	Wet meadow	Hydric forest	Occurrences ^b by county
central newt	x								Berrien
blue-spotted salamander							x		Berrien
spotted salamander						x			Berrien
marbled salamander							x		Berrien
eastern tiger salamander							x		Berrien
four-toed salamander ^d						x			Berrien
redback salamander							x		Berrien
mudpuppy	x								Berrien
western lesser siren	x								Berrien
American toad	x					x			Berrien, Van Buren
Fowler's toad	x					x			Berrien, Van Buren
Blanchard's cricket frog	x					x			Berrien, Van Buren
northern spring peeper									
gray treefrog					x				Berrien, Van Buren
western chorus frog					x				Berrien, Van Buren
bullfrog	x								Berrien, Van Buren
green frog	x				x				Berrien, Van Buren
pickereel frog	x				x				Berrien, Van Buren
northern leopard frog					x				Berrien, Van Buren
wood frog	x					x			Berrien, Van Buren
five-lined skink									Berrien
snapping turtle	x				x				Berrien, Van Buren
midland painted turtle	x				x				Berrien, Van Buren
red-eared turtle	x				x				Berrien, Van Buren
spotted turtle	x				x				Berrien
Blanding's turtle	x				x				Berrien
map turtle	x								Van Buren
eastern box turtle									Berrien, Van Buren
stinkpot	x								Van Buren
eastern spiny softshell	x				x				Berrien, Van Buren

(Continued)

Appendix C-7. (concluded)

Species	Lakes, ponds and streams	Marsh	Open bog	Wet meadow	Hydric forest	Occurrence ^b by county
blue racer						Berrien, Van Buren
northern ringneck snake					x	Berrien, Van Buren
western fox snake						Berrien, Van Buren
black rat snake					x	Berrien, Van Buren
eastern hognose snake	x			x		Berrien, Van Buren
eastern milk snake	x					Berrien
northern copperbelly	x					Berrien
Kirtland's water snake	x	x	x	x		Berrien
queen snake	x					Berrien, Van Buren
northern water snake	x	x	x	x		Berrien, Van Buren
brown snake (midland and/or northern)		x	x	x		Berrien, Van Buren
northern red-bellied snake	x	x	x	x		Berrien, Van Buren
Butler's garter snake	x	x				Berrien, Van Buren
northern ribbon snake	x	x				Berrien
eastern garter snake	x					Van Buren
eastern massasauga	x	x	x	x		Van Buren

^aBrewer (1976)

^bPentecost and Vogt (1976) and Conant (1975)

Appendix C-8. Percentage Frequency of Occurrence and Number of Areas
 Found for Amphibians and Reptiles for 13 Areas in
 Van Buren County^a

Species	Number of areas present	% occurrence
green frog	4	31
bullfrog	3	23
wood frog	3	23
American toad	2	15
Blanchard's cricket frog	1	8
northern leopard frog	1	8
pickerel frog	1	8
Blanding's turtle	4	31
spotted turtle	3	23
eastern box turtle	2	15
map turtle	1	8
midland painted turtle	1	8
northern water snake	3	23
black rat snake	2	15
northern ribbon snake	2	15
brown snake (northern and/or midland)	1	8
eastern massasauga	1	8

^aBrewer and Reed (1977)

Appendix C-9. Amphibians and Reptiles of the Coastal Counties in
Lake Section 9^a

	Kenosha	Racine	Milwaukee	Ozaukee	Sheboygan	Manitowoc	Kewaunee
<u>Amphibians</u>							
central newt		x	x			x	
blue-spotted salamander	x	x	x	x	x	x	x
eastern tiger salamander	x	x	x		x		
red-backed salamander						x	x
mudpuppy		x	x	x	x	x	x
American toad	x	x	x	x	x	x	x
Blanchard's cricket frog	x	x	x			x	
Cope's southern gray treefrog					x	x	x
northern spring peeper			x	x		x	
western chorus frog		x	x	x		x	
bullfrog		x					
green frog	x	x	x	x	x	x	x
pickereil frog		x					
northern leopard frog	x	x	x	x	x	x	x
wood frog			x		x	x	x
<u>Reptiles</u>							
five-lined skink			x				
snapping turtle ^b		x	x				x
painted turtle (midland and/or western) ^b	x	x	x				
Blanding's turtle ^b		x					
eastern spiny softshell ^b			x				
queen snake		x		x			x
northern water snake ^b	x	x			x		
eastern smooth green snake	x	x					
bull snake			x				
midland brown snake			x		x		
northern red-bellied snake		x	x			x	
Butler's garter snake	x		x				
eastern plains garter snake	x	x	x				
northern ribbon snake					x		
eastern garter snake	x	x	x	x	x	x	
Chicago garter snake	x	x					
eastern massasauga		x					
western fox snake		x					x
eastern milk snake		x	x	x	x		

^aPentecost and Vogt (1976) and Conant (1975)

^bReptiles that have wetland affinities

Appendix C-10. Amphibians and Reptiles of Newport State Park^a

Common species:

red-backed salamander
American toad
eastern garter snake

Other species:

blue-spotted salamander	uncommon
western chorus frog	uncommon
northern spring peeper	uncommon
gray tree frog	uncommon
northern leopard frog	rare
wood frog	uncommon to rare
northern water snake	uncommon to rare
northern brown snake	uncommon
northern red-bellied snake	uncommon
eastern smooth green snake	(not stated) ^b
western fox snake	uncommon ^b

^aWisconsin Department of Natural Resources, Bureau of Parks and Recreation (1974)

^bseldom associates with white cedar or other wetlands for breeding or feeding

Appendix C-11. Distribution and Abundance of the Amphibians and Reptiles of Lake Section 11^a

Species ^b	Distribution and abundance
mudpuppy	common in the Menominee River and probably in similar large rivers
blue-spotted salamander	common throughout region
red-backed salamander	locally common
American toad	common throughout region
northern spring peeper	common throughout region
gray treefrog	common where trees are present
bullfrog	locally common in isolated populations
green frog	locally common, but generally uncommon
pickerel frog	not present
wood frog	common throughout region
northern leopard frog	common throughout region but in a definite state of decline
snapping turtle	common throughout region
wood turtle	very rare near lakeshore; suitable habitat lacking
painted turtle (midland and/or western)	common throughout region
Blanding's turtle	common throughout region
five-lined skink	locally common on Lake Michigan beaches
northern water snake	rare and localized
northern red-bellied snake	common throughout region
eastern garter snake	common throughout region
eastern hognose snake	common in wetlands
eastern smooth green snake	uncommon throughout region
western fox snake	uncommon in wetlands
eastern milk snake	uncommon throughout region

^aWendel J. Johnson (University of Wisconsin Center - Marinette, personal communication) and Leroy Lintereur (Wisconsin Department of Natural Resources, Marinette, personal communication)

^bAmphibians and reptiles for whom local presence and abundance is uncertain include the four-toed salamander, mink frog, and midland brown snake

Appendix C-12. Amphibians and Reptiles of Menominee and Delta Counties, Michigan^a

Common name	Occurrence ^b	
	Pentecost and Vogt (1976)	Johnson (1965)
blue-spotted salamander	D	
mudpuppy	M,D	D
central newt	M,D	--
red-spotted newt	--	M,D
red-backed salamander	M,D	M,D
American toad	M,D	M,D
northern spring peeper	M,D	M,D
green frog	M,D	M,D
pickereil frog	M	M
northern leopard frog	M,D	M,D
mink frog	M,D	M,D
wood frog	M,D	M,D
snapping turtle	M,D	M,D
western painted turtle	M,D	M
midland painted turtle	--	M
wood turtle	M	M
five-lined skink	M,D	M
blue racer	M	--
western fox snake	M,D	M,D
eastern hognose snake	M	M
northern water snake	M,D	M,D
eastern smooth green snake	M,D	M,D
northern red-bellied snake	M,D	M,D
eastern garter snake	D	M,D

^aPentecost and Vogt (1976); Johnson (1965); and Conant (1975)

^bM=Menominee County

D=Delta County

Appendix C-13. Amphibians and Reptiles of Delta and Schoolcraft Counties, Michigan^a

Species	Occurrence ^b	
	Pentecost and Vogt (1976)	Johnson (1965)
blue-spotted salamander	--	D
mudpuppy	D,S	D,S
central newt	D,S	S
red-spotted newt	--	D,S
red-backed salamander	D,S	D,S
American toad	D,S	D,S
northern spring peeper	D,S	D,S
gray treefrog	S	S
bullfrog	S	--
green frog	D,S	D,S
northern leopard frog	D,S	D,S
mink frog	D,S	D,S
wood frog	D,S	D,S
snapping turtle	D,S	D
western painted turtle	D	S
midland painted turtle	--	S
wood turtle	S	S
five-lined skink	D	--
northern ringneck snake	S	S
western fox snake	D,S	D,S
northern water snake	D,S	D,S
eastern smooth green snake	D,S	D,S
northern red-bellied snake	D,S	D,S
eastern garter snake	D,S	D,S

^aPentecost and Vogt (1976); Johnson (1965); and Conant (1975)

^bD=Delta County

S=Schoolcraft County

Appendix C-14. Amphibians and Reptiles of Schoolcraft and Mackinac Counties, Michigan

Species	Occurrence ^a	
	Pentecost and Vogt (1976)	Johnson (1965)
blue-spotted salamander	M	M
spotted salamander	S,M	S,M
mudpuppy	S,M	S,M
central newt	S,M	S
red-spotted newt	--	S,M
red-backed salamander	S,M	S,M
American toad	S,M	S,M
northern spring peeper	S,M	S,M
gray tree frog	S,M	S
bullfrog	S,M	M
green frog	S,M	S,M
northern leopard frog	S,M	S,M
mink frog	S	S,M
wood frog	S,M	S,M
snapping turtle	S,M	M
western painted turtle	--	S
midland painted turtle	--	S
painted turtle intergrade	S	S
wood turtle	S	S
northern ringneck snake	S,M	S, BB
western fox snake	S	S
eastern milk snake	--	M
northern water snake	S,M	S, BB
eastern smooth green snake	S,M	S,M
queen snake	M	BB
eastern massasauga	M	BB
northern red-bellied snake	S,M	S,M
northern ribbon snake	M	BB
eastern garter snake	S,M	S,M

^aKey: S = Schoolcraft County
M = Mackinac County
BB = Bois Blanc Island Only

Appendix C-15. Amphibians and Reptiles of Mackinac County, Michigan^a

Species	Occurrence ^b	
	Pentecost and Vogt (1976)	Johnson (1965)
blue-spotted salamander	M	M
spotted salamander	M	M
mudpuppy	M	M
central newt	M	--
red-spotted newt	--	M
red-backed salamander	M	M
American toad	M	M
northern spring peeper	M	M
gray treefrog	M	--
bullfrog	M	M
green frog	M	M
northern leopard frog	M	M
mink frog	--	M
wood frog	M	M
snapping turtle	M	M
northern ringneck snake	M	BB
eastern milk snake	--	M
northern water snake	M	BB
eastern smooth green snake	M	M
queen snake	M	BB
eastern massasauga	M	BB
northern red-bellied snake	M	M
northern ribbon snake	M	BB
eastern garter snake	M	M

^aPentecost and Vogt (1976); Johnson (1965); and Conant (1975)

^bM=Mackinac County

BB=Bois Blanc Island only

Appendix D-1. Annotated List of Birds Occurring in Wilderness
State Park^a

Species	Status
common loon	rare transient
red-necked grebe	
great blue heron	summer resident
American egret	
black-crowned night heron	
American bittern	summer resident
Canada goose	
mallard	summer resident
black duck	common summer resident
pintail	rare
green-winged teal	rare
blue-winged teal	common summer resident
wood duck	
ring-necked duck	
scaup spp.	rare transient
common goldeneye	rare transient
bufflehead	rare transient
hooded merganser	summer resident
American merganser	common summer resident
red-breasted merganser	summer resident
turkey vulture	
goshawk	
sharp-shinned hawk	
red-tailed hawk	
red-shouldered hawk	
broad-winged hawk	summer resident
bald eagle	
marsh hawk	summer resident
osprey	
pigeon hawk (merlin)	uncommon transient
ruffed grouse	permanent resident
Virginia rail	common summer resident
sora	summer resident
semipalmated plover	common transient
piping plover	summer resident
killdeer	summer resident
golden plover	rare transient
black-bellied plover	transient
ruddy turnstone	uncommon transient
American woodcock	uncommon summer resident
common snipe	summer resident
upland sandpiper	summer resident

(Continued)

Appendix D-1. (continued)

Species	Status
spotted sandpiper	common summer resident
solitary sandpiper	transient
greater yellowlegs	transient
lesser yellowlegs	transient
knot	rare transient
pectoral sandpiper	transient
white-rumped sandpiper	rare transient
Baird's sandpiper	uncommon transient
least sandpiper	common transient
dunlin	rare transient
semipalmated sandpiper	transient
sanderling	transient
dowitcher	rare transient
buff-breasted sandpiper	rare transient
herring gull	
ring-billed gull	
Bonaparte's gull	uncommon transient
common tern	summer resident
Caspian tern	summer resident
black tern	
yellow-billed cuckoo	uncommon summer resident
black-billed cuckoo	uncommon summer resident
screech owl	rare summer resident
great horned owl	permanent resident
long-eared owl	
saw-whet owl	permanent resident
belted kingfisher	
pileated woodpecker	permanent resident
downy woodpecker	permanent resident
olive-sided flycatcher	summer resident
tree swallow	summer resident
barn swallow	summer resident
purple martin	summer resident
red-breasted nuthatch	common summer resident
winter wren	summer resident
short-billed marsh wren	common summer resident
veery	common summer resident
eastern bluebird	common summer resident
Nashville warbler	common summer resident
Parula warbler	summer resident
yellow warbler	common summer resident
magnolia warbler	uncommon summer resident
chestnut-sided warbler	summer resident

(Continued)

Appendix D-1. (concluded)

Species	Status
northern waterthrush	uncommon
mourning warbler	summer resident
yellowthroat	common summer resident
Canada warbler	common summer resident
red-winged blackbird	common summer resident
purple finch	common summer resident
common goldfinch	common summer resident
swamp sparrow	common summer resident
white-throated sparrow	common summer resident

^aPettingill et al. (1957)

Appendix D-2. Species Observed at the Straits of Mackinac,
 April 13-27, 1963^a

Species	Number
turkey vulture	23
unidentified accipiters	28
unidentified buteos	248
red-tailed hawks	439
broad-winged hawks	532
sparrow hawks	11
rough-legged hawks	3
golden eagles	3
bald eagles	2
marsh hawks	1
unidentified falcon	1
red-shouldered hawks	5

^aSheldon (1965)

Appendix D-3. Average Annual Waterfowl Harvest for Emmet County
(1961-1970)^a

Species	Average Annual Harvest
DABBING DUCKS	
mallard	339
black duck	98
American wigeon	4
green-winged teal	150
blue-winged teal	37
pintail	6
wood duck	4
<u>Total Dabbling Ducks</u>	<u>638</u>
DIVING DUCKS	
redhead	57
greater scaup	50
lesser scaup	158
ringneck	93
common goldeneye	31
ruddy duck	231
white-winged scoter	6
hooded merganser	125
<u>Total Diving Ducks</u>	<u>751</u>
GEESE	
Canada goose	31
<u>Total Geese</u>	<u>31</u>
<hr/>	
<u>Total Anatidae</u>	<u>1420</u>

The average number of migratory bird hunting stamps sold in Emmet County (1962-1971) was 290.7 (Schroeder et al., 1974)

^aCarney et al. (1975)

Appendix D-4. Wetland Bird Species of the Petoskey Census Area
in the 1972-1976 Christmas Bird Counts^a

Species	1976	1975	1974	1973	1972
common loon	--	4	2	--	--
horned grebe	4	10	1	--	--
pied-billed grebe	--	--	3	--	--
mute swan	26	7	21	28	17
whistling swan	1	--	--	--	--
Canada goose	46	30	35	15	--
snow goose	--	--	--	1	--
mallard	71	85	36	114	64
black duck	--	--	2	9	4
pintail	--	--	--	1	--
wood duck	--	2	--	--	--
redhead	--	1	--	--	--
canvasback	--	1	--	--	--
scaup spp.	--	8	--	--	10
lesser scaup	6	--	103	2	--
common goldeneye	53	38	80	36	113
bufflehead	7	4	5	1	13
oldsquaw	--	1	--	--	--
white-winged scoter	1	--	--	--	1
common merganser	12	29	29	13	14
red-breasted merganser	2	1	2	--	--
Cooper's hawk	1	--	--	--	--
red-shouldered hawk	--	--	--	1	--
bald eagle	1	--	--	--	--
osprey	--	--	-- ^b	--	--
American coot	--	--	1	--	--
killdeer	2	3	--	--	--
common snipe	--	--	1	--	--
glaucous gull	--	1	--	--	--
herring gull	4	74	125	1	7
ring-billed gull	64	151	58	103	329
belted kingfisher	1	2	1	1	--
pileated woodpecker	1	2	--	1	1
gray jay	--	1	--	--	--
winter wren	--	--	--	--	1
starling	8	142	100	52	172
red-winged blackbird	--	2	--	--	--
rusty blackbird	2	1	--	--	--
cardinal	12	42	--	10	8
purple finch	2	1	--	--	--
white-throated sparrow	--	--	1	--	1

^aArbib (1973, 1974, 1975, 1976, 1977)

^bObserved in the area during count week, but not seen on the count day.

Appendix D-5. Average Annual Waterfowl Harvest for Emmet, Charlevoix, Antrim, Grand Traverse, and Leelanau Counties, Michigan (1961-1970)^a

Species	Average annual harvest				
	Emmet	Charlevoix	Antrim	Grand Traverse	Leelanau
DABBING DUCKS					
mallard	339	53	376	588	269
mallard x black duck	--	4	--	--	--
black duck	98	11	25	164	154
gadwall	--	--	--	--	6
American wigeon	4	--	--	56	36
green-winged teal	150	--	--	105	105
blue-winged teal	37	--	--	10	--
northern shoveler	--	--	--	62	--
pintail	6	--	25	31	--
wood duck	4	--	70	131	79
<u>Total dabbling ducks</u>	<u>638</u>	<u>68</u>	<u>496</u>	<u>1147</u>	<u>649</u>
DIVING DUCKS					
redhead	57	--	--	28	10
greater scaup	50	15	--	28	159
lesser scaup	158	6	25	101	120
ringneck	93	11	4	46	--
common goldeneye	31	6	--	21	--
bufflehead	--	91	7	166	95
ruddy duck	231	--	--	20	--
black scoter	--	--	--	10	25
white-winged scoter	6	--	--	--	--
hooded merganser	125	--	--	122	--
red-breasted merganser	--	--	--	6	--
common merganser	--	--	--	29	93
<u>Total diving ducks</u>	<u>751</u>	<u>129</u>	<u>36</u>	<u>577</u>	<u>502</u>
GEESE					
snow goose	--	102	407	20	41
Canada goose	31	35	26	64	26
<u>Total geese</u>	<u>31</u>	<u>137</u>	<u>433</u>	<u>84</u>	<u>67</u>
<hr/>					
Total Anatidae	1420	334	965	1808	1218

The Average number of migratory bird hunting stamps sold between 1962 and 1971 for Emmet County is 290.7; for Charlevoix County is 194; for Antrim County is 178; for Grand Traverse County is 656; and for Leelanau County is 113 (Schroeder et al., 1974)

^aCarney et al. (1975)

Appendix D-6. Wetland Bird Species of the Ludington Census Area
 Contained in the 1972-1976 Christmas Bird Counts

Species	1976	1975	1974	1973	1972
horned grebe	--	--	--	1	--
whistling swan	1	9	3	55	--
Canada goose	225	39	--	154	20
mallard	37	13	7	26	--
black duck	40	66	11	88	5
redhead	--	--	2	--	--
ring-necked duck	--	--	1	--	--
canvasback	--	--	4	--	--
scaup spp.	--	1	--	--	--
common goldeneye	64	86	34	87	9
bufflehead	62	26	11	34	1
common merganser	4	28	--	10	--
Cooper's hawk	--	--	1	1	--
red-shouldered hawk	+	+	--	1	--
bald eagle	--	--	--	1	--
marsh hawk	--	1	--	1	--
American coot	--	3	1	4	--
herring gull	143	124	557	166	104
great horned owl	--	-- ^b	1	1	--
barred owl	1	--	--	--	--
belted kingfisher	1	--	--	1	--
winter wren	1	--	--	--	--
starling	368	296	253	116	19
cardinal	--	25	23	37	--
white-throated sparrow	2	--	--	--	--

^aArbib (1973, 1974, 1975, 1976, 1977)

^bObserved in the area during count week, but not seen on the count day.

Appendix D-7. Average Annual Waterfowl Harvest for Manistee, Mason,
Oceana, and Muskegon Counties, Michigan
(1961-1970)^a

Species	Average annual harvest			
	Manistee	Mason	Oceana	Muskegon
DABBING DUCKS				
mallard	250	791	304	849
mallard x black duck	--	--	14	11
black duck	114	60	286	430
gadwall	--	4	--	108
American wigeon	--	115	--	299
green-winged teal	4	195	72	456
blue-winged teal	155	544	21	459
northern shoveler	39	4	--	41
pintail	--	35	6	71
wood duck	124	771	225	665
<u>Total Dabbling Ducks</u>	<u>686</u>	<u>2519</u>	<u>928</u>	<u>3389</u>
DIVING DUCKS				
redhead	--	23	6	632
canvasback	--	17	6	122
greater scaup	--	381	6	543
lesser scaup	60	346	11	802
ringneck	60	216	4	147
common goldeneye	94	53	--	281
bufflehead	--	205	11	541
ruddy duck	--	23	--	65
black scoter	--	--	--	24
surf scoter	--	29	--	34
hooded merganser	--	6	--	36
red-breasted merganser	--	--	--	41
<u>Total Diving Ducks</u>	<u>214</u>	<u>1299</u>	<u>44</u>	<u>3275</u>

-continued-

Appendix D-7. (concluded)

Species	Average annual harvest			
	Manistee	Mason	Oceana	Muskegon
GEESE				
snow goose	22	44	44	20
Canada goose	--	261	63	111
<u>Total Geese</u>	<u>22</u>	<u>305</u>	<u>107</u>	<u>131</u>
<hr/>				
<hr/>				
Total Anatidae	922	4123	1079	6795

The average number of migratory bird hunting stamps sold (1962-1971) in Manistee County is 310; in Mason County is 412; in Oceana County is 206; and in Muskegon County is 1,583 (Schroeder et al., 1974).

^aCarney et al. (1975)

Appendix D-8. Annotated List of Birds Observed During the 1972-1976
Muskegon Christmas Bird Counts^a

Species	1976	1975	1974	1973	1972
pied-billed grebe	1	9	--	3	--
whistling swan	--	33	7	16	6
mallard	14	18	140	34	46
black duck	2	13	37	15	43
canvasback	2	89	58	5	--
scaup spp.	47	12	--	55	210
common goldeneye	166	175	281	75	81
bufflehead	6	18	168	43	30
common merganser	486	5022	195	252	173
ring-necked pheasant	9	7	4	6	3
American coot	32	189	105	116	42
herring gull	330	119	275	280	262
ring-billed gull	3	--	8	3	-- ^b
belted kingfisher	1	--	1	--	1
starling	266	168	74	55	125
cardinal	25	21	71	30	15

^aArbib (1973, 1974, 1975, 1976, 1977)

^bObserved in the area during the count week, but not seen on the count day.

Appendix D-9. Average Annual Waterfowl Harvest for Allegan, Ottawa,
and Muskegon Counties, Michigan (1961-1970) ^a

Waterfowl species	Average annual harvest		
	Allegan	Ottawa	Muskegon
DABBING DUCKS			
mallard	3451	992	849
mallard (hand reared)	4	13	--
mallard x black duck	86	16	11
black duck	1039	372	430
gadwall	101	19	108
American wigeon	381	85	299
green-winged teal	643	267	456
blue-winged teal	362	312	459
northern shoveler	78	--	41
pintail	179	31	71
wood duck	2107	368	665
<u>Total Dabbling Ducks</u>	<u>8431</u>	<u>2475</u>	<u>3389</u>
DIVING DUCKS			
redhead	18	49	632
canvasback	--	--	122
greater scaup	--	20	543
lesser scaup	27	88	802
ringnecked duck	127	70	147
common goldeneye	7	--	281
bufflehead	19	94	514
ruddy duck	--	39	65
oldsquaw	--	--	--
hooded merganser	19	--	36
red-breasted merganser	--	--	41
common merganser	--	12	34
<u>Total Diving Ducks</u>	<u>217</u>	<u>372</u>	<u>3275</u>

-continued-

Appendix D-9. (concluded)

Waterfowl species	Average annual harvest		
	Allegan	Ottawa	Muskegon
GEESE			
snow geese	26	7	20
Canada geese	4158	50	111
<u>Total Geese</u>	<u>4184</u>	<u>57</u>	<u>131</u>
<hr/>			
<u>Total Anatidae</u>	<u>12832</u>	<u>2904</u>	<u>6795</u>

The average number of migratory bird hunting stamps sold in Allegan County (1962-1971) is 1,593; in Ottawa County is 1,721; and in Muskegon County is 1,583 (Schroeder et al., 1974).

^aCarney et al. (1975)

Appendix D-10. Annotated List of the Birds of Ottawa County^a

Species	Status	Known breeding dates
pied-billed grebe	common transient	
great blue heron	common summer resident	May 15 - June 20
green heron	common transient	
American bittern	common summer resident	April 1 - May 17
Canada goose	common transient	
mallard	common summer resident	May 25 - July 10
black duck	common transient	known breeder, uncertain dates
green-winged teal	common summer resident	known breeder, uncertain dates
blue-winged teal	permanent resident	
wood duck	uncommon winter visitant	April 29 - May 22
redhead	common transient	April 22 - May 26
scaup spp.	common summer resident	
common goldeneye	common transient	known breeder, uncertain dates
bufflehead	uncommon winter visitant	
ruddy duck	common transient	April 20 - May 20
	common winter visitant	
	common transient	
	common winter visitant	
	common transient	
	common winter visitant	
	common transient	
	rare summer resident	

(Continued)

Appendix D-10. (continued)

Species	Status	Known breeding dates
common merganser	common transient	
red-shouldered hawk	common winter visitant uncommon transient rare summer resident rare winter visitant uncommon transient rare summer resident	March 24 - June 15 May 5 - June 10
broad-winged hawk	common transient	
marsh hawk	common summer resident rare winter visitant	May 12 - July 12 April 18 - June 20
ring-necked pheasant	common permanent resident	
Virginia rail	uncommon transient	
sora	uncommon summer resident common transient	May 7 - June 5
common gallinule	common summer resident	May 5 - June 20
American coot	common transient	
killdeer	common summer resident common transient common summer resident rare winter visitant	May 20 - June 28 May 1 - June 20
American woodcock	common transient	March 27 - July 13
spotted sandpiper	common summer resident common transient	April 20 - June 20
herring gull	common summer resident	known breeder, uncertain dates
ring-billed gull	common permanent resident	
black tern	common permanent resident common transient common summer resident	May 23 - July 5

(Continued)

Appendix D-10. (continued)

Species	Status	Known breeding dates
yellow-billed cuckoo	unknown	May 23 - July 5
black-billed cuckoo	common transient	
screech owl	common summer resident	
short-eared owl	common permanent resident	June 10 - August 15
	uncommon winter visitant	
	rare summer resident	
belted kingfisher	common transient	
	common summer resident	
	rare winter visitant	
downy woodpecker	common permanent resident	known breeder, uncertain dates
willow flycatcher	common transient	known breeder, uncertain dates
tree swallow	common summer resident	July 1 - July 30
bank swallow	common transient	May 2 - July 28
rough-winged swallow	common summer resident	May 20 - July 10
barn swallow	common transient	May 20 - July 3
purple martin	uncommon summer resident	May 27 - August 20
winter wren	common transient	May 15 - July 12
long-billed marsh wren	common summer resident	
short-billed marsh wren	uncommon transient	May 31 - June 20
veery	common transient	known breeder, uncertain dates
water pipit	common transient	
prothonotary warbler	rare winter visitant	
	uncommon transient	
	uncommon summer resident	known breeder, uncertain dates

(Continued)

Appendix D-10. (concluded)

Species	Status	Known breeding dates
Nashville warbler	common transient	
yellow warbler	common transient	May 3 - July 10
	common summer resident	
Northern waterthrush	common transient	
yellow-headed blackbird	rare transient	
red-winged blackbird	common transient	
	common summer resident	
rusty blackbird	rare winter visitant	May 5 - July 1
Brewer's blackbird	common transient	
white-throated sparrow	unknown	June 10 - July 3
swamp sparrow	common transient	
	common transient	
	common summer resident	
	rare winter visitant	known breeder, uncertain dates

aschroeder and De Blaey (1968)

Appendix D-11. Characteristic Species of Birds Associated with Wetland Habitats in the Kalamazoo-Black-Macatawa-Paw Paw River Basin^a

Species	Lakes, ponds, and streams	Marsh	Open bog	Wet meadow	Hydric forest
common loon ^d	x				
pied-billed grebe	x	x			x
great blue heron	x				
green heron	x	x			
least bittern		x			
American bittern ^d		x			
Canada goose	x				
mallard	x	x		x	
blue-winged teal	x	x			
wood duck	x				x
red-tailed hawk					x
red-shouldered hawk ^d					x
bald eagle ^c					x
harrier ^b		x	x	x	
ruffed grouse					x
ring-necked pheasant				x	
sandhill crane ^d		x		x	
king rail		x			
Virginia rail		x			
sora		x			
common gallinule	x	x			
American coot	x	x			
spotted sandpiper	x				
black tern	x	x			
mourning dove			x		
yellow-billed cuckoo					x
black-billed cuckoo					x
screech owl					x
barred owl ^d					x
saw-whet owl					x
ruby-throated hummingbird					x
belted kingfisher	x				x
pileated woodpecker					x
red-bellied woodpecker					x
red-headed woodpecker					x
hairy woodpecker					x
downy woodpecker					x
eastern kingbird			x		
great crested flycatcher					x
eastern phoebe	x				
Acadian flycatcher					x

(Continued)

Appendix D-11. (continued)

Species	Lakes, ponds, and streams	Marsh	Open bog	Wet meadow	Hydric forest
willow flycatcher			x		
eastern wood pewee					x
tree swallow	x	x			
barn swallow	x				
purple martin	x				x
blue jay					x
common crow					x
black-capped chickadee					x
tufted titmouse					x
white-breasted nuthatch					x
brown creeper					x
house wren					x
long-billed marsh wren		x			
short-billed marsh wren				x	
gray catbird			x		x
wood thrush					x
veery					x
blue-gray gnatcatcher					x
cedar waxwing	x		x		x
starling					x
yellow-throated vireo					x
red-eyed vireo					x
warbling vireo					x
prothonotary warbler					x
blue-winged warbler					x
Nashville warbler			x		
yellow warbler		x			
black-throated green warbler					x
chestnut-sided warbler			x		
cerulean warbler					x
Blackburnian warbler					x
ovenbird					x
Louisiana water thrush					x
common yellowthroat		x	x		
Canada warbler					x
American redstart				x	x
bobolink				x	
eastern meadowlark				x	
red-winged blackbird		x	x	x	x
northern oriole					x
Brewer's blackbird				x	
common grackle		x			x
brown-headed cowbird				x	x

(Continued)

Appendix D-11. (concluded)

Species	Lakes, ponds, and streams	Marsh	Open bog	Wet meadow	Hydric forest
scarlet tanager					x
cardinal					x
rose-breasted grosbeak					x
indigo bunting					x
American goldfinch		x	x		x
rufous-sided towhee			x		x
Henslow's sparrow				x	
field sparrow			x		
swamp sparrow		x	x	x	
song sparrow		x	x		x

^aBrewer (Western Michigan University, 1976)

^bThreatened in Michigan (Michigan Department of Natural Resources, Endangered and Threatened Species Program, 1976)

^cFederally endangered (U.S. Department of the Interior, Fish and Wildlife Service, 1977), no current breeding records

Appendix D-12. Percent Frequency of Occurrence for Breeding Birds from
Six Study Areas in Van Buren County from May 9 to
June 19, 1977^a

Wet meadow		Edge	
Species	% Frequency	Species	% Frequency
red-winged blackbird	100	American goldfinch	83.3
common yellowthroat	83.3	yellow warbler	83.3
swamp sparrow	66.7	eastern kingbird	66.7
mallard	50	song sparrow	50
green heron	50	blue jay	33.3
belted kingfisher	33.3	common grackle	33.3
blue-winged teal	33.3	gray catbird	33.3
great blue heron	33.3	tree sparrow	33.3
king rail	33.3	blue-winged warbler	16.7
sora	33.3	common grackle	16.7
wood duck	33.3	eastern wood pewee	16.7
American coot	16.7	ring-necked pheasant	16.7
killdeer	16.7	warbling vireo	16.7
ruby-throated hummingbird	16.7		
Virginia rail	16.7		

^aBrewer and Reed (1977)

Appendix D-16. Average Annual Waterfowl Harvest for LaPorte, Porter, and Lake Counties, Indiana (1961-1970)^a

Waterfowl species	Average annual harvest		
	LaPorte County	Porter County	Lake County
DABBING DUCKS			
mallard	1130	763	1106
mallard (hand reared)		4	
mallard x black duck	3		20
black duck	225	236	139
gadwall	74	45	131
American wigeon	80	61	215
green-winged teal	117	179	253
blue-winged teal	48	24	110
northern shoveler	8	3	37
pintail	67	38	47
wood duck	242	124	688
<u>Total dabbling ducks</u>	<u>1994</u>	<u>1477</u>	<u>2628</u>
DIVING DUCKS			
redhead	27	16	
canvasback			
greater scaup	8		18
lesser scaup	41		380
ringneck	31	41	22
common goldeneye	8		42
bufflehead	11	3	58
ruddy duck	16		28
oldsquaw			
surf scoter			40
hooded merganser	21	8	88
red-breasted merganser	8	12	11
common merganser			11
<u>Total diving ducks</u>	<u>171</u>	<u>72</u>	<u>698</u>
GEESE			
snow geese	16	17	153
Canada geese	129	125	111
<u>Total geese</u>	<u>145</u>	<u>142</u>	<u>264</u>
<u>Total Anatidae</u>	<u>2310</u>	<u>1691</u>	<u>3590</u>

The average number of migratory bird hunting stamps sold in LaPorte County (1962-1971) is 1,038; the average for Porter County is 791; the average for Lake County is 4,191 (Schroeder et al., 1974).

^aBased on Carney et al. (1975)

Appendix D-14. Estimated Seasonal Totals of Ducks Observed During
Diurnal Fall Migration at the St. Joseph River
Mouth^a

Year	Estimated seasonal total observed	Peak dates
1963	25,000-30,000	October 27
1964	20,000-25,000	October 18 (10,000-12,000) November 14 (4,000-6,000)
1965	30,000-35,000	October 22 (6,000-10,000) October 26 (3,000-3,500)
1966	30,000-40,000	October 23 (9,000) October 24 (5,000-10,000)
1967	27,000-32,000	October 15 (10,000-15,000) November 3 (10,000)
1968	50,000-55,000	October 24 (4,000) November 2 (10,000)
1969	light	
1970	25,000-30,000	November 5 (15,000) November 6 (4,000-5,000)
1971	36,000-52,000	October 11 (10,000-20,000) October 31 (5,000-5,500)

^aBooth (1972)

Appendix D-14. Estimated Seasonal Totals of Ducks Observed During
Diurnal Fall Migration at the St. Joseph River
Mouth^a

Year	Estimated seasonal total observed	Peak dates
1963	25,000-30,000	October 27
1964	20,000-25,000	October 18 (10,000-12,000) November 14 (4,000-6,000)
1965	30,000-35,000	October 22 (6,000-10,000) October 26 (3,000-3,500)
1966	30,000-40,000	October 23 (9,000) October 24 (5,000-10,000)
1967	27,000-32,000	October 15 (10,000-15,000) November 3 (10,000)
1968	50,000-55,000	October 24 (4,000) November 2 (10,000)
1969	light	
1970	25,000-30,000	November 5 (15,000) November 6 (4,000-5,000)
1971	36,000-52,000	October 11 (10,000-20,000) October 31 (5,000-5,500)

^aBooth (1972)

Appendix D-16. Average Annual Waterfowl Harvest for LaPorte, Porter, and Lake Counties, Indiana (1961-1970)^a

Waterfowl species	Average annual harvest		
	LaPorte County	Porter County	Lake County
DABBING DUCKS			
mallard	1130	763	1106
mallard (hand reared)		4	
mallard x black duck	3		20
black duck	225	236	139
gadwall	74	45	131
American wigeon	80	61	215
green-winged teal	117	179	253
blue-winged teal	48	24	110
northern shoveler	8	3	37
pintail	67	38	47
wood duck	242	124	688
<u>Total dabbling ducks</u>	<u>1994</u>	<u>1477</u>	<u>2628</u>
DIVING DUCKS			
redhead	27	16	
canvasback			
greater scaup	8		18
lesser scaup	41		380
ringneck	31	41	22
common goldeneye	8		42
bufflehead	11	3	58
ruddy duck	16		28
oldsquaw			
surf scoter			40
hooded merganser	21	8	88
red-breasted merganser	8	12	11
common merganser			11
<u>Total diving ducks</u>	<u>171</u>	<u>72</u>	<u>698</u>
GEESE			
snow geese	16	17	153
Canada geese	129	125	111
<u>Total geese</u>	<u>145</u>	<u>142</u>	<u>264</u>
<u>Total Anatidae</u>	<u>2310</u>	<u>1691</u>	<u>3590</u>

The average number of migratory bird hunting stamps sold in LaPorte County (1962-1971) is 1,038; the average for Porter County is 791; the average for Lake County is 4,191 (Schroeder et al., 1974).

^aBased on Carney et al. (1975)

Appendix D-17. Waterfowl of the Chicago Lakefront Census Area in
the 1972-1976 Christmas Bird Counts^a

	1976	1975	1974	1973	1972
Canada goose			1		
mallard	2000	623	717	540	350
black duck	1	27	18	19	17
gadwall		3			1
pintail				1	1
green-winged teal			2		
blue-winged teal			1		
northern shoveler		1		1	
redhead			4		
tufted duck				1	
greater scaup	2	33	21	84	5
lesser scaup		3	70	3	
common goldeneye	257	289	702	346	283
bufflehead		17	6	7	
oldsquaw	17	44	104	8	103
ruddy duck			2	5	
hooded merganser				-- ^b	2
common merganser		8	4	12	7
merganser, sp.		1	2	8	
red-breasted merganser	37	55	92	36	20
American coot		15	1	1	

^aThe Chicago Lakefront Census Area includes the area 2 miles north of the Lake Calumet Wetland Complex, which contains 15 miles of Chicago lakefront and several rivers, park ponds, and harbors (Arbib, 1973, 1974, 1975, 1976, 1977)

^bObserved in the area during the count week, but not seen on the count day

Appendix D-18. Waterfowl of the Chicago Urban Census Area in the
1972-1976 Christmas Bird Counts^a

	1976	1975	1974	1973	1972
Canada goose	52	46	37		21
snow (blue) goose	6	8	1		
mallard	2076	1295	1330	1430	850
black duck	176	86	122	132	109
gadwall	2	1	4	1	
pintail	4	2	6	7	
green-winged teal	3		2	1	3
blue-winged teal					2
northern shoveler		1	1	3	
American wigeon	2	4	1	2	
wood duck	5	13	2	6	2
redhead	4	7	7		4
ring-necked duck	3	1			
canvasback	1	1	1		
greater scaup	1				
scaup sp.	12				
lesser scaup	15	23	4	5	2
common goldeneye	157	57	37	91	43
bufflehead			3		
ruddy duck	3	1	1		
common merganser	-- ^b		0		
red-breasted merganser	7	4	6		
American coot	5	1	1	2	3

^aThe Chicago Urban Census area includes 10 miles of Lake Michigan shoreline and several rivers, park ponds, and harbors, which are outside of the Lake Calumet Wetland Complex (Arbib, 1973, 1974, 1975, 1976, 1977)

^bObserved in the area during the count week, but not seen on the count day

Appendix D-19. Waterfowl of the Chicago North Shore Census Area in
the 1972-1976 Christmas Bird Counts^a

	1976	1975	1974	1973	1972
whistling swan				1	1
Canada goose	45	322	120	325	6
snow (blue) goose			5		
mallard	1208	2074	2172	942	825
black duck	42	66	78	7	41
gadwall	1	1			1
pintail	4	5	-- ^b	3	2
green-winged teal	1	25	9		2
blue-winged teal					1
northern shoveler					-- ^b
American wigeon	2		-- ^b		2
wood duck	2	8	10	4	-- ^b
ring-necked duck	1	1			-- ^b
canvasback		1			2
greater scaup				6	-- ^b
scaup, sp.	68	2	27	6	2
lesser scaup			3	3	-- ^b
common goldeneye	218	1273	907	711	252
bufflehead	3	11	16	2	-- ^b
oldsquaw	70	325	249	179	108
dark-winged scoter, sp.			4		
white-winged scoter		2	1	6	
scoter, sp.				6	
surf scoter		1			
harlequin duck			-- ^b		
ruddy duck		3	18		
common merganser	1	7	1	3	-- ^b
merganser, sp.			1		
red-breasted merganser		10	1	3	2
American coot		6	1	1	

^aThe Chicago North Shore census area contains 10 miles of Lake Michigan shoreline and several wetlands (e.g., Skokie Lagoons) that are not included in this study (Arbib, 1973, 1974, 1975, 1976, 1977)

^bObserved in the area during the count week, but not seen on the count day

Appendix D-20. Average Annual Waterfowl Harvest for Cook and Lake Counties, Illinois (1961-1970)^a

Waterfowl species	Average annual harvest	
	Cook County	Lake County
DABBING DUCKS		
mallard	2020	1733
mallard (hand reared)	25	19
mallard x black duck	17	0
black duck	288	48
gadwall	82	83
American wigeon	371	103
green-winged teal	727	384
blue-winged teal	553	779
northern shoveler	75	33
pintail	33	25
wood duck	533	270
<u>Total dabbling ducks</u>	<u>4724</u>	<u>3477</u>
DIVING DUCKS		
redhead	99	39
canvasback	99	10
greater scaup	128	0
lesser scaup	404	20
ringneck	373	24
common goldeneye	176	0
bufflehead	149	0
ruddy duck	43	0
oldsquaw	85	0
hooded merganser	86	0
red-breasted merganser	0	7
<u>Total diving ducks</u>	<u>1642</u>	<u>100</u>
GEESE		
snow geese	0	10
Canada geese	38	206
<u>Total geese</u>	<u>38</u>	<u>216</u>
<u>Total Anatidae</u>	<u>6402</u>	<u>3793</u>

The average number of migratory bird hunting stamps sold in Cook County (1962-1971) is 2,213; the average number of migratory bird hunting stamps sold in Lake County (1962-1971) is 10,393 (Schroeder and Carney, 1974).

^aBased in Carney et al. (1972)

Appendix D-21. Average Annual Waterfowl Harvest for Kenosha, Racine, Milwaukee, Ozaukee, Sheboygan, Manitowoc, and Kewaunee Counties (1961-1970)^a

Waterfowl Species	Average Annual Harvest						
	Kenosha County	Racine County	Milwaukee County	Ozaukee County	Sheboygan County	Manitowoc County	Kewaunee County
DABBLING DUCKS							
mallard	406	730	14	650	1388	3584	409
mallard (hand reared)					31	17	
mallard x black duck					40		
black duck	18	117		43	68	419	42
gadwall		25			14	111	27
American wigeon	93	248		70	362	304	112
green-winged teal	156	533		244	471	581	69
blue-winged teal	106	863		167	297	915	114
northern shoveler		58		13	17	45	16
pintail	51	67		51	72	211	52
wood duck	162	514		205	774	1512	94
Total Dabbling Ducks	992	3155	14	1443	3534	7699	935
DIVING DUCKS							
redhead	84	27		101	226	16	56
canvasback	79	12			200	54	26
greater scaup		12		136	64	5	
lesser scaup	133	100		244	378	140	345
ring-necked duck	240	182	48	111	680	136	52
common goldeneye		34		130		9	186
bufflehead		24		197	68	85	318
ruddy duck	13	58		40	120	23	
white-winged scoter		12		90	43	3	
hooded merganser		12		62		35	
red-breasted merganser							
Total Diving Ducks	549	473	48	1145	1179	506	938

Appendix D-21. (concluded)

Waterfowl Species	Average Annual Harvest							
	Kenosha County	Racine County	Millwaukee County	Ozaukee County	Sheboygan County	Manitowoc County	Kewaunee County	
GEESE								
snow geese		47		35	61	48	93	
Canada geese	10	55	10	62	349	570	67	
Total geese	10	102	10	97	410	618	160	
Total Anatidae	1551	3730	72	2685	5723	8823	2078	

The average number of migratory bird hunting stamps sold in each county (1962-71) is as follows: Kenosha County - 1,750; Racine County - 2,759; Milwaukee County - 15,908; Ozaukee County - 1,070; Sheboygan County - 1,893; Manitowoc County - 1,993; Kewaunee County - 361 (Schroeder et al., 1974).

^aBased on Carney et al. (1975)

Appendix D-22. Average Annual Waterfowl Harvest for Door County,
Wisconsin (1961-1970)^a

<u>Waterfowl species</u>	<u>Average annual harvest</u>
DABBING DUCKS	
mallard	85
black duck	11
<u>Total dabbling ducks</u>	<u>96</u>
DIVING DUCKS	
greater scaup	29
lesser scaup	133
ring-necked duck	16
common goldeneye	112
bufflehead	85
common merganser	5
<u>Total diving ducks</u>	<u>380</u>
GEESE	
snow geese	40
Canada geese	72
<u>Total geese</u>	<u>112</u>
<u>Total Anatidae</u>	<u>588</u>

^aBased on Carney et al. (1975)

Appendix D-23. Bird Nesting Records of Green Bay and Lake Michigan
Wetlands in 1969^a

pied-billed grebe	12	American woodcock	--
great blue heron	-- ^b	common snipe	2
green heron	--	spotted sandpiper	1
black-crowned night heron	41	herring gull	83
least bittern	--	ring-billed gull	11
American bittern	1	Forster's tern	431
Canada goose	48	common tern	103
mallard	17	black tern	41
black duck	--	mourning dove	--
gadwall	11	long-eared owl	1
pintail	1	tree swallow	1
green-winged teal	--	winter wren	--
blue-winged teal	20	long-billed marsh wren	13
northern shoveler	--	short-billed marsh wren	1
wood duck	--	gray catbird	--
ruddy duck	--	brown thrasher	2
red-tailed hawk	--	American robin	4
harrier	--	cedar waxwing	--
ruffed grouse	--	starling	--
ring-necked pheasant	2	eastern meadowlark	--
king rail	--	yellow-headed blackbird	178
Virginia rail	2	red-winged blackbird	48
sora	2	Brewer's blackbird	19
yellow rail	--	brown-headed cowbird	11
common gallinule	4	American goldfinch	--
American coot	21	swamp sparrow	3
killdeer	1	song sparrow	2

^aNests were identified between April 15 and September 3, 1969 (Wisconsin Department of Natural Resources, 1969g)

^bNo nests were found, but this species probably breeds in the coastal wetlands

Appendix D-24. Bird Observations in Green Bay Wetlands in 1969^a

common loon	3	killdeer	27
horned grebe	2	black-bellied plover	5
pieb-billed grebe	43	ruddy turnstone	15
double-crested cormorant	8	common snipe	8
great blue heron	12	whimbrel	1
green heron	3	spotted sandpiper	8
common egret	1	solitary sandpiper	2
black-crowned night heron	35	greater yellowlegs	26
least bittern	1	lesser yellowlegs	56
American bittern	4	red knot	2
whistling swan	20	pectoral sandpiper	6
Canada goose	283	Baird's sandpiper	7
snow goose	1	least sandpiper	37
mallard	67	dunlin	1,200
black duck	8	short-billed dowitcher	47
gadwall	35	stilt sandpiper	74
pintail	20	semipalmated sandpiper	25
green-winged teal	200	marbled godwit	1
blue-winged teal	434	sanderling	3
American wigeon	83	Wilson's phalarope	4
northern shoveler	21	herring gull	350
wood duck	14	ring-billed gull	400
redhead	16	Franklin's gull	3
ring-necked duck	6	Bonaparte's gull	350
canvasback	1	Forster's tern	40
scaup spp.	300	common tern	143
common goldeneye	28	Caspian tern	40
bufflehead	24	black tern	84
ruddy duck	12	mourning dove	2
hooded merganser	4	great horned owl	1
common merganser	18	long-eared owl	5
red-breasted merganser	4	short-eared owl	1
turkey vulture	1	chimney swift	6
broad-winged hawk	1	belted kingfisher	1
harrier	3	common flicker	6
osprey	1	red-headed woodpecker	1
kestrel	1	downy woodpecker	1
ruffed grouse	1	eastern kingbird	2
ring-necked pheasant	11	great crested flycatcher	1
king rail	2	eastern phoebe	11
Virginia rail	8	willow flycatcher	2
sora	15	horned lark	1
common gallinule	3	tree swallow	1,000
American coot	200	bank swallow	5
semipalmated plover	10	rough-winged swallow	3
barn swallow	27	yellowthroat	4

(Continued)

Appendix D-24. (concluded)

cliff swallow	2	bobolink	15
purple martin	35	eastern meadowlark	3
blue jay	70	western meadowlark	1
common crow	12	yellow-headed blackbird	200
black-capped chickadee	1	red-winged blackbird	40
red-breasted nuthatch	1	northern oriole	2
long-billed marsh wren	6	rusty blackbird	6
short-billed marsh wren	10	Brewer's blackbird	18
gray catbird	1	common grackle	9
brown thrasher	3	brown-headed cowbird	25
American robin	15	indigo bunting	1
ruby-crowned kinglet	11	American goldfinch	16
starling	30	rufous-sided towhee	2
yellow warbler	12	savannah sparrow	4
magnolia warbler	1	tree sparrow	12
yellow-rumped warbler	4	clay-colored sparrow	1
blackburnian warbler	2	swamp sparrow	20
palm warbler	25	song sparrow	11

^aBirds were observed between April 15 and September 3, 1969, by Mathiak, Kleinert, and Bradley (Wisconsin Department of Natural Resources, 1969h).

Appendix D-25. Wetland Birds of Brown County^a

	Abun- dance ^b	Resident Status ^c		Abun- dance	Resident Status
pied-billed grebe	FC	S	spotted sandpiper	C	S
great blue heron	C	S	Bonaparte's gull	C	S
green heron	C	S	Forster's tern	C	S
common egret	R	S	common tern	C	S
black-crowned night heron	C	S	Caspian tern	U	S
American bittern	FC	S	black tern	C	S
Canada goose	U	S	barn owl	R	S
mallard	C	S	great horned owl	U	P
black duck	C	S	snowy owl	C	W
gadwall	U	S	barred owl	U	P
pintail	U	S	short-eared owl	U	W
green-winged teal	R	S	saw-whet owl	R	W
blue-winged teal	C	S	belted kingfisher	FC	S
northern shoveler	U	S	common flicker	C	S
wood duck	U	S	pileated woodpecker	R	P
greater scaup	R	S	red-bellied woodpecker	U	W
lesser scaup	R	S	red-headed woodpecker	C,U	S,W
old squaw	R	W	hairy woodpecker	C	P
ruddy duck	U	S	downy woodpecker	C	P
common merganser	U	S	eastern kingbird	C	S
red-tailed hawk	R	S	great crested flycatcher	C	S
red-shouldered hawk	U	S	eastern phoebe	C	S
broad-winged hawk	U	S	willow flycatcher	FC	S
harrier	C	S	least flycatcher	FC	S
kestrel	FC	S	eastern wood pewee	C	S
ruffed grouse	C	P	tree swallow	C	S
ring-necked pheasant	A	P	bank swallow	C	S
gray partridge	FC	P	rough-winged swallow	C	S
king rail	R	S	barn swallow	C	S
Virginia rail	FC	S	cliff swallow	FC	S
sora	FC	S	purple martin	C	S
common gallinule	FC	S	winter wren	R	S
American coot	FC	S	long-billed marsh wren	C	S
killdeer	C	S	short-billed marsh wren	C	S
American woodcock	FC	S	veery	U	S
common snipe	FC	S	yellow warbler	C	S
upland plover	FC	S	northern waterthroat	U	S

(Continued)

Appendix D-25. (concluded)

	Abun- dance ^b	Resident status ^c		Abun- dance	Resident status ^c
common yellowthroat	FC	S	purple finch	FC	W
yellow-headed blackbird	FC	S	pine siskin	U	W
red-winged blackbird	A	S	Le Conte's sparrow	R	S
Brewer's blackbird	U	S	white-throated sparrow	R	W
common grackle	A	S	swamp sparrow	C	S
brown-headed cowbird	C,U	S,W	song sparrow	C,R	S,W
cardinal	FC	P	Lapland longspur	U	W

^aFrom Wisconsin Department of Natural Resources (1973)

^bA = abundant

C = common

FC = fairly common

U = uncommon

R = rare

^cP = permanent

S = summer

W = winter

Appendix D-26. Breeding Bird Survey of West Shore Wetlands,
Brown County (1971-1974)^a

	1971	1972	1973	1974
double-crested cormorant			1	5
great blue heron	3			2
green heron		3	4	2
black-crowned night heron		2	5	2
least bittern	1			1
American bittern	1	1		3
Canada goose	x			
black duck		2		
mallard	2	12	12	5
gadwall	4	4	2	1
pintail	4			
green-winged teal	3	6	1	
blue-winged teal	9	30	2	4
wood duck				2
ring-necked duck		1		
lesser scaup		2		
ring-necked pheasant		2		
Virginia rail	1		1	
sora			2	
common gallinule			1	2
coot		4	7	3
killdeer	3	1		3
common snipe	1	1		
spotted sandpiper		3	1	1
herring gull	2	2		5
Forster's tern	6			4
common tern	3		3	
black tern	25	120	15	22
mourning dove		1	4	1
black-billed cuckoo				1
ruby-throated hummingbird			1	
flicker	2	1		1
red-bellied woodpecker			1	
hairy woodpecker	1		1	
downy woodpecker	1	1		2
eastern kingbird	4	2	2	
crested flycatcher	2	1		1
olive-sided flycatcher				6
tree swallow	13	88	77	6
bank swallow	5			77
rough-winged swallow			7	
barn swallow	12		5	
purple martin	6	61	2	4
blue jay	3		1	4
long-billed marsh wren	4		4	3

-continued-
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Appendix D-26. (concluded)

	1971	1972	1973	1974
short-billed marsh wren	1	3		
catbird		2		
brown thrasher	2			1
robin	16	12	10	1
wood thrush		1		
hermit thrush		2		
veery		1		
cedar waxwing	1			
starling	3	3	4	
yellow warbler	3			2
ovenbird		1		
yellow-headed blackbird	6	60	8	22
red-winged blackbird	51	x	32	40
Baltimore oriole		1		1
Brewer's blackbird		108		
grackle	10	10	18	10
cowbird	9	18	2	2
rose-breasted grosbeak	1			1
indigo bunting	1			
goldfinch		2		
swamp sparrow	3			
song sparrow	2	3	6	4

^aSurvey dates were June 14 and 21, 1971; July 1, 1972; July 2, 1973; July 1 and 3, 1974 (Wisconsin Department of Natural Resources, Scientific Areas Preservation Council, 1974).

Appendix D-27. Wetland Bird Species of the Green Bay Christmas
Bird Counts 1972-1976^a

	1976	1975	1974	1973	1972
red-necked grebe					1
American bittern	1				
whistling swan	2				
Canada goose	338	476	621	407	253
snow (blue) goose					1
mallard	1943	859	1282	1152	711
black duck	394	377	520	623	324
pintail	1	1			
blue-winged teal		1	1		
northern shoveler					1
wood duck				**	1
greater scaup		1		10	
common goldeneye	42	22	77	28	
hooded merganser	8				
common merganser	149	28	144	3	
bald eagle			1		
sora			1		
American coot	1	2	1		
herring gull	105	4	374	21	1
ring-billed gull	1				
great horned owl	2	1		1	2
barred owl	4				
long-eared owl	3				
starling	977	293	1097	799	384
red-winged blackbird	70	2	5		
rusty blackbird	**b			1	
Brewer's blackbird				1	
cardinal	34	66	27	20	19
purple finch	14	1	21	**	2
white-throated sparrow	1				1
swamp sparrow			2		

^aThe Green Bay Census Area encompasses all of Preble Township Wetland #1, Fox River Wetland, Atkinson Marsh, Peats Lake Wetlands #1 and #2, and Dead Horse Bay Wetlands #1, #2, and #3, as well as a portion of open Lake Michigan and a few small wetlands not included in this study.

^bObserved in the area during count week, but not seen on the count day.

Appendix D-28. Average Annual Waterfowl Harvest for Brown, Oconto and Marinette Counties (1961-1970)^a

Waterfowl Species	Average Annual Harvest		
	Brown County	Oconto County	Marinette County
DABBING DUCKS			
mallard	829	1100	644
mallard (hand reared)	37		
mallard x black duck	5	10	45
black duck	217	135	191
American wigeon	73	91	162
green-winged teal	324	73	529
blue-winged teal	313	171	303
northern shoveler	63		
pintail	44		26
wood duck	85	402	
<u>Total Dabbling Ducks</u>	<u>1990</u>	<u>1982</u>	<u>2321</u>
DIVING DUCKS			
redhead	179		12
canvasback	234	58	
greater scaup	96	95	72
lesser scaup	795	480	254
ring-necked duck	145	872	629
common goldeneye	137	34	166
bufflehead	87	98	98
ruddy duck	16		
surf scoter			16
hooded merganser	99	388	189
red-breasted merganser			22
common merganser	29		26
<u>Total Diving Ducks</u>	<u>1817</u>	<u>2025</u>	<u>1484</u>
GEESE			
snow geese	87	59	100
white fronted geese	5		
Canada geese	598	65	74
<u>Total Geese</u>	<u>690</u>	<u>124</u>	<u>174</u>
<u>Anatidae</u>	<u>4497</u>	<u>4131</u>	<u>3979</u>

The average number of migratory bird hunting stamps sold in each county (1962-1971) is as follows: Brown County - 3,450; Oconto County - 895; Marinette County - 1,197 (Schroeder et al., 1974).

^aBased on Carney et al. (1975) -1543-

Appendix D-29. Average Annual Waterfowl Harvest for Menominee and Delta Counties, Michigan (1961-1970)^a

Waterfowl species	Average annual harvest	
	Menominee County	Delta County
DABBING DUCKS		
mallard	728	761
mallard x black duck	0	38
black duck	247	1045
gadwall	18	122
American wigeon	185	265
green-winged teal	172	534
blue-winged teal	103	350
northern shoveler	0	7
pintail	47	99
wood duck	223	191
Total Dabbling Ducks	1723	3412
DIVING DUCKS		
redhead	78	187
canvasback	78	0
greater scaup	115	115
lesser scaup	935	225
ring-necked duck	1050	198
common goldeneye	1918	130
bufflehead	1233	339
ruddy duck	0	6
white-winged scoter	0	6
surf scoter	0	10
black scoter	27	0
hooded merganser	49	114
red-breasted merganser	64	0
common merganser	7	7
Total Diving Ducks	5554	1337

(Continued)

Appendix D-29. (concluded)

Waterfowl species	Average annual harvest	
	Menominee County	Delta County
GEESE		
snow geese	72	162
Canada geese	310	365
<hr/>	<hr/>	<hr/>
Total Geese	382	527
<hr/>	<hr/>	<hr/>
Total Anatidae	7659	5276

The average number of migratory bird hunting stamps sold (1962-1971) in Menominee County is 395 and in Delta County is 716 (Schroeder et al., 1974).

^aAdapted from Carney et al. (1975)

Appendix D-30. Average Annual Waterfowl Harvest for Delta County
(1961-1970)^a

Waterfowl species	Average annual harvest
DABBING DUCKS	
mallard	761
mallard x black duck	38
black duck	1,045
gadwall	122
American wigeon	265
green-winged teal	534
blue-winged teal	350
northern shoveler	7
pintail	99
wood duck	191
Total dabbling ducks	3,412
DIVING DUCKS	
redhead	187
greater scaup	115
lesser scaup	225
ring-necked duck	198
common goldeneye	130
bufflehead	339
ruddy duck	6
white-winged scoter	6
surf scoter	10
hooded merganser	114
common merganser	7
Total diving ducks	1,337
GEESE	
snow goose	162
Canada goose	365
Total geese	527
Total Anatidae	5,276

The average number of migratory bird hunting stamps sold in Delta County (1962-1971) is 716 (Schroeder et al., 1974).

^abased on Carney et al. (1975) -1546-

Appendix D-31. Average Annual Waterfowl Harvest for Schoolcraft and Mackinac Counties (1961-1979)^a

Waterfowl species	Average annual harvest	
	Schoolcraft County	Mackinac County
DABBING DUCKS		
mallard	149	700
mallard x black duck	14	
black duck	144	392
gadwall		19
American wigeon		4
green-winged teal	28	86
blue-winged teal	17	28
pintail		35
wood duck	41	70
Total Dabbling Ducks	393	1334
DIVING DUCKS		
redhead	11	188
canvasback		36
greater scaup		382
lesser scaup	24	1014
ring-necked duck	136	618
common goldeneye		648
bufflehead	6	480
white-winged scoter		10
hooded merganser	73	101
red-breasted merganser		20
common merganser	250	3497
Total Diving Ducks	643	4831
GEESE		
snow geese		24
Canada geese	63	79
Total Geese	63	103
Total Anatidae	706	4934

The average number of migratory bird hunting stamps sold in each county (1962-1971) is as follows: Schoolcraft County - 351; Mackinac County - 473.

Appendix D-32. Average Annual Waterfowl Harvest for Mackinac County,
Michigan (1962-1971)^a

Waterfowl species	Average annual harvest
DABBING DUCKS	
mallard	700
black duck	392
gadwall	19
American wigeon	4
green-winged teal	86
blue-winged teal	28
pintail	35
wood duck	70
<u>Total Dabbling Ducks</u>	<u>1334</u>
DIVING DUCKS	
redhead	188
canvasback	36
greater scaup	382
lesser scaup	1014
ringneck	618
common goldeneye	648
bufflehead	480
white-winged scoter	10
hooded merganser	101
red-breasted merganser	20
<u>Total Diving Ducks</u>	<u>3497</u>
GEESE	
snow geese	24
Canada geese	79
<u>Total Geese</u>	<u>103</u>
<u>Total Anatidae</u>	<u>4934</u>

The average number of migratory bird hunting stamps sold in Mackinac County during the period 1962-1971 was 473 (Schroeder and Carney, 1974).

^aCarney et al. (1975)

Appendix E-1. Mammalian Species Found in Wetland Habitats Associated with Lake Michigan in Western Leelanaw County^a

Common name	Common name
eastern cottontail	red fox
fox squirrel	raccoon
gray squirrel	weasel
muskrat	mink
white-footed mouse	striped skunk

^aHatt, 1924

Appendix E-2. Mammal Species of Beaver Island^a

Common name	Common name
masked shrew	Gapper's red-backed mouse
snowshoe hare	coyote
little brown bat	red fox
eastern chipmunk	raccoon
gray squirrel	long-tailed weasel
beaver	ermine
deer mouse	river otter
muskrat	white-tailed deer

^aHatt et al., 1928; Ozoga, 1963; Ozoga and Phillips, 1964

Appendix E-3. Relative Abundance of Wetland Mammal Species of the
Indiana Dunes National Lakeshore^a

Common name	Relative Abundance ^b
Virginia opossum	U
masked shrew	U
short-tailed shrew	C
least shrew	R
red bat	C
eastern cottontail	C
woodchuck	A
Franklin's ground squirrel	U
red squirrel	C
beaver	U
deer mouse	A
white-footed mouse	A
meadow vole	A
muskrat	C
southern bog lemming	U
meadow jumping mouse	U
coyote	R
red fox	C
raccoon	C
long-tailed weasel	U
mink	U
striped skunk	U
white-tailed deer	C

^aReshkin et al.(1975)

^bA=abundant, C=common, U-uncommon, R=rare

Appendix E-4. The Relative Abundance of Wetland Mammalian Species^a

Common name	Relative Abundance ^b
opossum	U
masked shrew	R
short-tailed shrew	C
least shrew	P
red bat	U
eastern cottontail	C
beaver	P
meadow vole	C
muskrat	C
southern bog lemming	U
meadow jumping mouse	R
red fox	C
raccoon	C
mink	C
striped skunk	C
white-tailed deer	U

^aDetermined by the Illinois Natural History Survey (1976)

^bC=common, readily observed

U=uncommon, but likely to be observed

R=rare, seldom observed

P=present, abundance not determined

Appendix E-5. Mammals of Door County, Wisconsin Which May Utilize Wetlands^a

Common name	Common name
masked shrew	meadow jumping mouse
short-tailed shrew	coyote
star-nosed mole	red fox
snowshoe hare	black bear ^b
eastern cottontail	raccoon
white-footed mouse	long-tailed weasel
deer mouse	mink
Gapper's red-backed mouse	river otter
meadow vole	bobcat ^b
muskrat	white-tailed deer

^a adapted from Long, 1978. Introduced species and bats were omitted from Long's original list.

^b These species occur infrequently.

Appendix E-6. Relative Abundance of Mammalian Species of Newport
State Park Which May Utilize Wetlands^a

Common name	Relative Abundance ^b
short-tailed shrew	C
little brown bat	C
snowshoe hare	U
eastern cottontail	U
red squirrel	U
deer mouse	C
meadow vole	C
Gapper's red-backed mouse	U
coyote	VR
red fox	U
raccoon	C
porcupine	C
long-tailed weasel	U
ermine	U
mink	R
striped skunk	U
white-tailed deer	C

^aWisconsin Bureau of Parks and Recreation, 1974

^bC=common, U=uncommon, R=rare, VR=very rare

Appendix E-7. Mammal Species of the Delta and Garden Peninsulas
Which May Utilize Wetlands^a

Common name	Common name
masked shrew	coyote
short-tailed shrew	red fox
star-nosed mole	black bear
snowshoe hare	raccoon
deer mouse	long-tailed weasel
Gapper's red-backed mouse	mink
meadow vole	river otter
muskrat	bobcat
meadow jumping mouse	white-tailed deer

^a adapted from Long, 1978. Introduced species and bats were not included in original list.

Appendix F-1. Endangered (E) or Threatened (T) Species in the States
Surrounding Lake Michigan

	Illinois ^a	Indiana ^b	Michigan ^c	Wisconsin ^d
MOLLUSKS				
<u>Actinonaias ellipsiformis</u>			T	
<u>Anodonta subgibbosa</u>			T	
<u>Cyclonaias tuberculata</u>			T	
<u>Dysnomia triquetra</u>			T	
<u>Elliptio complanatus</u>			T	
<u>Epioblasma sampsoni</u> *		E		
<u>Epioblasma sulcata delicata</u> *		E		
<u>Epioblasma torulosa torulosa</u> *		E		
<u>Lampsilis fasciola</u>			T	
<u>Lampsilis higginsii</u> *				E
<u>Lampsilis o. orbiculata</u> *		E		
<u>Obovaria leibii</u> ^e			E	
<u>Plethobasis cicatricosus</u> *		E		
<u>Plethobasis cooperianus</u> *		E		
<u>Pleurobema clava</u>			T	
<u>Pleurobema plenum</u> *		E		
<u>Potamilus capax</u> *		E		
<u>Simpsoniconcha ambigua</u>			E	
<u>Amnicola binneyana</u> ^e			T	
<u>Anguispira kochi</u> ^e			T	
<u>Discus patulus</u> ^e			T	
<u>Fontigens nicklineana</u> ^e			T	
<u>Haplotrema concavum</u> ^e			T	
<u>Lymnaea megasoma</u>			T	
<u>Mesodon elevatus</u> ^e			T	
<u>Mesodon sayanus</u> ^e			T	
<u>Mesomphix cupreus</u> ^e			T	
<u>Pomatiopsis cincinnatiensis</u>			T	
<u>Triodopsis notata</u> ^e			T	
<u>Zoogenetes harpa</u>			T	
FISH				
lake sturgeon (<u>Acipenser fulvescens</u>)	T		T	
alligator gar (<u>Lepisosteus spatula</u>)	T			
longjaw cisco (<u>Coregonus alpenae</u>)*	E	E	E	E
lake herring (<u>Coregonus artedii</u>)	T		T	
lake whitefish (<u>Coregonus clupeaformis</u>)	T			

Appendix F-1. (continued)

	Illinois ^a	Indiana ^b	Michigan ^c	Wisconsin ^d
bloater (<u>Coregonus hoyi</u>)			T	
deepwater cisco (<u>Coregonus johanna</u> e)			E	
kiyi (<u>Coregonus kiyi</u>)			T	
blackfin cisco (<u>Coregonus nigripinnis</u>)			E	
shortnose cisco (<u>Coregonus reighardi</u>)			E	
shortjaw cisco (<u>Coregonus zenithicus</u>)			E	
goldeye (<u>Hiodon alosoides</u>)				T
redside dace (<u>Clinostomus elongatus</u>)			T	
Ozark minnow (<u>Dionda nubila</u>)				T
speckled chub (<u>Hybopsis aestivalis</u>)				T
bigeye chub (<u>Hybopsis amblops</u>)	E			
gravel chub (<u>Hybopsis x-punctata</u>)				E
pallid shiner (<u>Notropis amnis</u>)				T
pugnose shiner (<u>Notropis anogenus</u>)		T		T
blacknose shiner (<u>Notropis heterolepus</u>)		T		
striped shiner (<u>Notropis chrysocephalus</u>)				E
silver shiner (<u>Notropis photogenis</u>)			T	
bluehead shiner (<u>Notropis sp. undescribed</u>)		E		
southern redbelly dace (<u>Phoxinus erythrogaster</u>)			T	
longnose sucker (<u>Catostomus catostomus</u>)		T		
blue sucker (<u>Cycleptus elongatus</u>)				T
black buffalo (<u>Ictiobus niger</u>)				T
river redbhorse (<u>Moxostoma carinatum</u>)			T	T
greater redbhorse (<u>Moxostoma valenciennesi</u>)				E

Appendix F-1. (continued)

	Illinois ^a	Indiana ^b	Michigan ^c	Wisconsin ^d
slender madtom (<u>Noturus exilis</u>)				E
northern madtom (<u>Noturus stigmosus</u>)			T	
starhead minnow (<u>Fundulus notti</u>)				E
longear sunfish (<u>Lepomis megalotis</u>)				T
bantam sunfish (<u>Lepomis symmetricus</u>)	T			
crystal darter (<u>Ammocrypta asprella</u>)				E
eastern sand darter (<u>Ammocrypta pellucida</u>)			T	
mud darter (<u>Etheostoma aspringene</u>)				T
bluebreast darter (<u>Etheostoma camurum</u>)	E			
bluntnose darter (<u>Etheostoma chlorosomum</u>)				E
harlequin darter (<u>Etheostoma histrio</u>)	E			
gilt darter (<u>Percina evides</u>)	E			
blue pike (<u>Stizostedion vitreum glaucum</u>)*			E	
REPTILES AND AMPHIBIANS				
spotted salamander (<u>Ambystoma maculatum</u>)				T
marbled salamander (<u>Ambystoma opacum</u>)			T	
silvery salamander (<u>Ambystoma platineum</u>)	E			
small-mouthed salamander (<u>Ambystoma texanum</u>)			T	
Tremblay's salamander (<u>Ambystoma tremblayi</u>)				T
northern dusky salamander (<u>Desmognathus fuscus fuscus</u>)	E			
western lesser siren (<u>Siren intermedia nettingi</u>)			T	
Illinois chorus frog (<u>Pseudacris streckeri illinoensis</u>)				T
pickereel frog (<u>Rana palustris</u>)				T

Appendix F-1. (continued)

	Illinois ^a	Indiana ^b	Michigan ^c	Wisconsin ^d
Burns' leopard frog (<u>Rana pipiens burnsi</u>)				T
spotted turtle (<u>Clemmys guttata</u>)	E			
wood turtle (<u>Clemmys insculpta</u>)				E
Blanding's turtle (<u>Emydoidea blandingi</u>)				T
Illinois mud turtle (<u>Kinosternon flavescens [spooneri]</u>)	E			
slider (<u>Pseudemys floridana x concinna</u>)	E			
eastern box turtle (<u>Terrapene carolina carolina</u>)			T	
ornate box turtle (<u>Terrapene ornata</u>)				E
western slender glass lizard (<u>Ophisaurus a. attenuatus</u>)				T
Great Plains rat snake (<u>Elaphe guttata</u>)	T			
black rat snake (<u>Elaphe obsoleta obsoleta</u>)			T	
western hognose snake (<u>Heterodon nasicus</u>)	T			
whip snake (<u>Masticophis flagellum</u>)	T			
northern copperbelly (<u>Natrix erythrogaster neglecta</u>)			T	
broad-banded watersnake (<u>Natrix fasciata</u>)	E			
Kirtland's water snake (<u>Natrix kirtlandi</u>)			T	
queen snake (<u>Natrix septemvitata</u>)				E
eastern massasauga (<u>Sistrurus catenatus</u>)				E
eastern ribbon snake (<u>Thamnophis sauritus sauritus</u>)	E			
northern ribbon snake (<u>Thamnophis sauritus septentrionalis</u>)				E
western ribbon snake (<u>Thamnophis proximus proximus</u>)				E

Appendix F-1. (continued)

	Illinois ^a	Indiana ^b	Michigan ^c	Wisconsin ^d
AVIFAUNA				
double-crested cormorant (<u>Phalacrocorax auritus</u>)	E		T	E
American bittern (<u>Botaurus lentiginosus</u>)	E			
great egret (<u>Casmerodius albus</u>)	E			T
snowy egret (<u>Egretta thula</u>)	E			
little blue heron (<u>Florida caerulea</u>)	E			
black-crowned night heron (<u>Nycticorax nycticorax</u>)	E			
Mississippi kite (<u>Ictinia mississippiensis</u>)	E			
Cooper's hawk (<u>Accipiter cooperii</u>)	E		T	T
red-shouldered hawk (<u>Buteo lineatus</u>)	E		T	T
Swainson's hawk (<u>Buteo swainsoni</u>)	E			
bald eagle (<u>Haliaeetus leucocephalus</u>)**	E	E	T	E
marsh hawk (<u>Circus cyaneus</u>)	E		T	
osprey (<u>Pandion haliaetus</u>)	E		T	E
peregrine falcon (<u>Falco peregrinus</u>)*	E	E	E	E
greater prairie chicken (<u>Tympanuchus cupido</u>)	E		T	T
yellow rail (<u>Coturnicops noveboracensis</u>)	E			
black rail (<u>Laterallus jamacensis</u>)	E			
purple gallinule (<u>Porphyryula martinica</u>)	E			
common gallinule (<u>Gallinula chloropus</u>)	T			
piping plover (<u>Charadrius melodus</u>)	E		T	E
Eskimo curlew (<u>Numenius borealis</u>)*	E			
upland sandpiper (<u>Bartramia longicauda</u>)	E			

-continued-
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Appendix F-1. (continued)

	Illinois ^a	Indiana ^b	Michigan ^c	Wisconsin ^d
Wilson's phalarope (<u>Steganopus tricolor</u>)	E			
least tern (<u>Sterna albifrons</u>)	E			
Forster's tern (<u>Sterna forsteri</u>)	E			E
common tern (<u>Sterna hirundo</u>)	E			E
black tern (<u>Chlidonias niger</u>)	E			
Caspian tern (<u>Hydroproyne caspia</u>)				
barn owl (<u>Tyto alba</u>)	E		T	E
short-eared owl (<u>Asio flammeus</u>)	E			
long-eared owl (<u>Asio otus</u>)	E			
brown creeper (<u>Certhia familiaris</u>)	E			
Bachman's warbler (<u>Vermivora bachmanii</u>)*	E			
Kirtland's warbler (<u>Dendroica kirtlandii</u>)*		E	E	
Swainson's warbler (<u>Limnithlypis swainsonii</u>)	T			
Brewer's blackbird (<u>Euphagus cyanocephalus</u>)	T			
yellow-headed blackbird (<u>Xanthocephalus xanthocephalus</u>)	E			
Bachman's sparrow (<u>Aimphila aestivalis</u>)	E			
Henslow's sparrow (<u>Ammodramus henslowii</u>)	T			
Bewick's wren (<u>Thryomanes bewickii</u>)	T			
veery (<u>Catharus fuscescens</u>)	T			
loggerhead shrike (<u>Lanius ludovicianus</u>)	T		T	T

MAMMALS

least shrew (<u>Cryptotis parva</u>)			T	
southeastern myotis (<u>Myotis austroriparius</u>)		E		

Appendix F-1.

	Illinois ^a	Indiana ^b	Michigan ^c	Wisconsin ^d
gray bat (<u>Myotis grisescens</u>)*	E	E		
Indiana bat (<u>Myotis sodalis</u>)*	E	E	E	
big-eared bat (<u>Plecotus rafinesquii</u>)		E		
white-tailed jackrabbit (<u>Lepus townsendii</u>)	E			
eastern wood rat (<u>Neotoma floridana</u>)	E			
golden mouse (<u>Ochrotomys muttalli</u>)	T			
rice rat (<u>Oryzomys palustris</u>)	T			
southern bog lemming (<u>Synatomys cooperi</u>)			T	
eastern timber wolf (<u>Canis lupus lycaon</u>)*		E	E	E
pine marten (<u>Martes americana</u>)			T	E
river otter (<u>Lutra canadensis</u>)	T	E		
badger (<u>Taxidea taxus</u>)		E		
Canada lynx (<u>Lynx canadensis</u>)				E
bobcat (<u>Lynx rufus</u>)	T	E		

*Also on federal list of endangered species (U.S. Fish and Wildlife Service, 1977).

**The bald eagle was reduced to threatened status on the federal list in 1978.

^aIllinois Department of Conservation (1978).

^bIndiana Department of Natural Resources (1978).

^cMichigan Endangered and Threatened Species Program (1976).

^dBased originally on Hine et al. (1975), updated, during review using Wisconsin Department of Natural Resources (1979) due to significant changes since 1975.

^eScientific name equivalents for endangered and threatened mollusks:
Simpsoniconcha = Simpsonaias; Ammicola binneyana = Cincinnatia emarginata;
Obovaria leibii = O. subrotunda; Anguispira kochi = A. solitaria; Discus patulus = Gonyodiscus perspectivus; Fontigens = Paludestrina; Haplotrema = Cincinnatiaria; Mesodon = Polygrya; Mesomphix = Omphalina; Triodopsis notata = Polygyra palliata.

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LIST OF U.S. GEOLOGICAL SURVEY MAPS

<u>Quadrangle</u>	<u>Series</u>	<u>Date</u>
Algoma, Wisconsin	15'	1960
Bar Lake, Michigan	15'	1956
Bark River, Michigan	15'	1963
Bayshore, Michigan	15'	1958
Beaver Island, Michigan	15'	1956
Benton Harbor, Michigan	7.5'	1970
Benton Heights, Michigan	7.5'	1970
Big Stone Bay, Michigan	7.5'	1964
Birch Creek, Michigan	7.5'	1976
Brevort, Michigan	7.5'	1975
Bridgeman, Michigan	7.5'	1970
Cedar River, Michigan-Wisconsin	15'	1963
Cedarburg, Wisconsin	7.5'	1971
Central Lake, Michigan	15'	1954
Central Lake, SE, Michigan	orthophotograph	1975
Chambers Island, Wisconsin-Michigan	15'	1961
Charlevoix, Michigan	15'	1954
Cleveland East, Wisconsin	7.5'	1973
Cooks, Michigan	15'	1958
Cross Village, Michigan	15'	1958
Custer, Michigan	15'	1959
Dunes Acres, Indiana	7.5'	1968
Elk Rapids, Michigan	15'	1957
Ellison Bay, Wisconsin-Michigan	15'	1960
Engadine, Michigan	7.5'	1973
Epoufette, Michigan	7.5'	1964
Escanaba, Michigan	15'	1958
Fairport, Michigan	15'	1958
Frankfort, Michigan	15'	1956
Garden, Michigan	15'	1958
Gary, Indiana	7.5'	1968
Gould City, Michigan	15'	1973
Green Bay East, Wisconsin	7.5'	1971
Green Bay West, Wisconsin	7.5'	1971
Gull Island, Michigan	15'	1955
Gulliver, Michigan	7.5'	1972
Hog Island, Michigan	15'	1955
Hos Island Point, Michigan	7.5'	1973
Holland West, Michigan	7.5'	1972
Hughes Point, Michigan	7.5'	1972
Inland West, Michigan	7.5'	1972
Jacksonport, Wisconsin	15'	1960
Kewaunee, Wisconsin	15'	1954
Kingsley, Michigan	15'	1956
Lake Calumet, Illinois-Indiana	7.5'	1973
Little Sturgeon, Wisconsin	15'	1961
Ludington, Michigan	15'	1959

<u>Quadrangle</u>	<u>Series</u>	<u>Date</u>
McGulpin, Michigan	7.5'	1964
Manistee, Michigan	15'	1958
Manistique East, Michigan	7.5'	1972
Manitowoc, Wisconsin	7.5'	1954
Maple City, Michigan	15'	1957
Marinette, Michigan-Wisconsin	15'	1963
Michigan City West, Indiana	7.5'	1969
Montaque, Michigan	15'	1959
Moran, Michigan	7.5'	1964
Muskegon East, Michigan	7.5'	1972
Muskegon West, Michigan	7.5'	1972
Naubinway, Michigan	7.5'	1973
New Buffalo, Michigan	7.5'	1970
New Franken, Wisconsin	15'	1954
North Manitou, Michigan	15'	1956
Northport, Michigan	15'	1957
Oconto, Wisconsin	15'	1956
Onkama, Michigan	15'	1956
Pellston, Michigan	15'	1958
Peninsula Point, Michigan	15'	1958
Point aux Chenes, Michigan	7.5'	1964
Point Patterson, Michigan	7.5'	1973
Portage, Indiana	7.5'	1968
Porterfield, Wisconsin	15'	1963
Port Sheldon, Michigan	7.5'	1972
Racine North, Wisconsin	7.5'	1971
Rapid River, Michigan	15'	1958
St. Ignace, Michigan	7.5'	1964
Seul Choix Point, Michigan	7.5'	1972
Sister Bay, Wisconsin	15'	1960
South Haven, Michigan	15'	1972
South Milwaukee, Wisconsin	7.5'	1971
Stevensville, Michigan	7.5'	1970
Sturgeon Bay, Wisconsin	15'	1960
Traverse City, Michigan	15'	1957
Twin Lake, Michigan	15'	1958
Whiting, Indiana	7.5'	1968
Zion, Illinois	7.5'	1972

ROCKFORD MAP PUBLISHERS^a

List of County Plat Books

<u>County</u>	<u>Year</u>
Antrim County	1975
Charlevoix County	1976
Delta County	1976
Emmet County	1975
Grand Traverse County	1975
Kenosha County	1977
Leelanau County	1975
Mackinac County	1972
Manistee County	1974
Mason County	1975
Menominee County	1974
Muskegon County	1975
Ottawa County	1976
Ozaukee County	1974
Racine County	1974
Schoolcraft County	1970
Sheboygan County	1977
Van Buren County	1975

^aRockford, Illinois