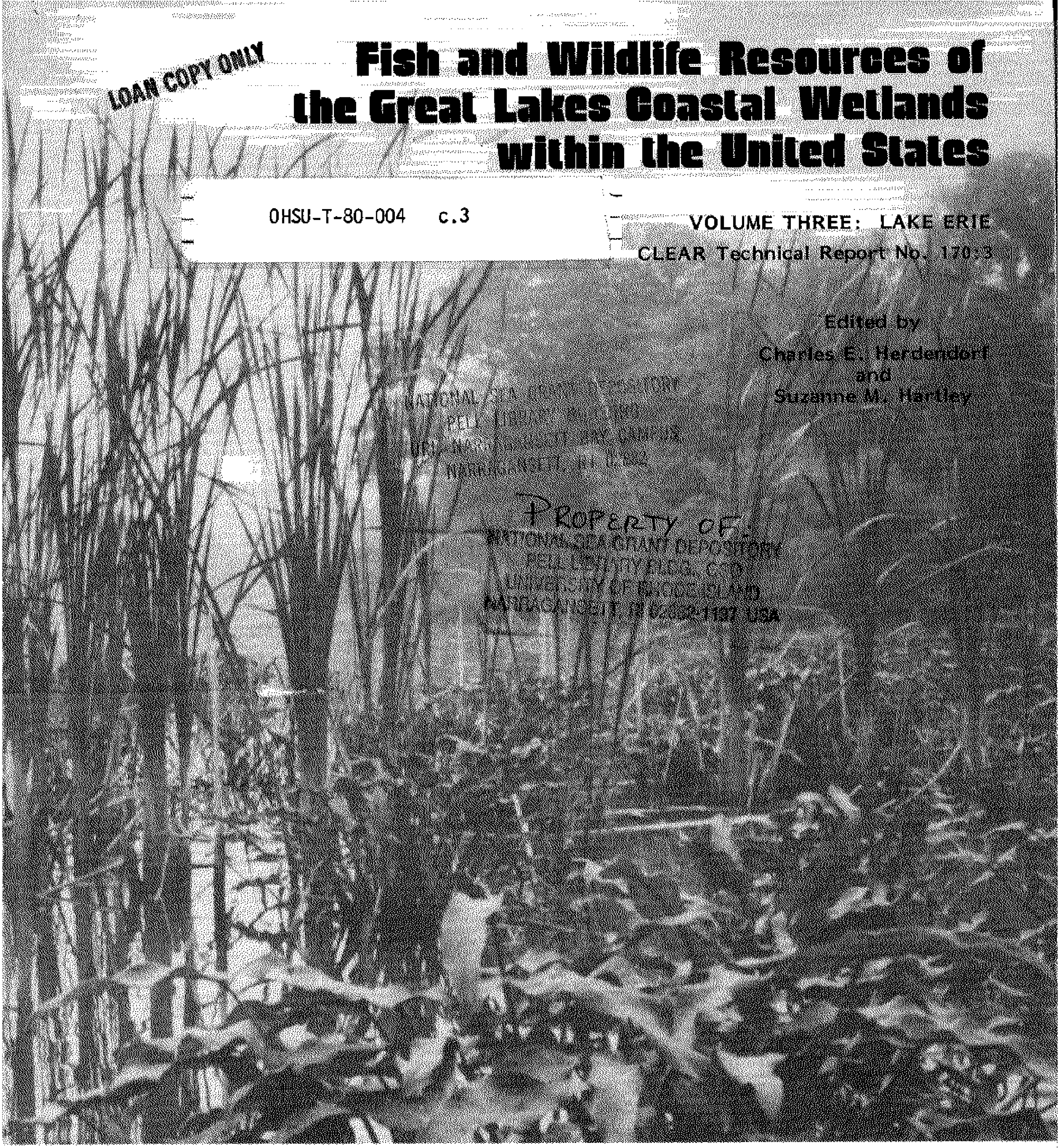
Fish and Wildlife Resources of the Great Lakes Coastal Wetlands within the United States

VOLUME THREE: LAKE ERIE

CLEAR Technical Report No. 170:3

Edited by
Charles E. Herdendorf
and
Suzanne M. Hartley



Prepared for U.S. Fish and Wildlife Service, Division of Ecological Services-Region 3
Twin Cities, Minnesota. Project Officer: Herbert W. Hyatt. Grant No. 14-16-0009-77-076

The Ohio State University, Center for Lake Erie Area Research,
and Ohio Sea Grant Program. Columbus, Ohio

in cooperation with

Indiana University, Environmental Systems Application Center. Bloomington, Indiana

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PREFACE

OBJECTIVES

The purpose of the volumes of which this is the third is the compilation of published information concerning fish and wildlife resources and environmental factors in the coastal wetlands of the Great Lakes within the United States. Specific objectives were as follows:

(a) to delineate and describe all wetland areas along the Great Lakes shorelines
(b) to inventory the fish and wildlife resources of these wetlands
(c) to describe the physiographic and cultural setting in which these wetlands are situated, and
(d) to determine the voids in knowledge pertaining to the fish and wildlife resources of the Great Lakes coastal wetlands.

The Great Lakes region has been divided into five areas of study, each consisting of a single lake and its connecting channel. These five areas are (1) Lake Ontario and the St. Lawrence River; (2) Lake Erie and the Niagara River; (3) Lake Huron and the St. Clair River, Lake St. Clair and the Detroit River; (4) Lake Michigan and the Mackinac Straits; and (5) Lake Superior and the St. Mary's River. Each such area comprises one volume in this study. An overview volume has been prepared which serves as an introduction to the five lake volumes.

The information summarizing the study areas is based on an extensive literature search undertaken by the Ohio State University Center for Lake Erie Area Research and the Indiana University Environmental Systems Application Center. Major sources of information used included referee journals and various technical and popular publications of the state departments of natural resources, libraries, universities, federal, state, and local agencies, multi-agency commissions having Great Lakes responsibilities, and private groups and individuals possessing knowledge of Lake Erie's coastal wetlands. In some cases unpublished open file data of various agencies and individuals was used. The sheer volume and the unfinished nature of unpublished data precluded its extensive use. Many agencies, institutions, and individuals were contacted by letter, telephone, or personal visit and provided valuable assistance in the acquisition and interpretation of published information. A complete listing of agencies, institutions, and individuals contacted appears in the Overview Volume (Volume #1).

ACKNOWLEDGEMENTS

This report represents the joint efforts of the Ohio State University Center for Lake Erie Area Research and the Indiana University Environmental Systems Application Center. The staff of the Center for Lake Erie Area Research was responsible for the preparation of all the components in this volume. Expertise insight for the preparation of the Physiographic and Cultural Setting components was provided by the faculty of the Indiana University School of Public and Environmental Affairs.

Assistance from federal, state and local agencies, educational institutions and private individuals was splendid.

We would like to acknowledge all of the individuals contacted during this study who provided us with information concerning the coastal wetlands of Lake Erie. A special thanks to Charles C. King for his participation as coordinator of the Peer Review Group. We would like to thank all the members of the Peer Review Group for their valuable guidance. The seven members of the Peer Review Group are: Dr. William E. Cooper, Michigan State University; Dr. Henry L. Hunker, The Ohio State University; Dr. Orie Loucks, University of Wisconsin; Dr. Frederick Marland, Georgia Department of Natural Resources; Dr. William Niering, Connecticut College; Dr. Henry A. Regier, University of Toronto; Dr. Milton B. Trautman; The Ohio State University; and Dr. Charles C. King, Ohio Biological Survey.

LIST OF CONTRIBUTORS

The Ohio State University, Center for Lake Erie Area Research

PROJECT SUPERVISORS

Charles E. Herdendorf - Principal Investigator
Suzanne M. Hartley - Project Manager

PHYSIOGRAPHIC SETTING

James S. Dingman
Charles E. Herdendorf
Nancy J. Ryan

BIOTIC SETTING

Vegetation

John H. Marshall

Fish

Mark D. Barnes

Invertebrates

Margarita Apanius
C. L. Cooper

Amphibians and Reptiles

Mark D. Barnes
C. L. Cooper

Avifauna

Margarita Apanius
C. L. Cooper

Mammals

Christine Bunck

Technical Advisers

Theodore A. Bookhout
Bernard L. Griswold
Ronald L. Stuckey

CULTURAL SETTING

Timothy M. Bartish
Joel L. Davis
Theresa C. Gordon
David B. Mackey
Robert N. Merrill
Thomas L. Pennebaker
Nancy J. Ryan
Lisa A. Trace

John H. Marshall - Coordinator

PROJECT EDITOR

Ruth B. Foltz

EDITORIAL ASSISTANCE

Timothy M. Bartish
Nancy J. Ryan

GRAPHIC ARTIST

Laurie J. Fletcher

PROJECT SECRETARY

Susan E. Sapecki

PROJECT TYPIST

Norma J. Darnell

SECRETARIAL ASSISTANCE

Dolores J. Adair
JoAnn Franks
Pamela Rusch
Mary C. Steward
Patricia B. Walker

PEER REVIEW

Charles C. King - Coordinator

U.S. FISH AND WILDLIFE SERVICE

Herbert W. Hyatt - Project Officer
Keith Kraii - Technical Advisor
Ronald Erickson - Technical Advisor

Indiana University, School for Public and Environmental Affairs

PROJECT SUPERVISORS

J. C. Randolph - Co-Principal Investigator
William A. Kelley - Project Coordinator

INTRODUCTION

WETLAND IDENTIFICATION AND DELINEATION

This volume concerns the coastal wetlands of Lake Erie and the Niagara River. U.S. Geological Survey quadrangle maps (scale 1:24,000 or 1:62,500, depending on availability) were the primary basis for identifying and delineating all coastal wetlands. An arbitrary boundary line was drawn on these maps 1,000 feet landward of the normal high water mark at all points along the Lake Erie shore. All wetlands depicted on the maps which were contained entirely or partially between the 1,000 feet boundary and the shore, whether contiguous to the lake or not, were included in the review. Wetlands located wholly or partially within 1,000 feet of a coastal body of water such as a bay, harbor, or estuary, or small lakes and ponds with direct connections to Lake Erie, were similarly included. Figure 1 illustrates the above delineation rules.

An aerial reconnaissance of the Lake Erie shoreline was conducted to verify the existence of the wetlands shown on the quadrangle maps as well as to provide some first-hand familiarity with the wetlands and their setting. Based on the quadrangle maps and aerial reconnaissance, 96 wetlands were identified and delineated along the Niagara River-Lake Erie shoreline. The 96 wetlands of Lake Erie are located along approximately 342 shoreline miles in New York, Pennsylvania, Ohio, and Michigan.

USE OF THIS DOCUMENT

In order to facilitate the use of this report, the Niagara River-Lake Erie shoreline has been divided into 7 lake sections (Table 1 and Figure 2). Each lake section corresponds to a separate chapter within this report. By looking at Figure 2, users of this document can determine which lake section contains the wetland(s) in which they are interested. Once this has been accomplished, the "Introduction" section of the appropriate lake section chapter should be consulted. A more detailed map of the shoreline is contained within the chapter Introduction. This map will permit users of the document to find the specific wetland(s) for which they are seeking information. The grouping of wetlands in a lake section does not necessarily imply physical or biological relationships among those wetlands. Rather, these sections are simply organizational devices and usually were drawn according to political boundaries or the density and distribution of wetlands along the coast.

Each wetland has been described in terms of its physiographic, biotic, and cultural characteristics. Table 2 identifies the sub-components considered within these three components. Where available, wetland-specific data are presented first within the individual wetland narratives, followed by historical or general information of relevance to the wetland. Reference may also be made to one of the appendices contained at the end of the report when more generalized but non-specific information is applicable to the wetland. A list of threatened and endangered species of New York, Ohio, Pennsylvania, and

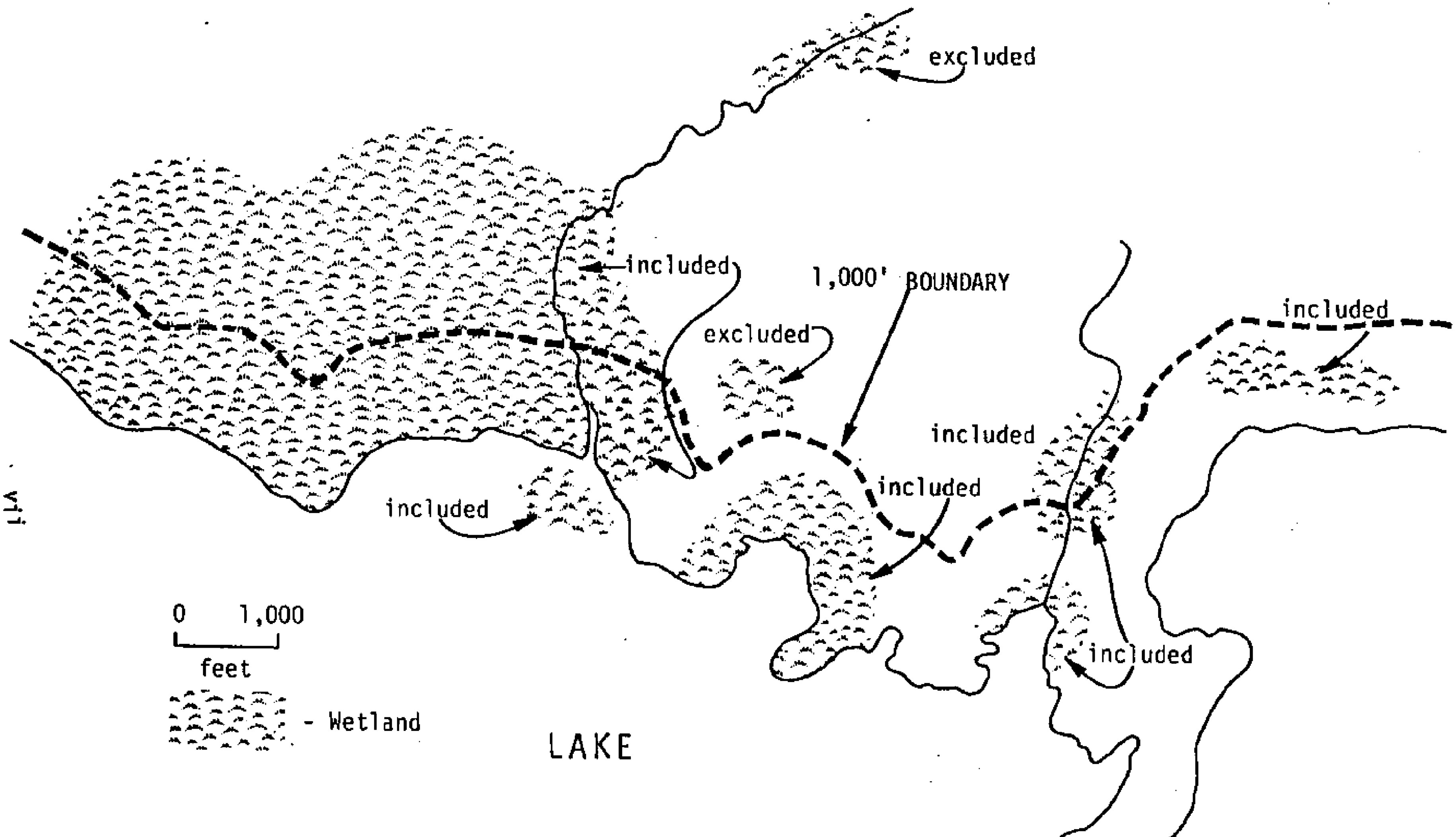

Figure 1. Wetland Delineation

Table 1. Seven Lake Sections of Lake Erie

Lake Section	Shoreline Area Included
LS 1	Buckhorn Island to New York-Pennsylvania border
LS 2	New York-Pennsylvania border to Ohio-Pennsylvania border
LS 3	Pennsylvania-Ohio line to Cedar Point, Ohio
LS 4	Cedar Point, Ohio to East Harbor, Ohio. Including Kelleys Island
LS 5	East Harbor, Ohio, to Port Clinton, Ohio. Including the American Islands (except Kelleys Island).
LS 6	Port Clinton, Ohio to Ohio-Michigan border
LS 7	Ohio-Michigan border to Gross Isle, Michigan

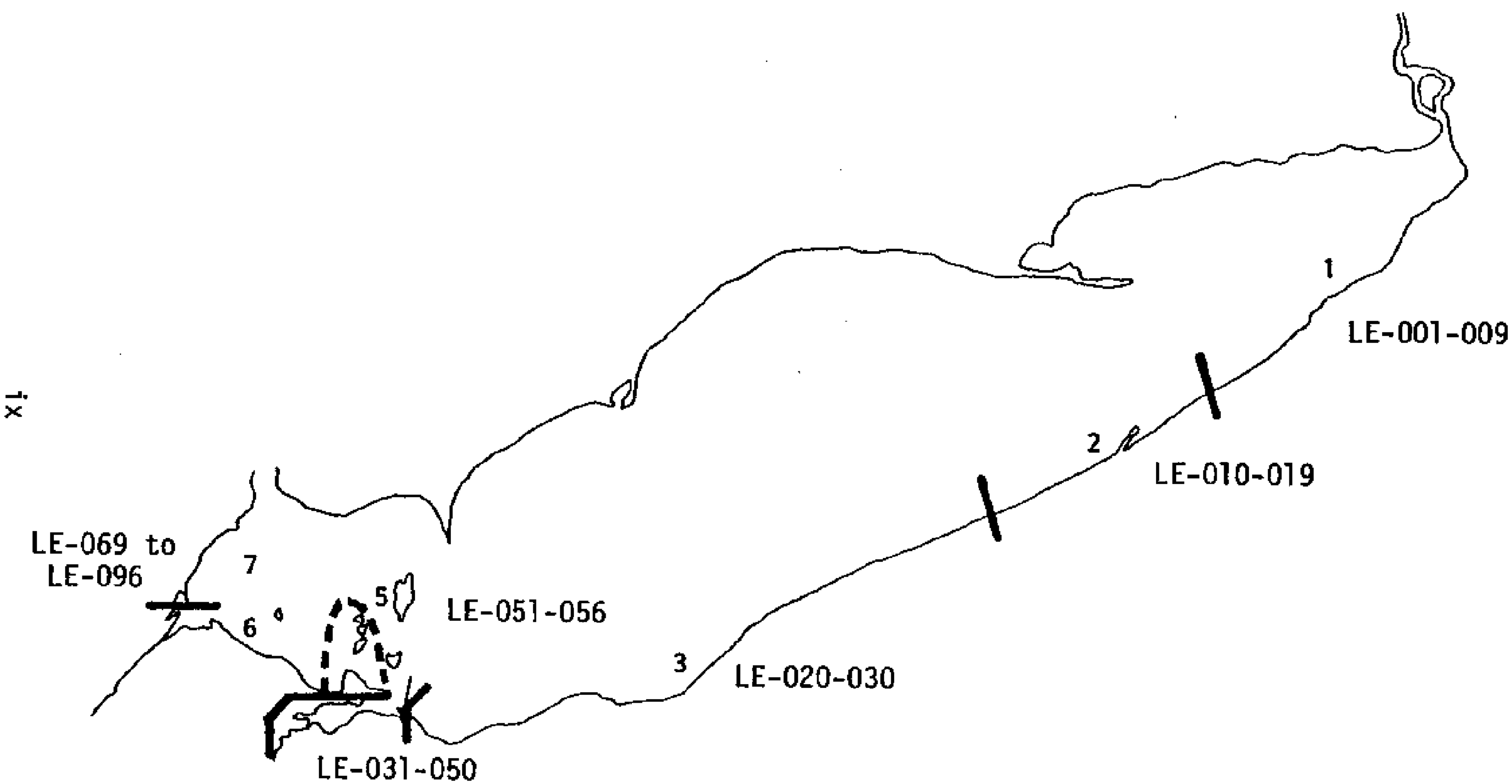

Figure 2. Lake Sections of Lake Erie and The Niagara River

Table 2. Major components Addressed in Individual Wetland Narratives

PHYSIOGRAPHIC SETTING

- Setting
- Topography
- Surficial Geology
- Soils
- Hydrology
- Climate
- Special Features

BIOTIC SETTING

- Vegetation
- Fish
- Invertebrates
- Amphibians and Reptiles
- Avifauna
- Mammals
- Endangered Species

CULTURAL SETTING

- Population
- Land Use and Ownership
- Recreation
- Mineral, Energy, and Forest Resources
- Public Utilities and Facilities
- Pollution Sources
- Historical and Archaeological Features

RESEARCH PROJECTS

Michigan appears in Appendix E-1 of this volume. Scientific names associated with the common names used in this volume are presented in the Appendices of the Overview Volume.

A number of the wetlands along the Lake Erie shoreline are situated in close proximity to one another and have been grouped into "complexes" for convenience of discussion. The grouping of several wetlands in a complex does not necessarily imply any physical or biological continuity among those wetlands, although such continuity may exist in some cases. Several small wetlands in close proximity to one another or to a single larger wetland may have little or no site-specific information associated with them. It is simpler to group them under a single narrative rather than provide a completely negative narrative for each separately. A complete listing of these complexes as well as the individual wetlands along the Lake Erie shoreline is presented in Table 3. The table also indicates the page number on which a description of the wetland can be found.

This report is intended to provide a comprehensive summary of published information concerning the coastal wetlands of Lake Erie that can be readily used by public institutions and agencies as well as private groups and individuals. This report should enable interested persons to more easily use existing information as well as to identify areas where information concerning coastal wetlands is lacking. Doubtless, some sources of published information have been overlooked. It is hoped that such information, however minor, will be relayed to the authors.

Table 3. Wetlands in Lake Erie

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Table 3. (continued)

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Table 3. (continued)

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Table 3. (continued)

-continued-

Table 3. (concluded)

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LAKE SECTION 1

INTRODUCTION

Lake Section 1 includes the Niagara River and the New York shoreline of Lake Erie in Erie County, New York. The region features low and marshy to gently sloping topography in the vicinity of the wetlands. The predominant shore type along this 109 mile stretch of river and lake shoreline is low plain.

Figure 1-1 shows the approximate location of the nine coastal wetlands in Lake Section 1. Data concerning latitude, longitude, acreage, and classification for each of these wetlands are presented in Table 1-1. The wetlands of Lake Section 1 lie at elevations between 563 and 592 feet above sea level, from six feet below the mean low water datum of the Niagara River up to 21 feet above the mean elevation of Lake Erie. These wetlands are classified as Riverine.

Available information related to physiographic and cultural features of the nine coastal wetlands is summarized in the individual narratives presented in this chapter. Published sources lack site-specific information related to the biotic characteristics of these wetlands in many instances.

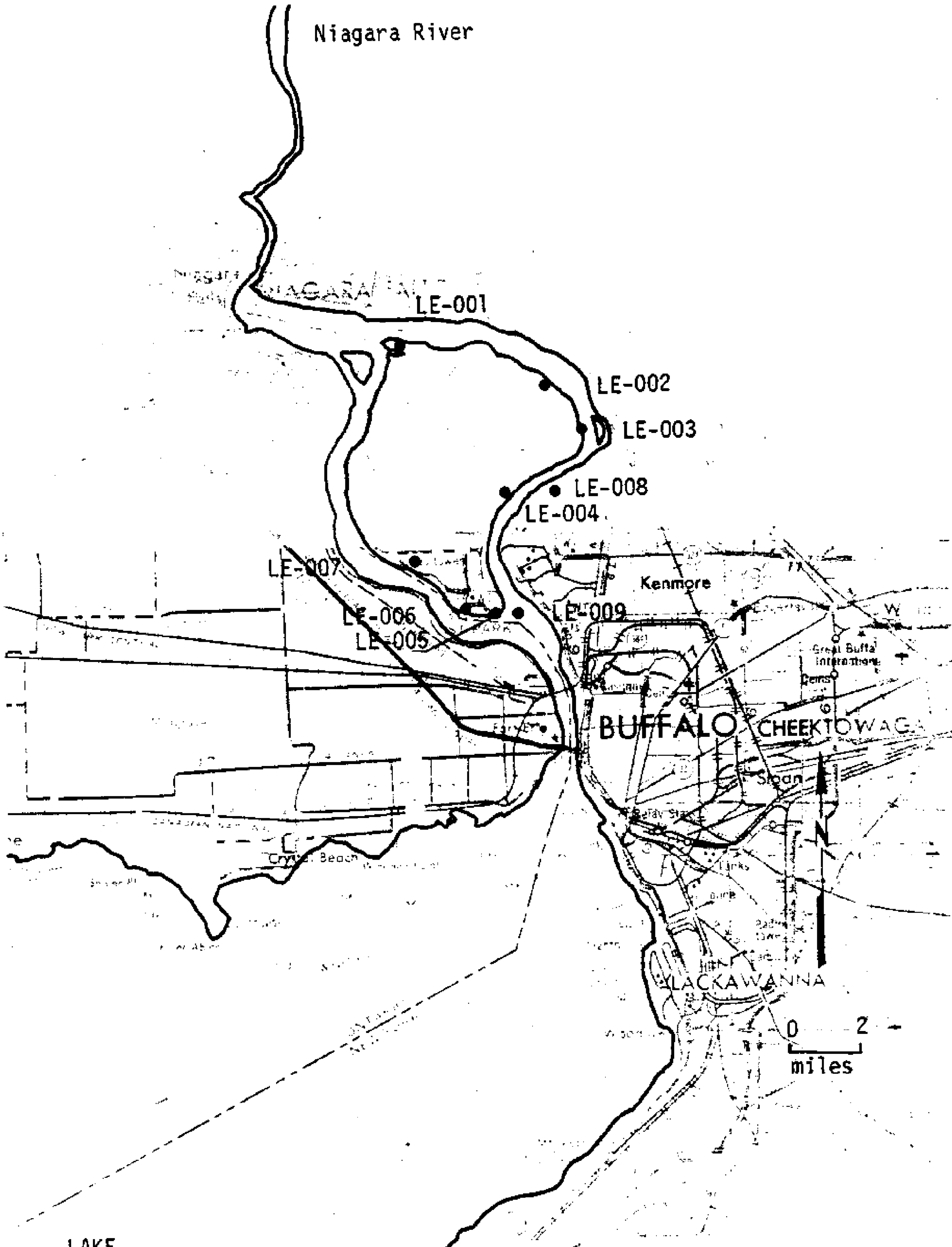

Figure 1-1. Lake Section 1

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

Wetland Number	Wetland	Latitude	Longitude	Acreage	Classification[a]
	GRAND ISLAND WETLAND COMPLEX				
001	Buckthorn Island Wetland	43°03'38"	78°59'20"	250	R
002	Gun Creek Area Wetland	43°02'24"	78°54'40"	35	R
003	Spicer Creek Area Wetland	43°02'17"	78°53'44"	22	R
004	Staley Road Wetland	43°00'28"	78°55'49"	7	R
005	Beaver Island State Park Wetland	43°57'27"	78°56'32"	22	R
006	Beaver Island Wetland	42°57'42"	78°57'33"	17	R
007	West River Road Wetland	42°58'51"	78°59'24"	4	P
008	Two-mile Creek Wetland	43°00'21"	78°54'20"	24	R
009	Motor Island Area Wetland	42°57'42"	78°55'54"	10	R

[a]P=palustrine
L=lacustrine
R=riverine

GRAND ISLAND WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LE 001-007

Setting

The Grand Island Wetland Complex is located in Erie County, New York. The wetland complex is comprised of Buckhorn Island, Gun Creek Area, Spicer Creek Area, Staley Road, Beaver Island State Park, Beaver Island, and West River Road Wetlands. The first five are located on the northern and eastern sides of Grand Island adjacent to the Tonawanda Channel of the Niagara River, while the latter three are on the south and west shores adjacent to the Chippewa Channel. The following table indicates the proximity of these wetlands to metropolitan areas:

Wetlands	Nearest city	Miles	Direction to City
Buckhorn Island	Niagara Falls, N.Y.	0.8	north
Gun Creek Area	North Tonawanda, N.Y.	1.3	east
Spicer Creek Area	Tonawanda, N.Y.	1.0	southeast
Staley Road	Tonawanda, N.Y.	1.2	northeast
Beaver Island S.P.	Buffalo, N.Y.	1.7	southeast
Beaver Island	Buffalo, N.Y.	2.5	southeast
West River Road	Buffalo, N.Y.	4.0	southeast

These wetlands are largely Riverine Systems, with the exception of West River Road Wetland which is located 0.2 miles inland from the Niagara River, and are non-wooded except for Gun Creek Area and Spicer Creek Area Wetlands (U.S.G.S. quadrangle maps, Tonawanda West, New York, 1965; Buffalo Northwest, New York-Ontario, 1965).

Topography

The wetlands of the Grand Island Complex have very little relief, lying at or near the Niagara River elevation of 570 feet above sea level with the exception of the inland West River Road Wetland which is situated at an elevation of 592 feet. The relief of Grand Island is approximately 35 feet. The shoreline of the island is low and marshy in places, with bluffs rarely exceeding 20 feet in height.

Surficial Geology

The surficial geology of the shoreline of Grand Island is characterized by unconsolidated sediments deposited by the Wisconsin ice sheet. These deposits are relatively thin and overlie Silurian formations composed of carbonate rock (Walker and Allen, 1975).

Soils

The soils of Grand Island are generally hapludalfs (formerly gray-brown podzolic soils without fragipan). These soils develop on gently sloping terrain and are characterized by a subsurface horizon of accumulated clay that is relatively thin (Gerlach, 1970).

Hydrology

All of the wetlands in this complex are adjacent to the Niagara River except West River Road Wetland. The following smaller streams are also associated with four of the wetlands:

Wetland	Stream
Buckhorn Island	Burnt Ship Creek and Woods Creek
Gun Creek Area	Gun Creek
Spicer Creek Area	Spicer Creek
Beaver Island	Beaver Island Channel

Generalized groundwater information for the New York portion of the Lake Erie shore is available in Weist (1978). Typical yields from groundwater wells in unconsolidated deposits on Grand Island are less than 10 gallons per minute. High sulfate concentrations (100 mg/l) are found in water from some of the unconsolidated aquifers in this portion of New York (Weist, 1978).

Water quality monitoring summaries for three stations on the Niagara River in the vicinity of Grand Island are presented in Table 1-2. Although the Niagara serves as a receiving body for large quanitites of municipal and industrial waste discharges, it has a very high assimilative capacity for oxygen-demanding substances because of the flow magnitude and favorable physical characteristics (i.e., rapids and falls). The major pollutants are oils and phenols, but the additional presence of floating debris detracts from the river's scenic appeal (New York Department of Environmental Conservation, 1975).

Climate

The closest weather station providing climatic data for the Grand Island Wetland Complex is Buffalo Airport. The average annual temperature is 48.1^{o}F based on the normal period from 1941-1970. The mean monthly low for January is 23.3^{o}F and the mean monthly high for July is 81.7^{o}F. The average annual precipitation is 36.11 inches, with a mean monthly precipitation of 2.89 inches in January and 2.93 inches in July. The growing season is approximately five and one half months long, with the last killing frost (28^{o}F) in 1975 occurring on April 14 and the first killing frost on October 30 (National Oceanic and Atmospheric Administration, 1975).

Table 1-2. Niagara River Water Quality Adjacent to Grand Island[a]

Parameter	Units	Station 01-0002			Station 01-0007			Station 01-0008		
		Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean
Flow	cfs	241,000	193,000	215,000	241,000	193,000	220,000	241,000	211,000	223,090
Color	units	45	2	13	20	3	8	30	5	12
Turbidity	JTU	62.0	2.0	12.7	18.0	1.0	7.2	24.0	2.0	8.6
Temperature	F°	78.8	33.8	50.5	77.0	35.6	55.9	78.8	33.8	55.6
Dissolved oxygen	mg/l	13.8	6.0	9.7	13.4	11.2	12.5	13.8	7.0	9.9
Dissolved oxygen	% sat	99.4	49.7	83.8	102.0	97.0	100.2	112.8	80.1	92.0
B.O.D. (5 day)	mg/l	6.1	1.0	2.7	3.6	0.2	0.8	3.2	0.8	1.6
C.O.D.	mg/l	25.0	8.0	14.7	19.0	5.0	9.5	23.0	6.0	11.9
Conductivity	umhos	499	224	325	374	224	289	378	224	302
Chlorides (Cl)	mg/l	44	22	29	30	23	25	34	23	26
Fluorides (F)	mg/l	-	-	-	0.5	0.3	0.4	0.52	0.33	0.40
pH	units	8.3	6.6	7.7	8.4	7.7	8.0	8.4	7.5	8.0
Carbon dioxide (CO_2)	mg/l	8.0	0.1	2.9	4.0	0.1	2.3	4.0	0.1	1.6
Hardness ($CaCO_3$)	mg/l	208	116	158	164	120	138	204	114	143
Total alkalinity ($CaCO_3$)	mg/l	122	76	102	119	85	99	113	82	98
Calcium (Ca)	mg/l	59.0	34.0	46.5	46.0	38.9	42.4	52.0	35.0	43.2
Magnesium (Mg)	mg/l	17.0	3.9	10.1	13.0	4.9	7.7	21.0	1.9	8.6
Sodium (Na)	mg/l	24.4	4.9	14.8	19.1	10.0	11.7	20.6	9.8	13.2
Potassium (K)	mg/l	3.2	0.7	1.6	1.9	0.5	1.4	2.5	0.7	1.7
Iron (Fe)	mg/l	1.90	0.02	0.37	0.80	0.02	0.24	0.80	0.02	0.28
Manganese (Mn)	mg/l	0.30	0.01	0.06	0.03	0.01	0.01	0.10	0.01	0.03
Ammonia (NH_3)	mg/l	0.67	0.07	0.26	0.15	0.01	0.03	0.21	0.04	0.13
Organic nitrogen (N)	mg/l	1.85	0.00	0.69	0.96	0.22	0.50	1.20	0.39	0.66
Nitrites (NO_2)	mg/l	0.11	0.02	0.06	0.04	0.00	0.01	0.18	0.02	0.05
Nitrates (NO_3)	mg/l	26.53	0.09	2.15	0.97	0.44	0.59	1.77	0.44	0.84
Phosphates (P)	mg/l	0.17	0.04	0.10	0.10	0.00	0.03	0.14	0.03	0.06
Phosphates (PO_4)	mg/l	0.53	0.13	0.30	0.31	0.01	0.10	0.44	0.08	0.18
Sulfate (SO_4)	mg/l	52.0	1.0	30.4	29.0	18.0	24.2	33.0	21.0	26.3
Phenol	mg/l	0.170	0.002	0.037	0.006	0.001	0.001	0.012	0.001	0.004
Total solids (evap.)	mg/l	329	181	246	349	163	230	251	195	225
Susp. solids (total)	mg/l	73	5	27	140	2	24	53	5	19
Susp. solids (volatile)	mg/l	71	2	11	18	2	7	19	2	8
Diss. solids (total)	mg/l	280	160	224	232	140	206	246	156	206
Diss. solids (volatile)	mg/l	143	0	90	121	49	93	122	36	92
Coliforms (MF)	no./100ml	12,000	90	2,795	270.0	1.0	42.5	5,000	140	1,299

[a]New York Department of Environmental Conservation (1975)
Period of Observations: 10/01/69 - 9/30/72
Station Locations:
- 01-0002 North of Buckhorn Island, at Niagara Fall city dock
- 01-0007 One mile downstream of Beaver Island State Park and 1000 ft southwest of Strawberry Island
- 01-0008 East of Beaver Island State Park at Tonawanda water treatment plant bulkhead

Special Features

No natural special features are found in the vicinity of the Grand Island Wetland Complex (U.S.G.S. quadrangle maps, Tonawanda West, New York, 1965; Buffalo Northwest, New York-Ontario, 1965).

BIOTIC SETTING

LE 001-007

Vegetation

Information pertaining to the geographic region is provided by Day (1881-1883), Moseley (1896), Muencher (1929), Knobloch (1933), and Zenkert (1934). However, 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 Grand Island Wetland Complex.

Fish

In a study of northern pike (Esox lucius) and muskellunge (Esox masquinongy) of the upper Niagara River and Grand Island (Harrison, 1978) little utilization of this wetland by these species was observed. Burnt Ship Bay has apparently undergone much filling and is now too shallow for spawning by northern pike and muskellunge, but it was apparently much deeper in the past and may have been an important spawning area. Shoal areas with submersed vegetation in Chippewa Channel northwest of Grand Island are currently important muskellunge spawning areas (Harrison, 1978). The shallow littoral shelf and shoal areas off western Grand Island and east of Navy Island are spawning areas for smallmouth bass (Micropterus dolomieui) (O'Mara, 1977), and submersed vegetation of Buckhorn Island Wetland may be utilized for feeding and cover by adult and juvenile smallmouth bass. Historically, numerous fish species utilized the large beds of aquatic vegetation of the Niagara River for spawning, feeding and cover (Greeley, 1929), but the list of these species, presented in Appendix A-1, is out-dated and not site-specific. The literature search provided no site-specific data pertaining to species composition, food sources, or commercial use of the fish populations in Buckhorn Island Wetland.

Gun Creek was extensively sampled during the same study of northern pike and muskellunge of the upper Niagara River and Grand Island (Harrison, 1978). Gun Creek is heavily utilized by northern pike for spawning; the spawning season begins in late March and lasts until early April. Male pike generally mature during their second growing season and females during their second, third, or fourth growing season. During the study population estimates indicated that 532-591 adult pike utilized the creek, with the number of adults in the creek decreasing after spawning in early spring. The summer habitat of the pike leaving the creek was not determined. Tagging experiments revealed a strong homing tendency, or a tendency to remain in the same locale, based on a high frequency of recaptured pike in the same creek one year after tagging. Growth statistics of pike collected in Gun Creek were not significantly different from those of pike collected in Woods Creek, suggesting either that the same pike population utilizes both creeks or that two separate populations with similar growth characteristics exist. Growth of pike was relatively slow compared to pike in other geographic locations, perhaps due to competition with muskellunge. Angling exploitation of pike was light and apparently had little effect on annual survival, although poaching of pike out-of-season was known to occur. Pike were heavily infested with black spot (*Uvulifer ambloplitis* or *Crassiphiala bulboglossa*), but no effect of the infestation on growth was established (Harrison, 1978).

Unlike pike, adult muskellunge did not heavily utilize the creeks of Grand Island, including Gun Creek, preferring to live and spawn in the deeper, swifter waters of the Niagara River. A small number of transient age muskellunge apparently enter Gun Creek in spring, but these fish gradually move back to the Niagara River in summer. Northern pike and muskellunge were found to be spatially and temporally segregated in habitat occupancy and spawning activity (Harrison, 1978).

Specific use of Gun Creek Area Wetland by pike or muskellunge is not documented, but during spring the wetland may become inundated and connect with Gun Creek, thereby providing access for spawning pike. Historically, numerous species of fish utilized beds of aquatic vegetation in the Niagara River for spawning, feeding, and cover (Greeley, 1929), but the list of these species, presented in Appendix A-1, is out-dated and not site-specific. Some of the species listed probably still utilize Gun Creek Area Wetland on at least a seasonal basis. The literature search provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal distribution and abundance, life histories, food sources, and recreational and commercial use of the fish populations in Gun Creek Area Wetland.

In the study of northern pike and muskellunge of the upper Niagara River and Grand Island (Harrison, 1978) Spicer Creek was only lightly sampled. Northern pike were found to utilize the creek for spawning, but little or no use of the creek by muskellunge was evident. Population statistics, movements, spawning activity, exploitation, and parasitism of pike utilizing Spicer Creek were assumed to be similar to those of pike utilizing Gun Creek and Woods Creek (Harrison, 1978). The proximity and apparent connection of Spicer Creek Area Wetland to Spicer Creek probably allows some utilization of this specific wetland by northern pike. Historically, numerous fish species utilized the beds of aquatic vegetation in and along the Niagara River for spawning, feeding, and cover (Greeley, 1969), but the list of these species, presented in Appendix A-1, is out-dated and not site-specific. Some of the species listed probably utilize the Spicer Creek Area Wetland on at least a seasonal basis.

Similarly, seasonal utilization of Staley Road Wetland for spawning by certain species, most notably northern pike, may occur if surface water connections with the Niagara River are available for entry. However, the literature search provided no site-specific information pertaining to species composition, food sources, or commercial use of the fish populations in Spicer Creek Area Wetland.

In the study of northern pike and muskellunge of the upper Niagara River and Grand Island, Beaver Island State Park Wetland was not sampled (Harrison, 1978), but it is apparently a type of wetland utilized largely for spawning, cover, and feeding by muskellunge and utilized very little by northern pike. Harrison (1978) observed that muskellunge of the upper Niagara River generally avoid streams and prefer the areas of submersed vegetation in the open river, while northern pike apparently avoid the open river and frequent the marshy streams of Grand Island. The shoal areas with submersed vegetation around Motor Island and Strawberry Island were heavily utilized for spawning by adult muskellunge in early June, after which adults sought deeper waters of the river. Vegetated shoal areas about one meter in depth were preferred by juvenile muskellunge (Harrison, 1978). Although Beaver Island State Park Wetland may not be heavily utilized by spawning adult muskellunge, its proximity to the primary spawning areas around Motor Island and Strawberry Island may lead to its use as a nursery area by juveniles. A more detailed site-specific account of the muskellunge population of the upper Niagara River is presented under Motor Island Area Wetland (LE-009).

Beaver Island State Park Wetland may also be a nursery and feeding area for smallmouth bass (Micropterus dolomieui), since O'Mara (1977) reported smallmouth bass spawning activity in the Beaver Island area. Historically, numerous fish species utilized the extensive submersed vegetation beds of the Niagara River (Greeley, 1929), but the list of these species, presented in Appendix A-1, is out-dated and not site-specific. Many of these species probably still utilize Beaver Island State Park Wetland.

In Harrison's (1978) study of northern pike and muskellunge of the upper Niagara River and Grand Island, the Beaver Island area was only lightly sampled. Northern pike evidently made minimal use of Beaver Island Wetland for spawning, preferring creeks to areas in and bordering on the Niagara River. There was also apparently little utilization of the wetland by muskellunge, which preferred the submersed vegetation beds in the open river around Strawberry Island and Motor Island. Population statistics, spawning activities, exploitation, and parasitism of northern pike in Beaver Island Wetland were assumed to be similar to those of pike collected in Gun Creek and Woods Creek (see Gun Creek Area Wetland) (Harrison, 1978). Smallmouth bass spawn in the shoal areas around Beaver Island and probably utilize the wetland for cover, feeding, and shelter of juveniles and young of the year (O'Mara, 1977). Historically, numerous fish species utilized the extensive aquatic vegetation beds in and along the Niagara River for spawning, feeding, and cover (Greeley, 1929), but the list of these species, presented in Appendix , is out-dated and not site-specific. Many of the species listed probably still utilize Beaver Island Wetland. The literature search provided no site-specific information pertaining to species composition, seasonal distribution and abundance, life histories, or recreational and commercial use of the fish populations of Beaver Island Wetland, or to species composition, food sources, and commercial exploitation of fish in Beaver Island State Park Wetland. No site-specific information of any kind was found with respect to fishes in West River Road 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 the seven wetlands comprising the Grand Island Wetland Complex.

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 the seven wetlands comprising the Grand Island Wetland Complex.

Avifauna

The species and numbers of waterfowl observed in the vicinity of Grand Island by personnel of the New York State Department of Environmental Conservation (1969-1978) are presented in Table 1-3. General information pertaining to the distribution and migration of gulls on the Niagara River is available in Andrle (1977).

Table 1-3. Species and Numbers of Waterfowl Observed During the One-day Aerial Waterfowl Census Flights in the Vicinity of Grand Island[a]

	10/19/69	10/20/70	1/6/77	1/19/78
black duck	279	150	566	40
mallard	176	75	250	522
American wigeon	95		65	
scaup	600		190	1,845
canvasback			2,935	1,709
goldeneye			1,000	3,760
oldsquaw				20
bufflehead			20	
American coot	30	30		4
Canada goose				1
merganser			11,160	17,470

[a] Taken from New York State Department of Environmental Conservation, Aerial Waterfowl Census. Open file data. 1969-1978

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 the Grand Island Wetland Complex.

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 seven wetlands comprising the Grand Island 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; Berle, 1978) were documented in the Grand Island 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, several NPDES permit holders discharge pollutants into area rivers and may have some effect on the health of these wetlands.

CULTURAL SETTING

LE 001-007

Population

The Grand Island Wetland Complex is located in Grand Island Township of Erie County, New York. The county is densely populated, having a density of 1,030 persons per square mile. Table 1-4 indicates that Erie County experienced a slow decline in population, while Grand Island Township underwent a rapid growth in population between 1970 and 1975. Projections for 1990 indicate that Erie County is expected to maintain a stable population.

Table 1-4. Population Data for the Vicinity of the Grand Island Wetland Complex

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Erie County	1,089,327	-2.2	1,091,000
Grand Island Township	17,480	25.1	--

[a] U.S. Bureau of the Census (1977)
[b] New York State Economic Development Board (1977)

Land Use and Ownership

Land use within the Grand Island Wetland Complex is rural open space. The surrounding area is residential. Numerous hard surface roads pass adjacent to the wetlands in this complex. North Grand Island Bridge crosses Buckhorn Island Wetland. Navigation lights are located in the northwestern part of Buckhorn Island Wetland, and power lines run along its western edge. Power lines also lie along the northeastern part of Staley Road Wetland. A few residences are located within Gun Creek Area Wetland. White Haven cemetery is located at the southwest corner of Spicer Creek Area Wetland. The wetland is under mixed state and private ownership, but its location suggests that it is subject to moderate development pressure (U.S.G.S. quadrangle maps, Tonawanda West, New York, 1965; Buffalo Northwest, New York-Ontario, 1965).

Recreation

Buckhorn Island Wetland of the Grand Island Wetland Complex is located in Buckhorn Island State Park, where fishing and hiking are permitted.

Beaver Island State Park Wetland and Beaver Island Wetland, also part of the Grand Island Wetland Complex, are within Beaver Island State Park. Picnicking, swimming, boating, baseball, fishing, and golfing are recreational activities provided for at Beaver Island State Park.

Mineral, Energy, and Forest Resources

A minor potential for forest resources exists in the Grand Island Wetland Complex. There are no known gas, oil, or other mineral resources in the vicinity of these wetlands.

Public Utilities and Facilities

A sewage disposal plant is located approximately 0.5 miles east of Buckhorn Island Wetland. Power transmission lines lie approximately 0.1 mile south of the wetland. North Tonawanda intake lies 0.2 mile east of Spicer Creek Area Wetland; a gauging station lies 0.4 mile east, and Tonawanda intake is located 0.3 mile south of this wetland. Power transmission lines lie adjacent to Staley Road Wetland, and a pipeline lies 0.4 miles southeast and southwest of this wetland. A water tank is located 0.2 miles north of Beaver Island Wetland; parking lots associated with Beaver Island State Park are located 0.1 and 0.4 mile east, and a filtration plant is located approximately 0.5 mile northwest, of this wetland (U.S.G.S. quadrangle maps, Buffalo Northwest, New York-Ontario, 1965; Fonawanda West, New York, 1965).

Pollution Sources

The following NPDES permit holders discharge pollutants which may effect the Grand Island Wetland Complex:

NPDES Permit Holders	Type of Discharge	Receiving Waters
Grand Island Sanitary Treatment Plant #1	sanitary waste	Niagara River
Grand Island Sanitary Treatment Plant #2	sanitary waste	Niagara River
Grand Island Sewage Treatment Plant #4	sanitary waste	East Branch Niagara River
Grand Island Water Treatment Plant	process water	West Branch Niagara River
Spaulding Fiber Company	sanitary waste	Niagara River
Tonawanda Water Treatment Plant	process water	Niagara River
Tonawanda Waste Water Treatment Plant #2	sanitary and significant industrial waste	Niagara River
Tonawanda Sewage Treatment Plant	sanitary waste	Niagara River
Continental Can Company	sanitary waste	Ellicot Creek
Amherst Sewage Treatment Plant	sanitary waste	Tonawanda Creek
Exolon Company	process and cooling water	Tonawanda Creek

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

Historical and Archaeological Features

The National Register of Historic Places records the Old Whitehaven Cemetery which lies 250 feet southwest of the Grand Island Wetlands Complex, and the site of the ferry connecting Grand Island and Tonawanda Island, 200 feet west of the wetland complex. No known archaeological sites are located in the vicinity.

RESEARCH PROJECTS

LE 001-007

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

TWOMILE CREEK WETLAND

PHYSIOGRAPHIC SETTING LE-008

Setting

Twomile Creek Wetland is located in Erie County, New York, within the corporation boundary of Tonawanda, at the western edge of the city and partially within Veterans Memorial Park. The wetland is largely Riverine, extending from the west bank of the Niagara River inland along the valley of Twomile Creek for 0.8 mile. The portion within the park is partially wooded (U.S.G.S. quadrangle map, Tonawanda West, New York, 1965).

Topography

Twomile Creek Wetland has very little relief, lying at or near the elevation of the Niagara River, approximately 570 feet above sea level. The relief of Twomile Creek valley in the vicinity of the wetland is 35 feet, with gently sloping sides (U.S.G.S. quadrangle map, Tonawanda West, New York, 1965).

Surficial Geology

The surficial geology of Twomile Creek valley is characterized by unconsolidated sediments deposited by the Wisconsin ice sheet. The primary deposit is a terminal moraine which extends in a northwest-southeast direction across the Niagara River valley (Gilbert and Taylor, 1913). These deposits are underlain by Silurian limestone (Walker and Allen, 1975).

Soils

The soils of Twomile Creek valley are generally hapludalfs (formerly gray-brown podzolic soils without fragipan). These soils develop on gently sloping terrain, and are characterized by a subsurface horizon of clay accumulation which is relatively thin (Gerlach, 1970).

Hydrology

Twomile Creek Wetland begins at the Niagara River and follows the lower portion of the creek valley for 0.8 mile inland. Twomile Creek is primarily a drainage course which receives storm and sanitary wastes, as well as cooling water from four industrial plants (New York Development of Environmental Conservation, 1975).

Water quality monitoring summaries for a station on the Niagara River at Tonawanda (Sta. 01-0008) are presented in Table 1-5. Although the Niagara River serves as a receiving body for a multitude of industrial and municipal waste discharges, no violations of the dissolved oxygen standards have been reported, owing to the high assimilative capacity of the river. The two major present pollution problems are phenol and oil. Coliform levels are generally low in the river but densities in the range of 10,000 per 100 ml have been reported for

Table 1-5 . Niagara River Water Quality Adjacent to Grand Island[a]

Parameter	Units	Station 01-0002			Station 01-0007			Station 01-0008		
		Maximum	Minimum	Mean	Maximum	Minimum	Mean	Maximum	Minimum	Mean
Flow	cfs	241,000	193,000	215,000	241,000	193,000	220,000	241,000	211,000	223,030
Color	units	46	2	13	20	3	8	30	5	12
Turbidity	JTU	62.0	2.0	12.7	18.0	1.8	7.2	24.0	2.0	8.6
Temperature	F°	78.8	33.8	50.5	77.0	35.6	56.9	78.8	33.8	55.6
Dissolved oxygen	mg/l	13.8	6.0	9.7	13.4	11.2	12.5	13.6	7.0	9.9
Dissolved oxygen	% sat	99.4	49.7	83.5	102.0	97.0	100.2	112.8	80.1	92.8
B.O.D. (5 day)	mg/l	6.1	1.0	2.7	3.6	0.2	0.8	3.2	0.8	1.6
C.O.D.	mg/l	25.0	8.8	14.7	19.0	5.0	9.5	23.0	6.0	11.9
Conductivity	umhos	498	224	325	374	224	289	374	224	302
Chlorides (Cl)	mg/l	44	22	28	30	21	25	34	23	26
Fluorides (F)	mg/l	-	-	-	0.5	0.3	0.4	0.52	0.33	0.40
pH	units	8.3	6.6	7.7	8.4	7.7	8.0	8.4	7.5	8.0
Carbon dioxide (CO_2)	mg/l	8.0	0.1	2.9	4.0	0.1	2.3	4.0	0.1	1.6
Hardness ($CaCO_3$)	mg/l	208	116	158	164	120	138	204	114	143
Total alkalinity ($CaCO_3$)	mg/l	122	76	102	119	85	99	113	82	98
Calcium (Ca)	mg/l	59.0	34.0	46.5	46.0	38.8	42.4	52.0	35.0	43.2
Magnesium (Mg)	mg/l	17.0	3.9	10.1	13.0	4.9	7.7	21.0	1.9	8.6
Sodium (Na)	mg/l	24.4	6.9	14.8	19.1	10.0	11.7	20.4	9.8	13.2
Potassium (K)	mg/l	3.2	0.7	1.8	1.9	0.5	1.4	2.5	0.7	1.7
Iron (Fe)	mg/l	1.30	0.02	0.37	0.30	0.02	0.24	0.80	0.02	0.28
Manganese (Mn)	mg/l	0.30	0.01	0.06	0.03	0.01	0.01	0.10	0.01	0.03
Ammonia (NH_3)	mg/l	0.67	0.07	0.25	0.15	0.01	0.03	0.21	0.04	0.13
Organic nitrogen (N)	mg/l	1.85	0.00	0.68	0.95	0.22	0.50	1.20	0.39	0.66
Nitrites (NO_2)	mg/l	0.11	0.02	0.06	0.04	0.00	0.03	0.18	0.02	0.05
Nitrates (NO_3)	mg/l	26.53	0.09	2.15	0.97	0.44	0.59	1.77	0.44	0.84
Phosphates (P)	mg/l	0.17	0.04	0.10	0.10	0.00	0.03	0.14	0.03	0.06
Phosphates (PO_4)	mg/l	0.53	0.13	0.30	0.31	0.01	0.10	0.44	0.08	0.18
Sulfate (SO_4)	mg/l	52.0	1.0	30.4	29.0	18.0	24.2	33.0	21.0	26.3
Phenol	mg/l	0.178	0.001	0.037	0.006	0.001	0.001	0.012	0.001	0.004
Total solids (evap.)	mg/l	329	181	248	349	163	230	251	195	225
Susp. solids (total)	mg/l	73	5	21	140	2	24	53	5	19
Susp. solids (volatile)	mg/l	71	2	11	18	2	7	19	2	8
Diss. solids (total)	mg/l	280	160	224	232	180	206	246	156	206
Diss. solids (volatile)	mg/l	143	8	90	121	49	93	122	36	92
Coliforms (MF)	no./100ml	12,000	90	2,795	270.0	1.0	42.6	5,000	140	1,239

[a]New York Department of Environmental Conservation (1975)

Period of Observations: 10/01/69 - 9/30/72

Station Locations:

- 01-0002 North of Buckhorn Island, at Niagara Fall city dock
- 01-0007 One mile downstream of Beaver Island State Park and 1000 ft southwest of Strawberry Island
- 01-0008 East of Beaver Island State Park at Tonawanda water treatment plant bulkhead

samples taken adjacent to the American shore (New York Department of Environmental Conservation, 1975).

Generalized groundwater information for the New York portion of the Lake Erie Shore is available in Walker and Allen (1975) and Weist (1978). Typical yields from groundwater wells in unconsolidated deposits along the Niagara River valley are less than 10 gallons per minute. High sulfate concentrations (100 mg/l) are found in water from some of the unconsolidated aquifers in this portion of New York (Weist, 1978).

The literature search provided no site-specific data pertaining to water level fluctuations, groundwater discharge patterns and runoff, depth or seasonal changes in this wetland.

Climate

The closest weather station providing climatic data for Twomile Creek Wetland is Buffalo Airport. The average annual temperature is 48.1°F based on the normal period from 1941-1970. The mean monthly low for January is 23.3°F and the mean monthly high for July is 81.7°F. The average annual precipitation is 36.11 inches, with a mean monthly precipitation of 2.89 inches in January and 2.93 inches in July. The growing season is approximately five and one half months long, with the last killing frost (28°F) in 1975 occurring on April 14 and the first killing frost on October 30 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Two-mile Creek Wetland (U.S.G.S. quadrangle map, Tonawanda West, New York, 1965).

BIOTIC SETTING — LE 008

Vegetation

Information on vegetation in the geographic region containing Twomile Creek Wetland is provided by Day (1882-1883), Moseley (1896), Muencher (1929), Knoblich (1933), and Zenkert (1934). However, 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 this wetland.

Fish

A search of the literature provided no site-specific data 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 Twomile 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 Twomile Creek 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 Twomile Creek Wetland.

Avifauna

General information pertaining to the distribution and migration of gulls on the Niagara River is available in Andrle (1977). However, 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 Twomile Creek 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 Twomile 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; Berle, 1978) were documented in Twomile Creek Wetland by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland. However, Twomile Creek receives sanitary wastes and cooling water from industrial plants, and this may have some effect on the health of Twomile Creek Wetland.

CULTURAL SETTING

LE 008

Population

Twomile Creek Wetland is located within the city of Tonawanda in Erie County, New York. The county is densely populated, having a density of 1,030 persons per square mile. Table 1-6 indicates that Erie County and Tonawanda (city) experienced a slow decline in population between 1970 and 1975. Projections for 1990 indicate that Erie County is expected to maintain a stable population.

Table 1-6. Population for the Vicinity of Twomile Creek Wetland

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Erie County	1,089,327	-2.2	1,091,000
City of Tonawanda	21,452	-2.0	--

[a] U.S. Bureau of the Census (1977)
[b] New York State Economic Development Board (1977)

Land Use and Ownership

Land use within Twomile Creek Wetland is rural open space. The surrounding area is residential. A four lane highway lies to the north of Two-mile Creek Wetland. The wetland is under undetermined ownership but its location suggests that it is subject to severe development pressure (U.S.G.S. quadrangle map, Tonawanda West, New York, 1965).

Recreation

No known state or federal recreational facilities are present in the vicinity of Twomile Creek Wetland.

Mineral, Energy, and Forest Resources

A minor potential for forest resources exists in Twomile Creek Wetland. There are no known gas, oil, or other mineral resources in the vicinity of this wetland.

Public Utilities and Facilities

Veterans Memorial Park is adjacent to Twomile Creek Wetland and a pipeline is located 0.3 mile west of the wetland (U.S.G.S. quadrangle map, Tonawanda West, New York, 1965).

Pollution Sources

No NPDES permit holders are adjacent to Twomile Creek 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 or archaeological features are present within 500 feet of Twomile Creek Wetland.

RESEARCH PROJECTS

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

MOTOR ISLAND AREA WETLAND

PHYSIOGRAPHIC SETTING

LE-009

Setting

Motor Island Area Wetland is located in Erie County, New York. This Riverine, non-forested wetland occupies a shallow portion of the Tonawanda Channel of the Niagara River, approximately 0.1 mile south of Motor Island and 1.0 mile northwest of Buffalo, New York (U.S.G.S. quadrangle map, Buffalo, Northwest, New York-Ontario, 1965).

Topography

Motor Island Area Wetland has very little relief; it constitutes a relatively flat portion of the Niagara River bottom which is less than 6 feet below Low Water Datum (568.6 feet). A shipping channel dredged to 21 feet below datum lies 0.2 mile east of the wetland. Natural river depths up to 26 feet occur 0.5 mile north of Motor Island (U.S.G.S. quadrangle map, Buffalo Northwest, New York-Ontario, 1965).

Surficial Geology

The surficial geology of Motor Island Area Wetland consists of unconsolidated river sediments underlain by Silurian bedrock of marine carbamates (Waller and Allen, 1975). This wetland and nearby Strawberry Island are near the dividing point of the Niagara River into east and west branches around Grand Island. Their influence on river current and flow direction significantly affects the characteristics of the river and shoreline downstream (Rosey, et al., 1977).

Soils

The soils of Motor Island are generally hapludalfs (formerly gray-brown podzolic soils without fragipan). These soils develop on gently sloping terrain and are characterized by a subsurface horizon of clay accumulation which is relatively thin (Gerlach, 1970).

Hydrology

Motor Island Area Wetland occupies shallow waters of the Niagara River off the southern tip of Grand Island. Generalized groundwater information for the New York portion of the Lake Erie Shore is available in Walker and Allen (1975) and Weist (1978). Typical yields from groundwater wells in unconsolidated deposits along the Niagara River valley are less than 10 gallons per minute. High sulfate concentrations (100 mg/l) are found in water from some of the unconsolidated aquifers in this portion of New York (Weist, 1978).

Water quality monitoring summaries for a station on the Niagara River near Strawberry Island (Sta. 01-0007) are presented in Table 1-7. Although the

Table 1-7 . Niagara River Water Quality Adjacent to Grand Island[a]

Parameter	Units	Station 01-0002 Maximum	Station 01-0002 Minimum	Station 01-0002 Mean	Station 01-0007 Maximum	Station 01-0007 Minimum	Station 01-0007 Mean	Station 01-0008 Maximum	Station 01-0008 Minimum	Station 01-0008 Mean
Flow	cfs	241,000	193,000	215,000	241,000	193,000	220,000	241,000	211,000	223,090
Color	units	45	2	13	20	3	8	30	5	12
Turbidity	JTU	42.0	2.0	12.7	18.0	1.0	7.2	24.0	2.0	8.6
Temperature	F°	78.8	33.8	50.5	77.0	35.6	55.9	78.8	33.8	55.6
Dissolved oxygen	mg/l	13.8	6.8	9.7	13.4	11.2	12.5	13.8	7.0	9.9
Dissolved oxygen	% sat	99.4	49.7	83.6	102.0	97.0	100.2	112.8	80.1	92.0
B.O.D. (5 day)	mg/l	6.1	1.0	2.7	3.6	0.2	0.8	3.2	0.8	1.6
C.O.D.	mg/l	25.0	8.0	14.7	19.0	5.0	9.5	23.0	6.0	11.9
Conductivity	umhos	490	224	325	374	224	289	374	224	302
Chlorides (Cl)	mg/l	44	22	29	30	23	25	34	23	26
Fluorides (F)	mg/l	-	-	-	0.5	0.3	0.4	0.62	0.33	0.40
pH	units	8.3	6.6	7.7	8.4	7.7	8.0	8.4	7.6	8.0
Carbon dioxide (CO_2)	mg/l	8.0	0.1	2.9	4.0	0.1	2.3	4.0	0.1	1.6
Hardness ($CaCO_3$)	mg/l	208	116	158	164	120	138	204	114	143
Total alkalinity ($CaCO_3$)	mg/l	122	76	102	119	85	99	113	82	98
Calcium (Ca)	mg/l	59.0	34.0	46.5	46.0	38.0	42.6	52.0	35.0	43.2
Magnesium (Mg)	mg/l	17.0	3.9	10.1	13.0	4.9	7.7	27.0	1.9	8.6
Sodium (Na)	mg/l	24.4	6.9	14.6	19.1	10.0	11.7	20.4	9.6	13.2
Potassium (K)	mg/l	3.2	0.7	1.8	1.9	0.5	1.4	2.5	0.7	1.7
Iron (Fe)	mg/l	1.90	0.02	0.37	0.80	0.02	0.24	0.80	0.02	0.28
Manganese (Mn)	mg/l	0.30	0.01	0.06	0.03	0.01	0.01	0.10	0.01	0.03
Ammonia (NH_3)	mg/l	0.67	0.07	0.26	0.15	0.01	0.03	0.21	0.04	0.13
Organic nitrogen (N)	mg/l	1.85	0.00	0.69	0.95	0.22	0.50	1.20	0.39	0.66
Nitrites (NO_2)	mg/l	0.11	0.02	0.06	0.04	0.00	0.01	0.18	0.02	0.06
Nitrates (NO_3)	mg/l	26.53	0.09	2.15	0.97	0.44	0.59	1.77	0.44	0.84
Phosphates (P)	mg/l	0.17	0.04	0.10	0.10	0.00	0.03	0.14	0.03	0.06
Phosphates (PO_4)	mg/l	0.53	0.13	0.30	0.31	0.01	0.10	0.44	0.08	0.18
Sulfate (SO_4)	mg/l	52.0	1.0	30.4	29.8	18.0	24.2	33.0	21.0	26.3
Phenol	mg/l	0.170	0.001	0.037	0.006	0.001	0.001	0.012	0.001	0.004
Total solids (evap.)	mg/l	329	181	246	349	163	230	251	195	225
Susp. solids (total)	mg/l	73	5	27	140	2	24	53	5	19
Susp. solids (volatile)	mg/l	71	2	11	18	2	7	19	2	8
Diss. solids (total)	mg/l	280	160	224	232	160	206	246	156	206
Diss. solids (volatile)	mg/l	163	0	90	127	49	93	122	36	92
Coliforms (MF)	no./100ml	12,000	90	2,795	270.0	1.0	42.5	5,000	140	1,299

[a]New York Department of Environmental Conservation (1975)

Period of Observations: 10/01/69 - 9/30/72

Station Locations:

- 01-0002 North of Buckhorn Island, at Niagara Fall city dock
- 01-0007 One mile downstream of Beaver Island State Park and 1000 ft southwest of Strawberry Island
- 01-0008 East of Beaver Island State Park at Tonawanda water treatment plant bulkhead

Niagara River serves as a receiving body for a multitude of industrial and municipal waste discharges, no violations of the dissolved oxygen standards have been reported, owing to the high assimilative capacity of the river. The two major present pollution problems are phenol and oil. Coliform levels are generally low in the river but densities in the range of 10,000 per 100 ml have been reported for samples taken adjacent to the American shore (New York Department of Environmental Conservation, 1975).

The literature search provided no site-specific information pertaining to water level fluctuations, groundwater discharge patterns and runoff, depth, or seasonal changes in this wetland.

Climate

The closest weather station providing climatic data for Motor Island Area Wetland is Buffalo Airport. The average annual temperature is 48.1°F based on the normal period from 1941-1970. The mean monthly low for January is 23.3°F and the mean monthly high for July is 81.7°F. The average annual precipitation is 36.11 inches, with a mean monthly precipitation of 2.89 inches in January and 2.93 inches in July. The growing season is approximately five and one half months long, with the last killing frost (28°F) in 1975 occurring on April 14 and the first killing frost on October 30 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are located in the vicinity of Motor Island Area Wetland (U.S.G.S. quadrangle map, Buffalo Northwest, New York-Ontario, 1965).

BIOTIC SETTING LE 009

Vegetation

Information pertaining to vegetation in the geographic region containing Motor Island Area Wetland is provided by Day (1882-1883), Moseley (1896), Muencher (1929), Knoblich (1933), and Zenkert (1934). However, 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 this wetland.

Fish

In a study of northern pike (*Esox lucius*) and muskellunge (*Esox masquinongy*) of the upper Niagara River and Grand Island (Harrison, 1978), little utilization of this wetland by northern pike was observed; this species preferred tributary streams to the open Niagara River. However, muskellunge utilized the Motor Island-Strawberry Island Area extensively as a spawning and nursery area. Few other areas in the upper Niagara River were utilized as extensively by muskellunge, and the Motor Island-Strawberry Island shoal areas are clearly of primary importance to continued survival and abundance of this species in the river. Adult muskellunge enter heavily vegetated shoal areas of the river to spawn in early June; the optimal water temperature for spawning is 16-18°C. Lentic water is not necessary, but submersed vegetation is required to help maintain position of the fish in the current. Adults inhabit the deeper waters of the river outside spawning season, and their movements are largely local. Young of the year and juvenile muskellunge prefer dense submersed vegetation in about one meter of water, although a few juveniles inhabit creeks on Grand Island on a transient basis in spring. The study found that sexual maturity was attained at age III+ by most males and age IV+ by most females. Growth rates of upper Niagara River muskellunge were greater during the first three years of life than in other geographic areas of North America, but growth rates were somewhat slower during the remaining years of life. The greatest number of muskellunge taken by anglers occurred in the Chippewa Channel from the Motor Island-Strawberry Island area north to the area of Black Creek, Ontario. Estimates of the number of legal-size muskellunge in this angling area between 1971 and 1976 ranged from 2,124 to 5,740. Angling harvest of muskellunge in the area is heavy, but the population of the upper Niagara River is apparently healthy and is not being depleted. The populations of pike and muskellunge in the upper Niagara River represent one of the few documented cases of sympatric existence of these two species, where interspecific competition is apparently minimized by temporal and spatial segregation in spawning and habitat utilization.

O'Mara (1977) observed smallmouth bass (Micropterus dolomieui) spawning on shoal areas of the upper Niagara River and collected smallmouth in the Motor Island-Strawberry Island area, although no reference to use of Motor Island Wetland by this species was made. It is probable that smallmouth bass utilize the wetland for cover and feeding. Historically, numerous species utilized the extensive submersed vegetation beds in the Niagara River for spawning, feeding and cover (Greeley, 1929), but the list of these species, presented in Appendix A-1, is out-dated and not site-specific. Many of the species listed probably still utilize the submersed beds in the Motor Island-Strawberry Island area.

The literature search provided no site-specific data pertaining to species composition, food sources, or commercial use of the fish populations in Motor Island 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 Motor Island Area 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 Motor Island Area Wetland.

Avifauna

General information pertaining to the distribution and migration of gulls on the Niagara River is available in Andrle (1977). However, 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 Motor Island Area 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 Motor Island 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; Berle, 1978) were documented in Motor Island 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 LE 009

Population

Motor Island Area Wetland is located in Grand Island Township of Erie County, New York. The county is densely populated, having a density of 1,030 persons per square mile. Table 1-8 indicates that Erie County experienced a slow decline in population, while Grand Island Township underwent a rapid growth in population, between 1970 and 1975. Projections for 1990 indicate that Erie County is expected to maintain a stable population.

Table 1-8. Population Data for the Vicinity of Motor Island Area Wetland

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Erie County	1,089,327	-2.2	1,091,000
Grand Island Township	17,480	25.1	--

[a] U.S. Bureau of the Census (1977)
[b] New York State Economic Development Board (1977)

Land Use and Ownership

Land use within Motor Island Area Wetland is rural open space. The surrounding area is predominantly residential. The wetland is under undetermined ownership but its location suggests that it is subject to moderate development pressure (U.S.G.S. quadrangle map, Buffalo Northwest, New York, 1965).

Recreation

No known state or federal recreational facilities are present in the vicinity of Motor Island Area Wetland.

Mineral, Energy, and Forest Resources

There are no forest resources exists in Motor Island Area Wetland. There are no known gas, oil, or other mineral resources in the vicinity of this wetland.

Public Utilities and Facilities

A substation is located approximately 0.4 miles north of Motor Island Area Wetland (U.S.G.S. quadrangle map, Buffalo Northwest, New York-Ontario, 1965).

Pollution Sources

No NPDES permit holders are adjacent to Motor Island Area 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 or archaeological features are present within 500 feet of Motor Island Area Wetland.

RESEARCH PROJECTS LE 009

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

Table 1-9. Data Gaps-Lake Section 1

Data Gap*		Wetland Number	001-007	008	009
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		*	
		Food Sources	*	*	*
	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	*	*	*
		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	*	*	*
		Endangered Species			
		Health	*	*	*
Cultural Setting		Population			
		Land Use and Ownership			
		Recreation			
		Mineral,Energy,Forest Resourc			
		Public Utilities/Facilities			
		Point Pollution Sources			
		Non-Point Pollution Sources	*	*	*
		Historic Features			
		Archaelogic Features			

LAKE SECTION 2

INTRODUCTION

Lake Section 2 extends along the Pennsylvania shoreline of Lake Erie in Erie County, Pennsylvania. The region features shallow depressions to sloping topography in the vicinity of the wetlands. The predominant shore type along this 40 mile stretch of shoreline is low plain.

Figures 2-1 and 2-2 show the approximate location of the nine coastal wetlands in Lake Section 2. Data concerning latitude, longitude, acreage, and classification for each of these wetlands are presented in Table 2-1. The wetlands of Lake Section 2 lie at elevations between 571 and 615 feet above sea level, 0 to 44 feet above the approximate mean elevation of Lake Erie. These wetlands are classified as Palustrine and Lacustrine.

Available information related to physiographic and cultural features of the nine coastal wetlands is summarized in the individual wetland narratives presented in this chapter. Published sources lack site-specific information related to the biotic characteristics of these wetlands in many instances.

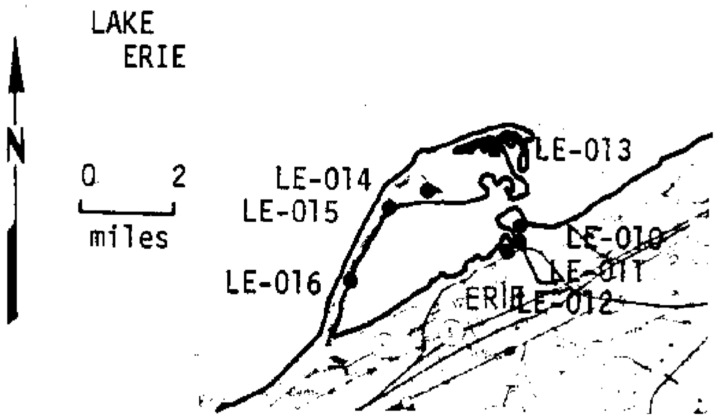

Figure 2-1. Lake Section 2 - Presque Island Area

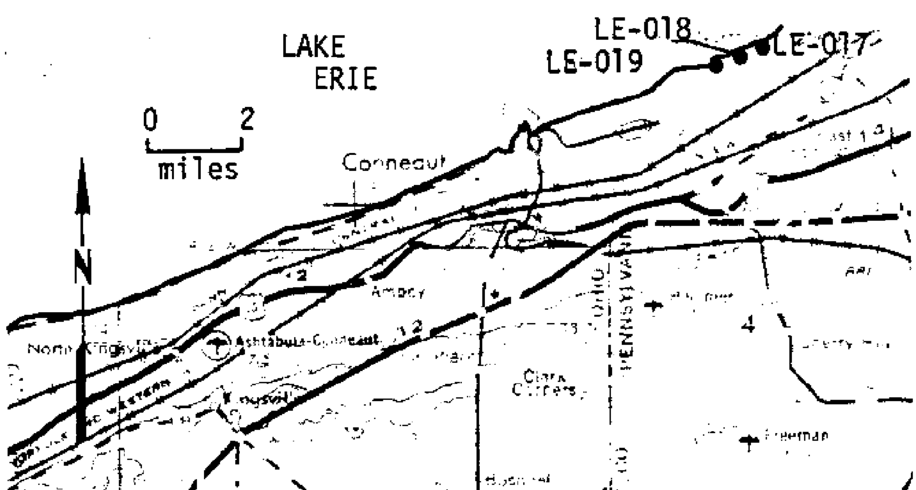

Figure 2-2. Lake Section 2 - Raccoon Creek Area

Table 2-1. Location, Acreage, and Classification of Wetlands in Lake Section 2

Wetland Number	Wetland	Latitude	Longitude	Acreage	Classification[a]
	ERIE CITY WETLAND COMPLEX				
010	Erie City Wetland #1	42°08'45"	80°04'37"	30	P
011	Erie City Wetland #2	42°08'00"	80°04'46"	5	P
012	Erie City Wetland #3	42°08'20"	80°04'50"	2	P
	PRESQUE ISLE WETLAND COMPLEX				
013	Presque Isle Wetland	42°10'04"	80°05'40"	281	L,P
014	Long Pond Wetland	42°09'16"	80°06'32"	65	L,P
015	Big Bend Wetland	42°09'01"	80°07'41"	13	P
016	Presque Isle Bay Wetland	42°07'39"	80°08'34"	15	L,P
017	Camp Lamber Wetland	41°59'49"	80°27'06"	2	P
	RACCOON CREEK AREA WETLAND COMPLEX				
018	Ellis Road Wetland	41°59'39"	80°27'46"	1	P
019	Raccoon Creek Area Wetland	41°59'26"	80°28'32"	1	P

[a]P=palustrine
L=lacustrine
R=riverine

ERIE CITY WETLAND COMPLEX

PHYSIOGRAPHIC SETTING LE 010-012

Setting

The Erie City Wetland Complex lies within the corporation limits of the city of Erie, in Erie County, Pennsylvania. The wetland complex is comprised of Erie City Wetlands #1, #2, and #3. These largely Palustrine wetlands are located in the northern portion of the city, near the entrance to Presque Isle Bay, each within 0.1 mile of the bay or Lake Erie. All three are in non-forested, industrial areas. Erie City Wetland #1 has increased in size by approximately 25 percent during the period 1957 to 1975, owing to land-fill activities in Presque Isle Bay (U.S.G.S. quadrangle map, Erie North, Pennsylvania, 1975).

Topography

All three wetlands in the Erie City Complex have less than 10 feet of relief, lying at or near the approximate mean elevation of Lake Erie (571 above sea level). The low shoreline area which contains the wetlands rises rapidly toward the south, forming the slope of the Portage Escarpment. This escarpment slope reaches an elevation of 1000 feet; there it forms the northern edge of the Appalachian Plateau approximately five miles south of Lake Erie (Taylor, 1960).

Surficial Geology

The surficial geology of the Erie City Wetland Complex is characterized by unconsolidated sediments deposited as stratified silt and sand in glacial lakes that once stood as much as 230 feet higher than the present level of Lake Erie (Schooler, 1974). These deposits are underlain by glacial tills and Devonian brown shales and thin sandstones of the Canadaway Formation (Gray and Shepps, 1960).

Soils

The soils of the Erie City Wetland Complex either belong to the Rimer-Wauseon-Berrien association, characterized by sandy soils of the lake plain, or are fresh water marsh soils (Taylor, 1960). The Berrien series is the most common in the complex, consisting of a fine sandy loam on low slopes (2%). The parent material was composed of acid, lacustrine sands that were sorted and deposited by water; when saturated with water, this material is known locally as "quicksand." The fresh water marsh soils occur in shallow lagoons fringing Presque Isle Bay. They consist of 6 to 12 inches of partly decomposed organic material that is underlain by deep lacustrine sand and gravel. The surface is normally covered by water up to a depth of 3 feet. This area supports a luxuriant growth of cattails and provides suitable habitat for wildlife (Taylor, 1960).

Hydrology

The wetlands within the Erie City Wetland Complex are in close proximity to Lake Erie or Presque Isle Bay. Most of the wetlands have been disturbed by land filling activities in the bay. The one stream in the complex is Mill Creek, which receives urban runoff and combined sewer overflow (R.J. Wellington, Erie County Department of Health, personal communication, July 31, 1978). Erie City Wetland #2 lies along the estuarine, lower portion of this stream.

Typical yields from groundwater wells in unconsolidated deposits along the Pennsylvania shore of Lake Erie are less than 10 gallons per minute (Weist, 1978).

Flash floods occur occasionally along the smaller streams in northern Erie County, generally during July and August when rainfall is heavy. A disastrous flash flood occurred along Mill Creek, which flows through the city of Erie and Erie City Wetland #2, after a cloudburst in August of 1915. Thirty-seven people were drowned, and property damage was estimated at several million dollars. A structure has since been built in Mill creek at Glenwood Park, 3 miles south of the wetland, to collect debris and thus prevent a recurrence of this disaster (Taylor, 1960).

The literature search provided no site-specific data pertaining to water level fluctuations, groundwater drainage patterns, water quality, depth, or seasonal changes in this wetland.

Climate

The climate of northern Erie County, Pennsylvania is greatly influenced by the waters of Lake Erie. In fall and winter cold air reaching this area is moderated in temperature by the warmer waters of the lake. In spring and summer warm air is moderated by the cooler lake water. As a result the climate of the lake plain differs markedly from that of the interior upland. This moderating effect is most noticeable within a few miles of the shoreline (Taylor, 1960).

The closest weather station providing climatic data for the Erie City Wetland Complex is located in Erie, Pennsylvania. The average annual temperature is 47.1°F based on the normal period from 1941-1970. The mean monthly low for January is 23.8°F and the mean monthly high for July is 80.9°F. The average annual precipitation is 38.20 inches, with a mean monthly precipitation of 2.47 inches in January and 3.52 inches in July. The growing season is approximately six months long, with the last killing frost (28°F) in 1975 occurring on April 22 and the first killing frost on October 30 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of the Erie City Wetland Complex (U.S.G.S. quadrangle map, Erie North, Pennsylvania, 1975).

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 Erie City Wetlands #1, #2, and #3.

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 Erie City Wetlands #1, #2, and #3.

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 Erie City Wetlands #1, #2, and #3.

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 the three wetlands comprising the Erie City Wetland Complex.

Avifauna

Historical accounts of the birds of Presque Isle and Erie, Pennsylvania are available in Todd et al. (1904), and a list of birds and the numbers observed in the Erie, Pennsylvania vicinity is presented in Appendix D-1. However, 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 the Erie City Wetland Complex.

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 Erie City 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, 1976, 1977; Pennsylvania Fish Commission, 1978) were documented in the Erie City 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

LE 010-012

Population

The Erie City Wetland Complex is located within the city of Erie in Erie County, Pennsylvania. The county is moderately populated, having a density of 336 persons per square mile. Table 2-2 indicates that Erie County experienced moderate population growth, while Erie (city) underwent a slow decline in population between 1970 and 1975. ErieCounty is expected to maintain a stable population.

Table 2-2. Population Data for the Vicinity of the Erie City Wetland Complex

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990
Erie County	273,396	3.7	--
City of Erie	127,895	-1.1	--

[a] U.S. Bureau of the Census (1977)

Land Use and Ownership

Land use within the Erie City Wetland Complex is urban open space. The surrounding area is predominantly commercial. Dual highways run adjacent to Erie City Wetlands #2 and #3, and hard surface roads run through Erie City Wetland #1. There are railroad tracks along the east and northeast ends of Erie City Wetland #1, and submerged cribs lie offshore of this wetland. A sewage disposal plant is located between Erie City Wetlands #1 and #2. The wetland is under undetermined ownership but its location suggests that it is subject to severe development pressure (U.S.G.S. quadrangle map, Erie North, Pennsylvania, 1975).

Recreation

No known state or federal recreational facilities are present in the vicinity of the Erie City Wetland Complex.

Mineral, Energy, and Forest Resources

Potential resources in the Erie City Wetland Complex include sand, gravel, and gas (Great Lakes Basin Commission, 1974) (Socolow, A.A., undated). Brine wells are in the vicinity of the wetland complex. Development of the resources is unlikely because the wetlands are within the city of Erie, Pennsylvania.

Public Utilities and Facilities

A sewage disposal plant is located approximately 0.1 mile from the Erie City Wetland Complex. A public dock and Niagara Park lie 0.5 mile from the wetlands. Gas storage facilities are located 0.3 mile south of Erie City Wetland #1 and adjacent to Erie City Wetland #2. A water storage facility lies 0.1 mile east of Erie City Wetland #1 (U.S.G.S. quadrangle map, Erie North, Pennsylvania, 1975).

Pollution Sources

No NPDES permit holders are adjacent to the Erie City Wetland Complex. No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical or archaeological features are present within 500 feet of the Erie City Wetland Complex.

RESEARCH PROJECTS

LE 010-012

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

PRESQUE ISLE WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LE 013-016

Setting

The Presque Isle Wetland Complex, comprised of Presque Isle Wetland, Long Pond Wetland, Big Bend Wetland, and Presque Isle Bay Wetland, lies within Millcreek Township of Erie County, Pennsylvania. All four occupy shallow depressions in Presque Isle Peninsula which forms an arc in Lake Erie north of the city of Erie, Pennsylvania.

Wetlands	Distance from Erie Public Dock	Distance from Distal End of Peninsula
Presque Isle	1.7 miles	0.1 miles
Long Pond	1.4	1.9
Big Bend	2.2	3.2
Presque Isle Bay	2.6	5.0

These Lacustrine and Palustrine wetlands are partially forested and all lie within 0.1 mile of the Lake Erie or Presque Isle Bay shoreline (U.S.G.S. quadrangle map, Erie North, Pennsylvania, 1975).

Topography

Presque Isle peninsula is a compound recurved sand spit which extends in a general northeasterly direction from its junction with the mainland just west of the city of Erie. Enclosed between the peninsula and the mainland is Presque Isle Bay. During its migratory growth, the extreme easterly end of the spit has turned shoreward and would now be connected to the mainland at the eastern edge of the city of Erie except for the presence of a deep-draft navigation channel. The length of the peninsula is about 6.3 miles (U.S. Army Corps of Engineers, 1960).

The general ground elevation of the peninsula is relatively low, rising to an average height of only 5 feet above the mean level of Lake Erie (571 feet above sea level). There are four major and several minor beach ridges or dunes which extend across the peninsula in an east-west direction and rise to an average height of 20 feet above the lake. The wetlands occupy the shallow depressions between these ridges. The elevations of the wetlands within this complex are at or near the level of Lake Erie, giving them very little relief (U.S.G.S. quadrangle map, Erie North, Pennsylvania, 1975).

Surficial Geology

The Presque Isle Wetland Complex lies within the Central Lowland physiographic province. The surficial geology of this complex is characterized by unconsolidated sediments deposited by glacial action, as stratified silt and sand in glacial lakes that stood as much as 230 higher than the present level of Lake Erie, and by littoral processes in Lake Erie (Schooler, 1974; Tomikel and Shipp, 1967). The original sand responsible for the formation of the peninsula is of glacial origin; wave erosion to the west and littorial transport of the eroded sand in an easterly direction have formed the spit (Jennings, 1930; U.S. Army Corps of Engineers, 1960). The surface deposits are generally underlain by glacial tills of low gravel content (Taylor, 1960) and by brown shales and thin sandstones of the Canadaway Formation (Gray and Shepp, 1960).

Soils

The soils in the Presque Isle Wetland Complex either belong to the Rimer-Wauseon-Berrien association, characterized by sandy soils of the lake plain, or are fresh water marsh soils (Taylor, 1960). The Berrien series is the most common in the complex, consisting of a fine sandy loam on low slopes (2%). The parent material was composed of acid, lacustrine sands that were sorted and deposited by water; when saturated with water, this material is known locally as "quicksand." The freshwater marsh soils occur in shallow lagoons fringing Presque Isle Bay. They consist of 6 to 12 inches of partly decomposed organic material that is underlain by deep lacustrine sand and gravel. The surface is normally covered by water up to a depth of 3 feet. This area supports a luxuriant growth of cattails which provides suitable habitat for wildlife (Taylor, 1960).

Hydrology

All of the wetlands in the Presque Isle Wetland Complex lie within 0.1 mile of Lake Erie or Presque Isle Bay. No surface streams are present on Presque Isle. The wetlands are covered by 1 to 3 feet of water; the water level fluctuates seasonally and is especially high following storms (Taylor, 1960).

The water level within the Presque Isle Wetland Complex is strongly influenced by the surface elevation of Lake Erie, which varies irregularly from year to year. During the course of each year the surface is subject to consistent seasonal rise and fall, the lowest stages prevailing during the winter months and the highest stages during the summer months. In addition to the annual fluctuation, there are also oscillations of irregular frequency, amplitude, and duration produced by storms. Some, with periods of a few minutes to a few hours, are the results of squall conditions, the fluctuations being produced by a combination of wind and barometric pressure changes that accompany the squalls. At other times the lake level is affected for longer periods by strong winds of sustained velocity and direction which drive the surface water forward to raise its level on the lee shore and lower it on the weather shore. This type of fluctuation has a very pronounced effect in Lake Erie because its shallow depth affords little opportunity for the impelled upper water to return through reverse currents below the depth disturbed by storms. Oscillations of the lake surface, known as seiches, may continue for many hours after the abatement of the storms by which they were produced. Because Presque Isle is located east of the nodal point of the surface oscillations, the lake level there is raised by westerly winds and lowered by easterly winds, so that when other factors are equal, westerly storms are more damaging at Presque Isle. High-water storms from the west can cause the spit to be breached and the wetlands to be connected temporarily to the open lake (Seibel et al., 1976). Short period fluctuations of up to 3 feet above the normal lake level occur about once a year (U.S. Army Corps of Engineers, 1960).

Currently, four hydrologic and meterologic forces appear to be involved in the complex development of the spit and the formation of new wetlands at the distal end of Presque Isle: 1) littoral currents bearing beach material and deviating lakeward, 2) conflicting currents turning the spit inward to form a hook, 3) northeasterly storm winds causing the formation of ridges, and 4) effects of wind and vegetal cover on dunes and soil. Comparison of the present position of the peninsula with surveys of the shoreline in 1970 and 1834 reveals that the sand spit has migrated steadily more than a mile to the east during this 176-year period (Seibel et al., 1976).

The literature search provided no site-specific data pertaining to groundwater discharge patterns, runoff, or water quality in the Presque Isle Wetland Complex.

Climate

The climate of northern Erie County, Pennsylvania is greatly influenced by the waters of Lake Erie. In fall and winter cold air reaching this area is moderated in temperature by the warmer waters of the lake. In spring and summer warm air is moderated by the cooler lake water. As a result the climate of the lake plain differs markedly from that of the interior upland. This moderating effect is most noticeable within a few miles of the shoreline (Taylor, 1960).

The closest weather station providing climatic data for the Presque Isle Wetland Complex is located in Erie, Pennsylvania. The average annual temperature is 47.1°F based on the normal period from 1941-1970. The mean monthly low for January is 23.8°F and the mean monthly high for July is 80.9°F. The average annual precipitation is 38.20 inches, with a mean monthly precipitation of 2.47 inches in January and 3.52 inches in July. The growing season is approximately six months long, with the last killing frost (28°F) in 1975 occurring on April 22 and the first killing frost on October 30 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of the Presque Isle Wetland Complex (U.S.G.S. quadrangle map, Erie North, Pennsylvania, 1975).

Vegetation

Considering the nature of the literature base related to the four wetlands comprising the Presque Isle Wetland Complex, a narrative characterization of this site is best approached with a general habitat-type characterization with respect to successional changes.

Two major wetland types occur on Presque Isle, lagoon ponds and beach ponds. Lagoon ponds have been and are formed on the northeastern end of the peninsula. The complex interaction of wave action and littoral current coupled with a progressive northeast extension of the land mass has produced a clockwise rotation of age-class in these ponds, with successively younger ponds being formed to the north and northeast of older lagoon ponds. Beach ponds are elongate and parallel to present or former shorelines, being formed only a few meters from Lake Erie. They may persist only a few months or up to 75 years. A major difference between lagoon and beach ponds is the duration of connection with the lake. While beach ponds are typically sealed at formation, lagoon ponds may remain in direct contact with the lake for a number of years (Kormondy, 1969), hence the relationship of vegetation zones to water levels may be a more critical factor in lagoon ponds.

Major species composition of wetlands on Presque Isle follows successional patterns. As ponds are formed, cottonwood (Populus deltoides) and willows (Salix sp.) become established along the ridges which define the pond. Stonewort (Chara sp.) is the dominant aquatic species in this early stage. Within 3-5 years, the stoneworts, Chara and Nitella are characteristic of the open water habitat, while narrow-leaved cattail (Typha angustifolia) is dominant among emergent vegetation. Within 10 years, the stoneworts are replaced by such higher plants as water milfoil (Myriophyllum) and coontail (Ceratophyllum). Floating-leaved plants generally do not appear for another 30 to 40 years. Major floating-leaved species include water shield (Brasenia schreiberi), pond weed (Potamogeton sp.) and yellow water lily (Nuphar advena). Major emergent species in addition to cattail include American bulrush (Scirpus americanus), soft-stem bulrush (Scirpus validus), rush (Juncus sp.), and spike rush (Eleocharis sp.). As filling of these ponds proceeds, more drought-tolerant species such as reed canary grass (Calamogrostis canadensis) succeed the above emergent vegetation. Ponds in very late stages of succession are characterized by an increasing encroachment by such terrestrial species as black oak (Quercus velutina), sugar maple (Acer saccharum), white pine (Pinus strobus) and wild cherry (Prunus sp.) (Kormondy, 1969; Baker, 1974).

The literature search yielded no site-specific information pertinent to density and productivity of vegetation in the Presque Isle Wetland Complex.

Fish

A general list of fish species found on Presque Isle was presented by Baker, Inc. (1974) and is reproduced in Appendix A-2. Not all these species are associated with wetlands, and those which most likely utilize the four wetlands of the Presque Isle Complex are indicated. The interior pond wetlands of Presque Isle probably support few fish because there is little or no access to the bay or lake, and oxygen depletion is probable in winter and summer. If any fishes occur in these wetlands, they are most likely to be the bluegill (*Lepomis macrochirus*) and the brown bullhead (*Ictalurus nebulosus*). Wetlands with access to the bay or lake are probably utilized for spawning, feeding, or cover by yellow perch (*Perca flavescens*), carp (*Cyprinus carpio*), goldfish (*Carassius auratus*), bluntnose minnow (*Pimephales notatus*), largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieui*), pumpkinseed (*Lepomis gibbosus*), white sucker (*Catostomus commersoni*), brown bullhead, stonecat mad tom (*Noturus flavus*), and gizzard shad (*Dorosoma cepedianum*). However, the literature search provided no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, food sources, or recreational and commercial use of the fish populations in Presque Isle Wetland, Long Pond Wetland, Big Bend Wetland, or Presque Isle Bay Wetland.

Invertebrates

Information on the distribution of the Malacostraca, Coleoptera, Diptera, Odonata, and Hemiptera inhabiting the beach ponds and lagoons on Presque Isle is available in Kormandy (1969). The results of this study can be used to characterize Presque Isle Wetland and Long Pond Wetland in the Presque Isle Wetland Complex and are presented below.

The Malacostraca collected were the Amphipods, *Gammarus fasciatus* and *Hyallela azteca*, the isopod, *Asellus* sp. and the decapod, *Orconectes immunis*. Of the twenty-six species of Coleoptera collected Table 2-3, *Laccophilus maculosus*, *Berosus striatus*, *Haliplus immaculatus*, *Peltodytes edentulus*, *Coptotomus interrogatus*, *Cybister* sp. and *Hydrocanthus* sp. were the most commonly observed. *Chaoborus* sp. and *Odontomyia* sp. Table 2-4, were the most generally distributed Diptera larvae. Fifteen species of Odonata Table 2-5, were collected with *Ishnura verticalis*, *Anax junius*, *Lestes rectangularis*, *Enallagma ebrium*, and *Sympetrum vicinum* most commonly observed. *Physa gyrina*, *Gyraulus deflectus*, *G. parvus*, *Lymnaea humilis*, *L. palustris*, *Sphaerium partumeium* and *S. securis* were the most common molluscs of the eighteen species collected (Table 2-6).

Gamble (1931) and Williams (1931) provide historical data for the Presque Isle Peninsula. Zagorski et al. (1969) provide information which may be applicable to Big Bend Wetland and Presque Isle Bay Wetland, owing to the proximity of the bay. Baker (1974) described the invertebrate community of Presque Isle as abundantly rich and highly diverse. However, the literature search yielded no site-specific data pertaining to abundance, density and productivity, recreational and commercial use, relationship to water levels, or major food sources of the invertebrates present in the four wetlands comprising the Presque Isle Wetland Complex.

Table 2-3. Coleoptera Collected in Beach Ponds and Lagoons on Presque Isle[a]

Haliplidae
- *Haliplus fasciatus*
- *H. immaculatus*
- *H. triopes*
- *Haliplus* sp.
- *Peltodytes edentulus*
- *P. sexmaculatus*

Dytiscidae
- *Acilus semisulcatus*
- *Acilus* sp.
- *Coptotomus interrogatus*
- *Coptotomus* sp.
- *Cybister* sp.
- *Dytiscus* sp.
- *Graphoderus liberus*
- *Hydrocanthus* sp.
- *Hydroporus niger*
- *Hydrovatus p. pustulatus*
- *Hydrovatus* sp.
- *Hygrotus impressopunctulatus*
- *H. laccophilinus*
- *H. sayi*

Dytiscidae (continued)
- *Ilybius oblitus*
- *Laccophilus maculosus*
- *Laccophilus* sp.
- *Matus bicarnatus*
- *Rhantus suturellus*

Gyrinidae
- *Dineutes assimilis*
- *D. hornii*
- *D. nigrior*
- *Dineutes* sp.
- *Gyrinus* sp.

Hydrophylidae
- *Berosus striatus*
- *Berosus* sp.
- *Enochrus pygmaeus*
- *Paracymus subcupreus*
- *Tropisternus lateralis*
- *T. mixtus*
- *T. natator*

[a]Taken from Kormandy (1969)

Table 2-4 . Diptera Larvae Collected in Beach Ponds and Lagoons on Presque Isle[a]

Culicidae
- *Chaoborus* sp.

Tendipedidae
- *Clinotanypus* sp.
- *Cryptochironomus* nr. *fulvus*
- *Harnischia amachaerus*
- *Psectrocladius nigra*
- *Pelopia stellata*
- *Pentaneura* (melanopus group)
- *P. monilis*
- *P. peleensis*
- *Polypedilum halterale*
- *P.* nr. *illinoense*

Tendipedidae (continued)
- *Tanypus* sp.
- *Tanytarsus* nr. *nigricans*
- *Tendipes* nr. *attenuates*
- *T. modestus*
- *T. prasinus*

Stratiomyidae
- *Odontomyia* sp.

Sciomyzidae
- *Sepedon* sp.

[a]Taken from Kormandy (1969)

Table 2-5 . Odonata Collected in Beach Ponds and Lagoons on Presque Isle[a]

Lestidae
- *Lestes disjunctus australis*
- *L. d. disjunctus*
- *L. rectangularis*
- *L. unguiculatus*

Coenagrionidae
- *Enallagma carunculatum*
- *E. ebrium*
- *E. hageni*
- *Ischnura posita*
- *I. verticalis*

Aeshnidae
- *Anax junius*

Libellulidae
- *Libellula incesta*
- *L. luctuosa*
- *L. pulchella*
- *Pachydiplax longipennis*
- *Sympetrum vicinum*

[a]Taken from Kormandy (1969)

Table 2-6. Mollusca Collected in Beach Ponds and Lagoons on Presque Isle[a]

Gastropoda	Pelecypoda
Viviparidae	Unionidae
Viviparus contectoides	*Ligumia nasuta*
V. malleatus	Sphaeriidae
Physidae	*Pisidium casertanum*
Physa gyrina	*P. variabile*
P. integra	*Sphaerium lacustre*
Lymnaeidae	*S. partiumeium*
Lymnaea columella	*S. securis*
L. humilis	
L. palustris	
Succinea ovalis	
Planorbidae	
Gyraulus deflectus	
G. parvus	
Helisoma trivolvis	
Menetus exacuous	

[a]Taken from Kormandy (1969)

Reptiles and Amphibians

The herpetofauna of Presque Isle State Park was studied by McKinstry and Felege (1973) and McKinstry (1975). Species collected the vicinity of Presque Isle Wetland included red-spotted newt (*Notophthalmus viridescens*) in the eft stage only, spotted salamander (*Ambystoma maculatum*), map turtle (*Graptemys geographica*), midland painted turtle (*Chrysemys picta*), eastern garter snake (*Thamnophis sirtalis*), northern ribbon snake (Thamnophis *sauritus*), and northern brown snake (*Storeria dekayi*).

The literature search yielded no other 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 the four wetlands comprising the Presque Isle Wetland Complex.

Avifauna

Historical accounts of the birds of Presque Isle and Erie, Pennsylvania are available in Todd et al. (1904). Owing to increased human disturbance, fifteen breeding species of birds including the bald eagle (*Haliaeetus leucocephalus*), pileated woodpecker (*Dryocopus pileatus*), barred owl (*Strix varia*), common tern (*Sterna hirundo*) and piping plover (*Charadrius melodus*) have disappeared from the area within the last fifteen years (Baker, 1974). The bald eagle is currently on the Federal Endangered Species List. Migratory flights through the area have also been reduced in number, but not in diversity (Baker, 1974). A list of birds and the numbers observed in the Erie, Pennsylvania vicinity appears in Appendix D-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 the Presque Isle Wetland Complex.

Mammals

Hunting and trapping are permitted within aurthorized areas of Presque Isle State Park during seasons established by the Pennsylvania Game Commission (Pennsylvania Department of Environmental Resources). However, 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 Presque Isle 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, 1976, 1977; Pennsylvania Fish Commission, 1978) were documented in the Presque Isle 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

LE 013-016

Population

The Presque Isle Wetland Complex is located in Mill Creek Township of Erie County, Pennsylvania. The county is moderately populated, having a density of 336 persons per square mile. Table 2-7 indicates that Erie County experienced moderate population growth, and Mill Creek Township underwent rapid population growth, between 1970 and 1975. Erie County is expected to maintain a stable population.

Table 2-7. Population Data for the Vicinity of the Presque Isle Wetland Complex

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990
Erie County	273,396	3.7	--
Mill Creek Township	42,045	13.8	--

[a] U.S. Bureau of the Census (1977)

Land Use and Ownership

Land use within the Presque Isle Wetland Complex and most of the surrounding area is rural open space. Hard surface roads pass through the wetlands of this complex. A signal tower is located in the northeastern part of Presque Isle Wetland. Abandoned setting basins are located south of Big Bend Wetland, and a boat marina is near the southern part of Presque Isle Bay Wetland. The wetland is under state ownership and its location suggests that it is subject to minimal development pressure (U.S.G.S. quadrangle map, Erie North, Pennsylvania, 1975).

Recreation

The Presque Isle Wetland Complex is within Presque Isle State Park, where recreational activities include hiking, picnicking, swimming, boating, and fishing.

Mineral, Energy, and Forest Resources

Potential resources in the Presque Isle Wetland Complex include sand, gravel, timber, and gas (Great Lakes Basin Commission, 1974) (Socolow, A.A., undated). Brine wells are in the vicinity. However, the wetland complex is in Presque Isle State Park and because of its present status and uniqueness, resource development is unlikely.

Public Utilities and Facilities

A U.S. Coast Guard Station is located approximatley 0.4 miles south of Presque Isle Wetland, and a signal tower lies within the wetland. A boat marina is adjacent to Presque Isle Bay Wetland (U.S.G.S. quadrangle map, Erie North, Pennsylvania, 1975).

Pollution Sources

No NPDES permit holders are adjacent to the Presque Isle Wetland Complex. No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

Presque Isle was used by Oliver H. Perry during the War of 1812, as a base for building the fleet which defeated the British for control of the Great Lakes.

Owing to the historical significance of Presque Isle State Park, it is registered as a State Historical Landmark. According to Mr. William Watson of the Historical Site Surveys, Pennsylvania Historical Museum Commission, Presque Isle is not on the National Register of Historic Places. However, it is eligible for nomination to the Register and would fall within the provisions of Executive Order 11593. In addition, Presque Isle State Park is included on the National Registry of Natural Landmarks. Because of this designation it is protected by the National Environmental Policy Act of 1969.

RESEARCH PROJECTS LE 013-016

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

CAMP LAMBEC WETLAND

PHYSIOGRAPHIC SETTING

LE 017

Setting

Camp Lambec Wetland is located in Springfield Township of Erie County, Pennsylvania, about 0.2 mile south of the Lake Erie shoreline. This small Palustrine wetland is approximately 20 miles southwest of the city of Erie and 1.2 miles west of the village of North Springfield, Pennsylvania. The wetland is forested and was recently modified (between 1959 and 1969) by a dam placed on a small stream which flows through the wetland, to form a small lake (U.S.G.S. quadrangle map, East Springfield, Pennsylvania, 1969).

Topography

Camp Lambec Wetland lies at an elevation of 600 feet above sea level, approximately 29 feet above the approximate mean elevation of Lake Erie. The wetland itself has very little relief, but the valley that holds the wetland has a relief of 80 feet within 0.5 mile of Lake Erie (U.S.G.S. quadrangle map, East Springfield, Pennsylvania, 1969). The Lake Erie shoreline along this reach has an average bluff height of 57 feet, a recession rate of 1.4 feet per year, and is classified as "erodible high bluff" by the Great Lakes Basin Commission (Seibel et al., 1976). Leggette (1936) indicates a buried valley of glacial outwash deposits which may have had its western edge in the vicinity of Camp Lambec Wetland.

Surficial Geology

The bluffs forming the shoreline of Lake Erie in the vicinity of Camp Lambec Wetland are composed of lacustrine silt and sand deposited in glacial lakes that once stood 230 feet above the present lake level (Taylor, 1960 and Schooler, 1974). These unconsolidated lake sediments are underlain by glacial till, Devonian shales, and siltstones of the Conneaut Group (Gary and Shepps, 1960).

Soils

The soils in Camp Lambec Wetland are of the Rimer-Wauseon-Berrien association, characterized by sandy soils of the lake plain; the Wallington-Birdsael-Williamson association, characterized by silty and clayey soils of the lake plain; and the Wayland series, characterized by silt and clay soils of flood plains. The Berrien, Wallington, and Wayland series are the most common. Berrien soils consist of a fine sandy loam on low slopes, with a parent material of acid, lacustrine sands that were sorted and deposited by water. When these soils are saturated with water, they are known locally as "quicksand." Wallington soils are poorly drained, with parent material consisting of lacustrine deposits derived from acid shale bedrock and from sandstone and limestone of glacial origin. Wayland soils are poorly drained and are typically covered by water for long periods in the spring (Taylor, 1960).

Hydrology

Camp Lambec Wetland lies in the valley of a small, unnamed tributary to Lake Erie. The stream has been dammed to form a small lake in wooded terrain.

Typical yields from groundwater wells in unconsolidated deposits along the Pennsylvania shore of Lake Erie are less than 10 gallons per minute (Weist, 1978). The literature search provided no site-specific data pertaining to water level fluctuations, groundwater drainage patterns and runoff, water quality, depth or seasonal changes in these wetlands.

Climate

The closest weather station providing climatic data for Camp Lambec Wetland is located in Erie, Pennsylvania. The average annual temperature is 47.1°F based on the normal period from 1941-1970. The mean monthly low for January is 23.8°F and the mean monthly high for July is 80.9°F. The average annual precipitation is 38.20 inches, with a mean monthly precipitation of 2.47 inches in January and 3.52 inches in July. The growing season is approximately six months long, with the last killing frost (28°F) in 1975 occurring on April 22 and the first killing frost on October 30 (National Oceanic and Atmospheric Administration, 1975).

The climate of northern Erie County, Pennsylvania is greatly influenced by the waters of Lake Erie. In fall and winter cold air reaching this area is moderated in temperature by the warmer waters of the lake. In spring and summer warm air is moderated by the cooler lake water. As a result the climate of the lake plain differs markedly from that of the interior upland. This moderating effect is most noticeable within a few miles of the shoreline (Taylor, 1960).

Special Features

No natural special features are located in the vicinity of Camp Lambec Wetland (U.S.G.S. quadrangle map, East Springfield, Pennsylvania, 1969).

BIOTIC SETTING

LE 017

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 Camp Lambec Wetland.

Fish

A search of the literature provided no site-specific data 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 Camp Lambec 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 Camp Lambec 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 Camp Lambec Wetland.

Avifauna

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 Camp Lambec 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 Camp Lambec 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, 1976, 1977; Pennsylvania Fish Commission, 1978) were documented in Camp Lambec 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

LE 017

Population

Camp Lambec Wetland is located in Springfield Township of Erie County, Pennsylvania. The county is moderately populated, having a density of 336 persons per square mile. Table 2-8 indicates that Erie County experienced moderate population growth, while Springfield Township underwent rapid population growth, between 1970 and 1975. Erie County is expected to maintain a stable population.

Table 2-8. Population Data for the Vicinity of Camp Lambec Wetland

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990
Erie County	273,396	3.7	--
Springfield Township	2,689	9.9	--

[a] U.S. Bureau of the Census (1977)

Land Use and Ownership

Land use within Camp Lambec Wetland is rural wooded space. The surrounding area is predominantly open space, except for residential development near the lake. The wetland is under private ownership, and its location suggests that it is subject to moderate development pressure (U.S.G.S. quadrangle map, East Springfield, Pennsylvania, 1969).

Recreation

No known state or federal recreational facilities are present in the vicinity of Camp Lambec Wetland.

Mineral, Energy, and Forest Resources

Potential resources in the vicinity of Camp Lambec Wetland include sand, gravel, and gas (Great Lakes Basin Commission, 1974). A minor forest resource is located to the south of the wetland.

Public Utilities and Facilities

No public utilities or facilities are located within 0.5 mile of Camp Lambec Wetland (U.S.G.S. quadrangle map, East Springfield, Pennsylvania, 1969).

Pollution Sources

No NPDES permit holders are located adjacent to Camp Lambec 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 or archaeological features are present within 500 feet of Camp Lambec Wetland.

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

RACCOON CREEK AREA WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LE 018-019

Setting

The Raccoon Creek Area Wetland Complex, consisting of Ellis Road Wetland and Raccoon Creek Area Wetland, is located in Springfield Township of Erie County, Pennsylvania, about 21 miles southwest of the city of Erie, 2 miles west of the village of North Springfield, and 2.5 miles northeast of the Ohio State Line. Ellis Road Wetland is approximately 0.7 mile east of Raccoon Creek Wetland, and both are about 0.1 mile south of the Lake Erie shoreline. Both wetlands are Palustrine and lie at the edge of wooded terrain (U.S.G.S. quadrangle map, East Springfield, Pennsylvania, 1969).

Topography

Both of the wetlands in this complex are small and have very little relief; each lies at an elevation 615 feet above sea level (44 feet above the approximate mean level of Lake Erie). Although the wetlands are nearly flat, the stream valleys that border the complex on the east and west have a relief of approximately 80 feet within 0.5 mile of the lake shoreline (U.S.G.S. quadrangle map, East Springfield, Pennsylvania, 1969). The Lake Erie shoreline along this reach has a bluff height of over 60 feet, a recession rate of 1.4 feet per year and is classified as "erodible high bluff" by the Great Lakes Basin Commission (Seibel et al., 1976).

Surficial Geology

The bluffs forming the shoreline of Lake Erie in the vicinity of the Raccoon Creek Area Wetland Complex are composed of lacustrine silt and sand deposited in glacial lakes that once stood 230 feet above the present lake level (Taylor, 1960; Schooler, 1974). These unconsolidated lake sediments are underlain by glacial till and Devonian shales and siltstones of the Conneaut Group (Gary and Shepps, 1960).

Soils

The soils of the Raccoon Creek Area Wetland Complex are of the Rimer-Wauseon-Berrien association, characterized by sandy soils of the lake plain; the Wallington-Birdsael-Williamson association, characterized by silty and clayey soils of the lake plain; and the Wayland series, characterized by silt and clay soils of flood plains. The Berrien, Wallington, and Wayland series are the most common. Berrien soils consist of a fine sandy loam on low slopes, with a parent material of acid, lacustrine sands that were sorted and deposited by water. When these soils are saturated with water, they are known locally as "quicksand." Wallington soils are poorly drained, with parent material consisting of lacustrine deposits derived from acid shale bedrock and from sandstone and limestone of glacial origin. Wayland soils are poorly drained and are typically covered by water for long periods in the spring (Taylor, 1960).

Hydrology

The Raccoon Creek Area Wetland Complex lies between two small tributaries to Lake Erie: an unnamed stream on the east, 0.1 mile east of Ellis Road Wetland, and Raccoon Creek on the west, 0.3 mile west of Raccoon Creek Area Wetland. Typical yields from groundwater wells in unconsolidated deposits along the Pennsylvania shore of Lake Erie are less than 10 gallons per minute (Weist, 1978).

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

Climate

The closest weather station providing climatic data for the Raccoon Creek Area Wetland Complex is located in Erie, Pennsylvania. The average annual temperature is 47.1^{o}F based on the normal period from 1941-1970. The mean monthly low for January is 23.8^{o}F and the mean monthly high for July is 80.9^{o}F. The average annual precipitation is 38.20 inches, with a mean monthly precipitation of 2.47 inches in January and 3.52 inches in July. The growing season is approximately six months long, with the last killing frost (28^{o}F) in 1975 occurring on April 22 and the first killing frost on October 30 (National Oceanic and Atmospheric Administration, 1975).

The climate of northern Erie County, Pennsylvania is greatly influenced by the waters of Lake Erie. In fall and winter cold air reaching this area is moderated in temperature by the warmer waters of the lake. In spring and summer warm air is moderated by the cooler lake water. As a result the climate of the lake plain differs markedly from that of the interior upland. This moderating effect is most noticeable within a few miles of the shoreline (Taylor, 1960).

Special Features

No natural special features are found in the vicinity of the Raccoon Creek Area Wetland Complex (U.S.G.S. quadrangle map, East Springfield, Pennsylvania, 1969).

BIOTIC SETTING

LE 018-019

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 Raccoon Creek Area Wetland Complex.

Fish

A search of the literature provided no site-specific data 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 Raccoon Creek 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 Raccoon Creek Area Wetland Complex.

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 the two wetlands comprising the Raccoon Creek Area Wetland Complex.

Avifauna

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 the Raccoon Creek Area Wetland Complex.

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 Raccoon 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, 1976, 1977; Pennsylvania Fish Commission, 1978) were documented in the raccoon 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 LE 018-019

Population

The Raccoon Creek Area Wetland Complex is located in Springfield Township of Erie County, Pennsylvania. The county is moderately populated, having a density of 336 persons per square mile. Table 2-9 indicates that Erie County experienced moderate population growth, while Springfield Township underwent rapid population growth, between 1970 and 1975. Erie County is expected to maintain a stable population.

Table 2-9. Population Data for the Vicinity of the Raccoon Creek Area Wetland Complex

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990
Erie County	273,396	3.7	--
Springfield Township	2,689	9.9	--

[a] U.S. Bureau of the Census (1977)

Land Use and Ownership

Land use within the Raccoon Creek Area Wetland Complex is rural open space. The surrounding area is predominantly open space except for shoreline residential development along the lake shore near Ellis Road Wetland. A hard surface road lies between Ellis Road Wetland and Raccoon Creek Area Wetland. A few dwellings and an unimproved dirt road are located within the wetland. The wetland is under private ownership, and its location suggests that it is subject to moderate development pressure (U.S.G.S. quadrangle map, East Springfield, Pennsylvania, 1969).

Recreation

No known state or federal recreational facilities are present in the vicinity of the Raccoon Creek Area Wetland Complex.

Mineral, Energy, and Forest Resources

Potential resources in the vicinity of the Raccoon Creek Area Wetland Complex include sand, gravel, and gas (Great Lakes Basin Commission, 1974). A minor forest resource is located to the south of the wetland complex.

Public Utilities and Facilities

No public utilities or facilities are located within 0.5 mile of the two wetlands comprising the Raccoon Creek Area Wetland Complex (U.S.G.S. quadrangle map, East Springfield, Pennsylvania, 1969).

Pollution Sources

No NPDES permit holders are located adjacent to the Raccoon Creek Area Wetland Complex. No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical or archaeological features are present within 500 feet of the Raccoon Creek Area Wetland Complex.

RESEARCH PROJECTS

LE 018-019

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

Table 2-10. Data Gaps-Lake Section 2

Data Gap*		Wetland Number	010–012	013–016	017	018–019
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	*	*	*	*
		Food Sources	*	*	*	*
	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	*	*	*	*
		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	*	*	*	*
		Endangered Species				
		Health	*	*	*	*
Cultural Setting		Population				
		Land Use and Ownership				
		Recreation				
		Mineral, Energy, Forest Resourc				
		Public Utilities/Facilities				
		Point Pollution Sources				
		Non-Point Pollution Sources	*	*	*	*
		Historic Features				
		Archaelogic Features				

LAKE SECTION 3

INTRODUCTION

Lake Section 3 extends along the southern shoreline of Lake Erie from the Ohio-Pennsylvania border to Cedar Point in Erie County, Ohio. The region features gently to steeply sloping topography in the vicinity of the wetlands. The predominant shore type along this 180 mile stretch of shoreline is low plain.

Figures 3-1 through 3-5 show the approximate location of the 11 coastal wetlands in Lake Section 3. Data concerning latitude, longitude, acreage, and classification for each of these wetlands are presented in Table 3-1. The wetlands of Lake Section 3 lie at elevations between 571 to 610 feet above sea level (0 to 39 feet above the approximate mean elevation of Lake Erie). These wetlands are classified as Palustrine and Lacustrine.

Available information related to physiographic and cultural features of the 11 coastal wetlands is summarized in the individual wetland narratives presented in this chapter. Published sources lack site-specific information related to the biotic characteristics of these wetlands in many instances.

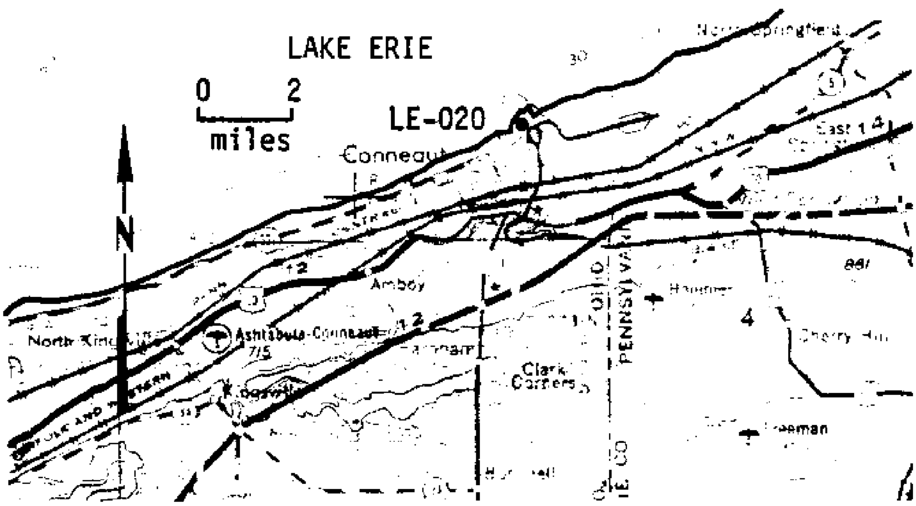

Figure 3-1. Lake Section 3 - Conneaut Creek Area

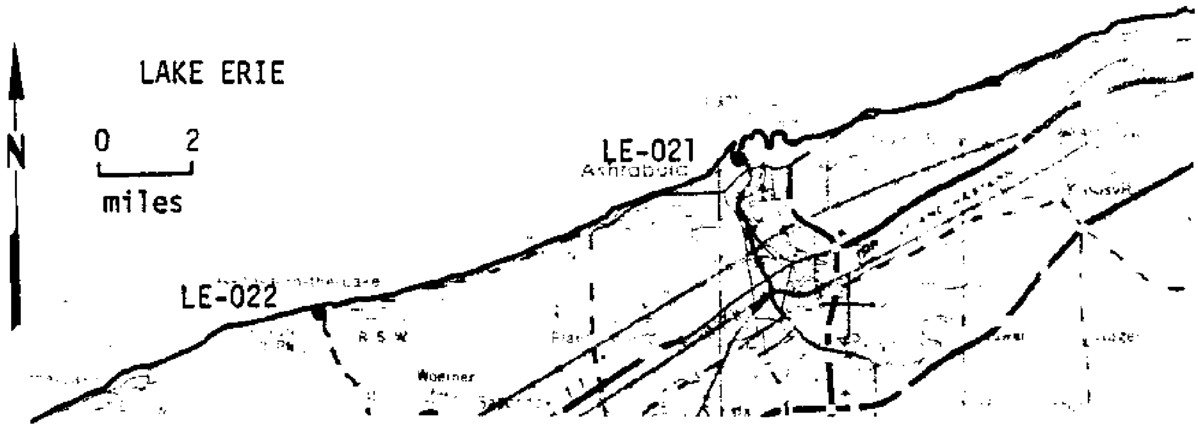

Figure 3-2. Lake Section 3 - Ashtabula Area

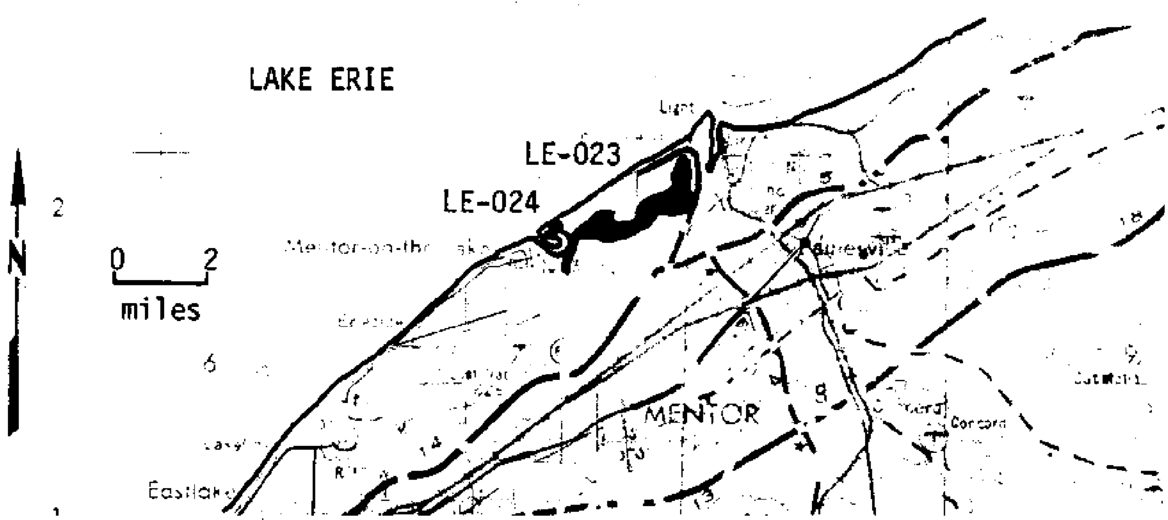

Figure 3-3. Lake Section 3 - Mentor Area

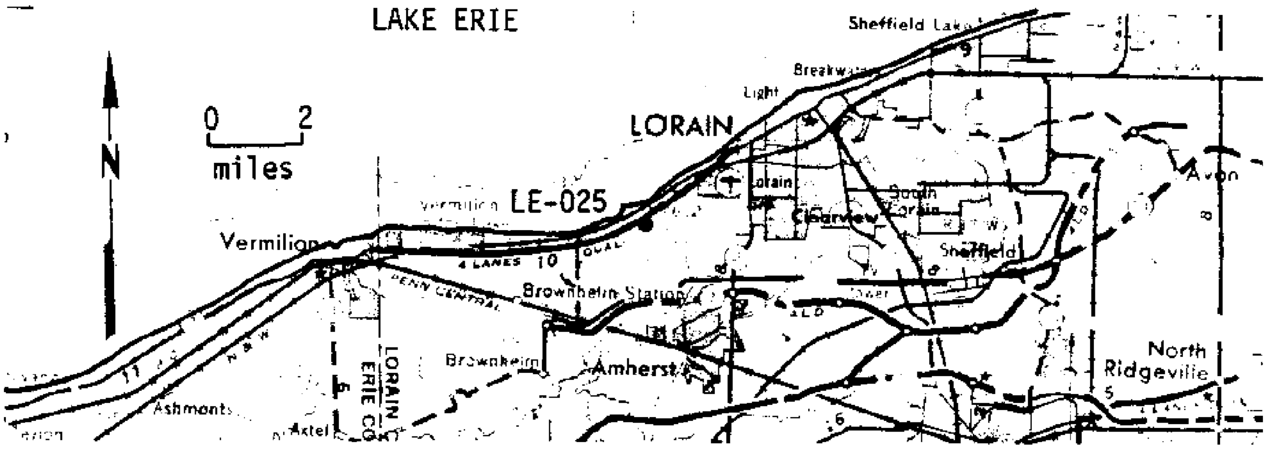

Figure 3-4. Lake Section 3 - Beaver Creek Area

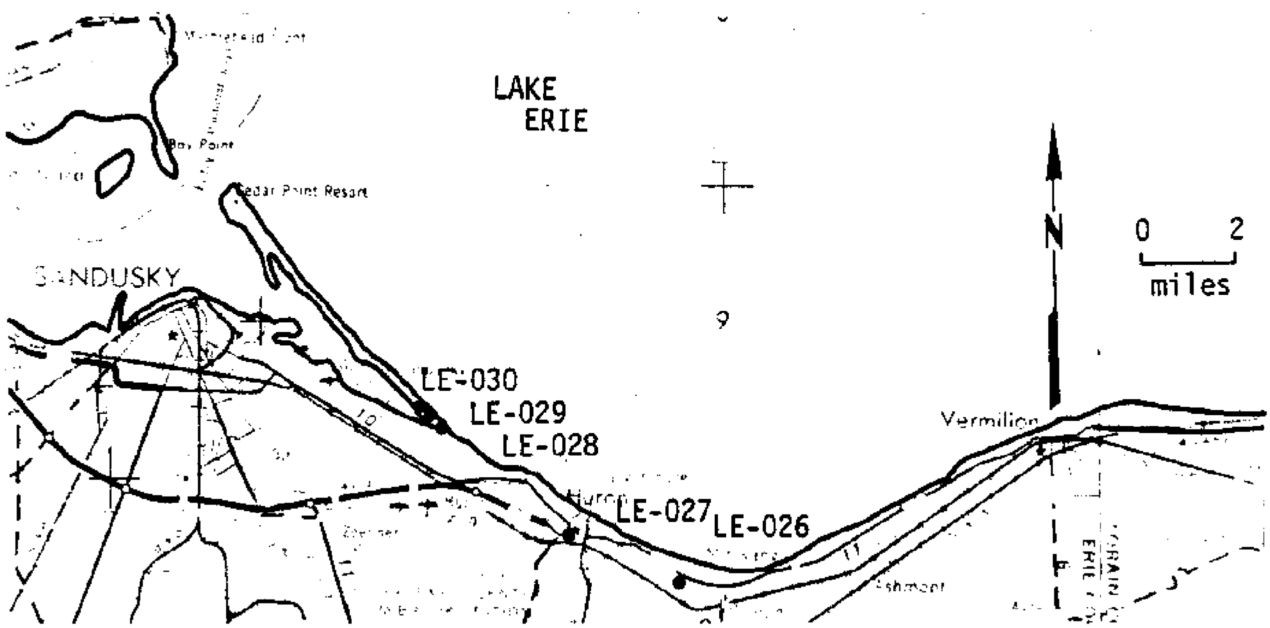

Figure 3-5. Lake Section 3 - Huron Area

Table 3-1. Location, Acreage, and Classification of Wetlands in Lake Section 3

Wetland Number	Wetland	Latitude	Longitude	Acreage	Classification[a]
020	Conneaut Creek Wetland	41°57'51"	80°32'39"	2.5	P
021	Astabula River Delta Wetland	41°54'12"	80°48'19"	6.5	P
022	Driftwood Area Wetland	41°51'18"	80°58'28"	16	P
	MENTOR AREA WETLAND COMPLEX				
023	Mentor Marsh	41°43'56"	81°18'56"	717	P
024	Mentor-on-the-Lake Area Wetland	41°43'40"	81°20'48"	9	P
025	Beaver Creek Wetland	41°54'12"	82°14'33"	9	P
026	Old Woman Creek Wetland	41°22'32"	82°30'50"	158	P,L
027	Huron River Wetland	41°23'19"	82°33'20"	10	P
	SAWMILL CREEK WETLAND COMPLEX				
028	Sawmill Creek Area Wetland #1	41°24'57"	82°35'32"	17.5	P
029	Sawmill Creek Area Wetland #2	41°24'55"	82°35'48"	56.5	P
030	Sawmill Creek Area Wetland #3	41°25'07'	82°36'00"	10	P

[a] P=palustrine
L=lacustrine
R=riverine

CONNEAUT CREEK WETLAND

PHYSIOGRAPHIC SETTING

LE 020

Setting

Conneaut Creek Wetland is located within the city of Conneaut in northeastern Ashtabula County, Ohio. This Palustrine wetland lies on the non-wooded floodplain of Conneaut Creek, approximately 0.5 mile upstream of the creek mouth at Lake Erie (U.S.G.S. quadrangle map, Conneaut, Ohio-Pennsylvania, 1970).

Topography

Conneaut Creek Wetland has very low relief, lying on the floodplain at or near the mean elevation of Lake Erie (571 feet above sea level). The relief of Conneaut Creek Valley is approximately 70 feet in the vicinity of the wetland. The valley walls are steep-sided, and separated by a flat floodplain 2000 feet wide (U.S.G.S. quadrangle map, Conneaut, Ohio-Pennsylvania, 1970).

Surficial Geology

The bluffs in the vicinity of the wetland are composed of gray glacial till clay, capped by a thin layer of brown lacustrine silt and sand, and underlain by black and gray shales of Upper Devonian age. Shale of the Chagrin Member of the Ohio Shale Formation is exposed along the lower parts of the lake and creek bluffs. The surface material forming the floodplain is Quaternary Alluvium (Pincus, 1960; Pree, 1960).

Soils

The soils of the Conneaut Creek Wetland are of the Lobdell series, consisting of a dark grayish-brown silt loam. In the floodplain these soils are poorly drained, and flooding normally occurs in winter and early spring (Reeder et al., 1973).

Hydrology

Conneaut Creek Wetland lies on the floodplain of Conneaut Creek within the estuarine portion of the stream that is influenced by the level of Lake Erie. The wetland is normally flooded by stream action in the winter and early spring and by high-water lake storms in the fall. Northwest storms are particularly effective in producing wind tides and seiches in the estuary (Pincus, 1961). Conneaut Creek has a drainage area of 192 square miles with an average yield of 1.23 cubic feet per second (cfs) per square mile. The average stream discharge in the vicinity of the wetland is 236 cfs (Youngqueat, 1953). Water quality measurements for Conneaut Creek 6 miles upstream of the wetland are presented in Table 3-2.

Table 3-2 . Water Quality Measurements in Conneaut Creek at Conneaut, Ohio

Parameter	Units	March 3, 1976	August 12, 1976
Time	minutes	0800	1240
Discharge	cfs	1,080	60
Conductivity	µmhos/cm	150	240
pH	units	6.7	8.6
Temperature	°C	3.0	22.5
Dissolved Oxygen	mg/l	11.5	9.8
Dissolved Oxygen	% sat.	85	110
B.O.D. (5-day)	mg/l	2.3	3.3
Hardness, total	mg/l	53	98
Calcium (Ca)	mg/l	15	26
Magnesium (Mg)	mg/l	3.7	8.0
Sodium (Na)	mg/l	6.3	7.0
Potassium (K)	mg/l	1.5	2.3
Alkalinity, total	mg/l	25	61
Carbon Dioxide (CO_2)	mg/l	9.9	0.3
Sulfate (SO_4)	mg/l	28	30
Chloride (Cl)	mg/l	12	12
Fluoride (F)	mg/l	0.2	0.1
Silica (SiO_2)	mg/l	4.1	0.5
Dissolved Solids	mg/l	86	123
Nitrate (N)	mg/l	0.61	0.04
Nitrite (N)	mg/l	0.01	0.01
Ammonia (N)	mg/l	0.05	0.03
Phosphorus (P)	mg/l	0.18	0.04
Organic Carbon (C)	mg/l	18.0	7.7
Arsenic (As)	µg/l	3.0	0.0
Chromium (Cr)	µg/l	<10.0	10.0
Cooper (Cu)	µg/l	0.0	0.0
Iron (Fe)	µg/l	60	200
Lead (Pb)	µg/l	3	3
Manganese (Mn)	µg/l	10	20
Mercury (Hg)	µg/l	<0.5	<0.5
Zinc (Zn)	µg/l	20	20

Data Source: U.S. Geological Survey, Water Resources Division
Station Location: Keefus Road bridge at Conneaut, Ohio, 6.4 miles upstream from mouth

This wetland is strongly influenced by the level of Lake Erie. The average or normal elevation of the surface of Lake Erie varies irregularly from year to year. During the course of each year the surface is subject to consistent seasonal rise and fall, the lowest stages prevailing during the winter months and the highest stages during the summer months. In addition to the annual fluctuation, there are also oscillations of irregular frequency, amplitude and duration produced by storms. Some, with periods of a few minutes to a few hours, are the result of squall conditions, the fluctuations being produced by a combination of wind and barometric pressure changes that accompany the squalls. At other times the lake level is affected for longer periods by strong winds of sustained velocity and direction which drive the surface water forward to raise its level on the lee shore and lower it on the weather shore. This type of fluctuation has a very pronounced effect on Lake Erie because its depth affords little opportunity for the impelled upper water to return through reverse currents beneath the depth disturbed by storms. Oscillations of the lake surface, known as seiches, may continue for many hours after the abatement of the storms by which they were produced. Because of its location east of the nodal point of the surface oscillations, the lake level at Conneaut is raised by westerly winds and lowered by easterly winds. Thus, with other factors being equal, westerly storms are more damaging at Conneaut. Short period fluctuations of up to 3 feet above the normal lake level occur about once a year (U.S. Army Corps of Engineers, 1960).

Generalized groundwater information for the Ohio portion of the Lake Erie shore is available in Stout et al. (1943) and for Ashtabula County in Pree (1960). Alluvium deposits are generally non-water-bearing and wells in the glacial till clay and shale yield generally less than 5 gallons per minute (Pree, 1960).

The literature search provided no site-specific information pertaining to groundwater drainage patterns and runoff, or water quality in Conneaut Creek Wetland.

Climate

Situated in the northeastern corner of Ohio, on the northwestern slope of the Appalachian Plateau, Ashtabula County has a climate that is classified as continental, although adjacent Lake Erie has some effect. Lake Erie, on the northern boundary of the county, has a moderating effect on the climate throughout the county but the effect lessens as distance from the shore increases. The moderating effect of Lake Erie is greatest during cold periods, and because of this the growing season is lengthened a few days at each end. Lake Erie affects the weather primarily by moderating the temperature. The high temperature during the day is lowered in summer, and the low temperature is raised in winter when winds are blowing across warmer water. The most spectacular climatic effect of Lake Erie is seen in winter snowfall; most of Ashtabula County is in the snow belt of Ohio. Air masses passing over the open water of Lake Erie pick up moisture and heat. Then as the air is forced to rise over the bluff and ridges that parallel the lake, the excess moisture falls in the form of snow. The instability of the warmed air creates turbulence, which produces heavy snow squalls. This portion of Ohio receives more than twice as much snow as the state average (Reeder et al., 1973).

The nearest station reporting climatic data for Conneaut Creek Wetland is located in Erie, Pennsylvania. The average annual temperature is 47.1°F based on the normal period from 1941-1970. The mean monthly low for January is 23.8°F and the mean monthly high for July is 80.9°F. The average annual precipitation is 38.20 inches, with a mean monthly precipitation of 2.47 inches in January and 3.52 inches in July. The growing season is approximately six months long, with the last killing frost (28°F) in 1975 occurring on April 22 and the first killing frost on October 30 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Conneaut Creek Wetland (U.S.G.S. quadrangle map, Conneaut, Ohio-Pennsylvania, 1970).

BIOTIC SETTING

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 Conneaut Creek Wetland.

Fish

A list of fish species associated with wetland habitat or aquatic vegetation in the Lake Erie area of Ohio is presented, with annotations, in Appendix A-3. However, the literature search provided no site-specific data pertaining to major species, species composition, spawning and hatching areas, seasonal locations and abundance, life histories, food sources, or recreational and commercial use of the fish populations in Conneaut 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 Conneaut Creek Wetland.

Reptiles and Amphibians

The following reptiles, which may occur in wetland habitat, have been recorded in Conneaut Creek or the vicinity of Conneaut (Conant, 1951, 1938): snapping turtle (*Chelydra serpentina*), queen snake (*Natrix septemvittata*), and northern brown snake (*Storeria dekayi dekayi*). These species may occur in Conneaut Creek Wetland but have not been specifically reported there. Several other species of reptiles and amphibians have been recorded elsewhere in Ashtabula County (Appendix C-1), often in wetland habitat, and may also occur in Conneaut Creek Wetland. The literature search yielded no site-specific information pertaining to seasonal abundance and distribution, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in Conneaut Creek Wetland.

Avifauna

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 Conneaut Creek 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 Conneaut 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; Ohio Division of Wildlife, 1976) were documented in Conneaut 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 LE 020

Population

Conneaut Creek Wetland is located within the city of Conneaut in Ashtabula County, Ohio. The county is moderately populated, having a density of 146 persons per square mile. Table 3-3 indicates that Ashtabula County experienced moderate population growth, while Conneaut (city) underwent somewhat slower population growth between 1970 and 1975. Projections for 1990 indicate that Ashtabula County is expected to experience slow population growth in the future.

Table 3-3. Population Data for the Vicinity of Conneaut Creek Wetland

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Ashtabula County	101,940	3.8	110,900
City of Conneaut	14,892	2.3	--

[a] U.S. Bureau of the Census (1977)
[b] Northern Ohio Urban System, Series 11 Method of Population Projection (1977)

Land Use and Ownership

Land use within Conneaut Creek Wetland is urban open space. The surrounding area is predominantly commercial. Railroad tracks and docking facilities on the west side of the creek have a heavy impact on Conneaut Creek Wetland. The wetland is under private ownership, and its location suggests that it is subject to severe development pressure (U.S.G.S. quadrangle map, Conneaut, Ohio-Pennsylvania, 1970).

Recreation

No known state or federal recreational facilities are present in the vicinity of Conneaut Creek Wetland.

Mineral, Energy, and Forest Resources

Potential resources in the vicinity of Conneaut Creek Wetland include sand, gravel, and gas (Great Lakes Basin Commission, 1974). A minor forest resource lies to the east of the wetland.

Public Utilities and Facilities

An ore storage area is located approximately 0.2 mile north of Conneaut Creek Wetland, and a sewage disposal facility lies 0.4 mile northwest of the wetland (U.S.G.S. quadrangle map, Conneaut, Ohio-Pennsylvania, 1960).

Pollution Sources

No NPDES permit holders are located adjacent to Conneaut Creek Wetland. No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

The Ohio Historic Inventory indicates that two historical sites are located in the vicinity of Conneaut Creek Wetland, the Conneaut Four-track Swing Bridge (0.3 mile southeast) and the Barzella Viets Residence (0.4 mile east).

Further information regarding field research and exact locations can be obtained from the Ohio History Center (Ohio Historic Preservation Office).

The Ohio Archaeological Inventory indicates that one archaeological feature (the Pittsburgh Dock Company site) is located 0.5 mile northwest of Conneaut Creek Wetland. Further information regarding field research and exact location can be obtained from the Ohio History Center (Ohio Historic Preservation Office).

RESEARCH PROJECTS

LE 020

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

ASHTABULA RIVER WETLAND

PHYSIOGRAPHIC SETTING

LE 021

Setting

Ashtabula River Wetland is located within the city of Ashtabula in Ashtabula County, Ohio. This Palustrine wetland lies on non-forested land fill deposits inside the Ashtabula harbor breakwalls, approximately 0.1 mile south of the Lake Erie shoreline and 0.2 mile west of Ashtabula River mouth (U.S.G.S. quadrangle map, Ashtabula North, Ohio, 1970).

Topography

Ashtabula River Wetland has very little relief, lying at or near the elevation of Lake Erie (571 feet above sea level). The lake bluff immediately south of the wetland rises from 580 feet to slightly over 630 feet giving a total relief of 60 feet for the area within 0.5 mile of the shoreline (U.S.G.S. quadrangle map, Ashtabula North, Ohio, 1970).

Surficial Geology

Ashtabula River Wetland occupies depressions in man-made land fill that grades into beach sands, trapped by the breakwall, toward the west. The underlying deposits consist of lacustrine silts over glacial till clay. Devonian shale bedrock lies about 12 feet below the elevation of Lake Erie at the shoreline, under the unconsolidated deposits (Pincus, 1961).

Soils

The soils of Ashtabula River Wetland are classified as "made land" by Reeder et al. (1973). Made land consists of areas of earthen fill in which the original soils have been greatly altered.

Hydrology

Since Ashtabula River Wetland lies on harbor fill adjacent to Lake Erie, the water level in the wetland is strongly influenced by lake levels, although the wetland is protected from waves by the harbor structures. The average or normal elevation of the surface of Lake Erie varies irregularly from year to year. During the course of each year the surface is subject to consistent seasonal rise and fall, the lowest stages prevailing during the winter months and the highest stages during the summer months. In addition to the annual fluctuation, there are also oscillations of irregular frequency , amplitude, and duration produced by storms. Some, with periods of a few minutes to a few hours, are the results of squall conditions, the fluctuations being produced by a combination of wind and barometric pressure changes that accompany the squalls. At other times the lake level is affected for longer periods by strong winds of sustained velocity and direction which drive the surface water forward to raise its level on the lee shore and lower it on the weather shore. This type of fluctuation has a very pronounced effect on Lake Erie because its shallow depth affords little opportunity for the impelled upper water to return through reverse currents beneath the depth disturbed by storms. Oscillations of the lake surface, known as seiches, may continue for many hours after the abatement of the storms by which they were produced (U.S. Army Corps of Engineers, 1960).

Generalized groundwater information for the Ohio portion of the Lake Erie shore is available in Stout et al. (1943) and for Ashtabula County in Pree (1960). Land-fill deposits are generally non-water-bearing, and wells in glacial till clay and shale yield generally less than 5 gallons per minute (Pree, 1960). The literature search provided no site-specific data pertaining to groundwater drainage patterns and runoff, water quality, depth, and seasonal changes in Ashtabula River Wetland.

Climate

Situated in the northeastern corner of Ohio, on the northwestern slope of the Appalachian Plateau, Ashtabula County has a climate that is classified as continental. However, Lake Erie, on the northern boundary, has a moderating effect on the climate throughout the county although the effect lessens as distance from the shore increases. The moderating effect of Lake Erie is greatest during cold periods, and because of this the growing season is lengthened a few days at each end. Lake Erie affects the weather primarily by moderating the temperature; the high temperature during the day is lowered in summer, and the low temperature is raised in winter when winds are blowing across warmer water. The most spectacular climatic effect of Lake Erie is seen in winter snowfall; most of Ashtabula County is in the snow belt of Ohio. Air masses passing over the open water of Lake Erie pick up moisture and heat. Then as the air is forced to rise over the bluff and ridges that parallel the lake, the excess moisture falls in the form of snow. The instability of the warmed air creates turbulence, which produces heavy snow squalls. This portion of Ohio receives more than twice as much snow as the state average (Reeder et al., 1973).

The nearest station reporting climatic data for the Ashtabula River Wetland is located in Erie, Pennsylvania. The average annual temperature is 47.1^{o}F based on the normal period from 1941-1970. The mean monthly low for January is 23.8^{o}F and the mean monthly high for July is 80.9^{o}F. The average annual precipitation is 38.20 inches, with a mean monthly precipitation of 2.47 inches in January and 3.52 inches in July. The growing season is approximately six months long, with the last killing frost (28^{o}F) in 1975 occurring on April 22 and the first killing frost on October 30 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Ashtabula River Wetland (U.S.G.S. quadrangle map, Ashtabula North, Ohio, 1970).

Vegetation

Bissell (1977) reports the following potentially endangered or threatened species of plants presently occurring in Ashtabula River Wetland:

Common name	Scientific name	Status *
golden-fruited sedge	*Carex aurea*	endangered
schweinitz cyperus	*Cyperus schweinitzii*	threatened
fringed gentian	*Gentiana crinita*	threatened
bog twayblade	*Liparis loeselii*	undetermined
sand-dropseed	*Sporobolus cryptandrus*	threatened
wild celery	*Vallisneria americana*	potentially threatened

* Based on Ohio Natural Heritage Lists

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

Fish

Unpublished collection files of Dr. Andrew White, John Carroll University, Cleveland, indicate at least 18 species of fish present in Ashtabula River Wetland (Table 3-4).

Table 3-4. Fish Species Collected in Ashtabula River Wetland[a]

Species	Species
banded killifish	black bullhead
northern pike	white crappie
quillback	black crappie
carp	largemouth bass
goldfish	bluegill
goldenshiner	green sunfish
bluntnose minnow	pumpkinseed
yellow bullhead	johnny darter
brown bullhead	mottled sculpin

[a] Unpublished Collection notes of Dr. Andrew White, John Carroll University, Cleveland, Ohio.

A list of fish species associated with wetland habitats or aquatic vegetation in the Lake Erie area of Ohio appears, with annotations, in Appendix A-3. Some of these species, in addition to those listed in Table 3-4, may also utilize Ashtabula River Wetland. However, the literature search provided no site-specific data pertaining to species composition, spawning and hatching areas, seasonal distribution and abundance, life histories, food sources, or recreational and commercial use of the fish populations in this wetland.

Invertebrates

The historical and recent status of the aquatic biota of the Ashtabula area is discussed in U.S. Army Engineer District (March, 1975) and Terlecky, Jr. et al. (1975). These studies may be applicable to Ashtabula River Wetland owing to its proximity to the harbor. Information regarding distribution, abundance and density of the benthic macroinvertebrate fauna in the river, harbor and disposal area is presented in Tables 2-9 and 2-10 respectively in U.S. Army Corps of Engineers E.I.S. for Ashtabula Harbor (July, 1975).

The harbor area has been characterized by the three studies as a polluted environment with a benthic macroinvertebrate fauna of high biomass and low species diversity. The predominant organisms found were oligochaetes, molluscs, and chironomids. However, the literature search provided no site-specific information pertaining to productivity, major food sources, or relationship to water levels for the invertebrates present in Ashtabula River Wetland.

Reptiles and Amphibians

The following species have been recorded in the Ashtabula Harbor area and may occur in Ashtabula River Wetland: American toad (*Bufo americanus americanus*), bullfrog (*Rana catesbeiana*), northern leopard frog (*Rana pipiens*), snapping turtle (*Chelydra serpentina*), eastern box turtle (*Terrapene carolina carolina*), northern brown snake (*Storeria dekayi dekayi*), and eastern garter snake (*Thamnophis sirtalis sirtalis*) (U.S. Army Corps of Engineers, 1975). Other species which have often been found in wetland habitat in Ashtabula County are listed in Appendix C-1.

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

Avifauna

Great blue herons (*Ardea herodias*), mallards (*Anas platyrhynchos*), black ducks (*A. rubripes*), canvasbacks (*Aythya valisineria*), common goldeneyes (*Bucephala clangula*), buffleheads (*Bucephala albeola*), oldsquaw (*Clangula hyemalis*), mergansers (*Lophodytes* spp. and *Mergus* spp.), Bonaparte's gull (*Larus philadelphia*), ring-billed gulls (*Larus delawarensis*), and herring gulls (*Larus argentatus*) have been recorded in Ashtabula Harbor. The harbor and the surrounding natural areas are used for wintering and during migration by other waterfowl and shorebirds (U.S. Army Corps of Engineers, 1975). These species may utilize this wetland owing to its proximity to the harbor. 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 the birds utilizing Ashtabula River Wetland.

Mammals

The house mouse (Mus musculus), Norway rat (Rattus norvegicus), raccoon (Procyon lotor), and occasionally the Virginia opossum (Didelphis virginiana) are found on Ashtabula River Wetland (U.S. Army Corps of Engineers, 1975). The literature search provided no site-specific data pertaining to seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, major food sources, or relationship to water levels of the mammals inhabiting Ashtabula River Wetland.

Endangered Species

The banded killifish (Fundulus diaphanus), a fish endangered in Ohio, has been collected in Ashtabula River Wetland (A. White, John Carroll University, unpublished). A list of rare or endangered birds that have been recorded in Ashtabula Harbor appears in Table 3-5. A list of six endangered, threatened, or potentially threatened plant species known to occur in this wetland appears in the vegetation section.

No other plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Ohio Division of Wildlife, 1976) were documented in Ashtabula 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, the presence of several threatened or endangered species of plants and a diversity of fish, reptiles and amphibians and birds would seem to indicate that the health of Ashtabula River Wetland is good.

CULTURAL SETTING

LE 021

Population

Ashtabula River Wetland is located within the city of Ashtabula in Ashtabula County, Ohio. The county is moderately populated, having a density of 146 persons per square mile. Table 3-6 indicates that Ashtabula County experienced moderate population growth, while Ashtabula (city) maintained a stable population between 1970 and 1975. Projections for 1990 indicate that Ashtabula County is expected to undergo slow population growth in the future.

Table 3-5. Rare and Endangered Birds Observed at Ashtabula Harbor[a]

Species	Basis for listing[b]	Winter sightings - Christmas counts									
		1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
sharp-skinned hawk	O,B	2			2			1	+	+	
Cooper's hawk	B			2	1		1	1	1		1
red-shouldered hawk	B,S.U.		4	1			2		1		3
bald eagle	O,E										
marsh hawk	B		2		1				2		
osprey	B,S.U.								+		
peregrine falcon	O,E										
American kestrel	B	2	8	8	10	2	11	18	24	6	11
king rail	O										
upland sandpiper	O										
common tern	O										

[a]modified from U.S. Army Corps of Engineers, 1975
[b]O=Endangered, State of Ohio
B=On the Blue List for 1974
S.U.=Federal status is undetermined, but under consideration
E=Endangered federal status
+=Bird observed during count period but not on count day

Table 3-6. Population Data for the Vicinity of Ashtabula River Wetland

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Ashtabula County	101,940	3.8	110,900
City of Ashtabula	24,264	-0.2	--

[a] U.S. Bureau of the Census (1977)
[b] Northern Ohio Urban System, Series 11 Method of Population Projection (1977)

Land Use and Ownership

Land use within Ashtabula River Wetland is rural open space. The surrounding area is predominantly institutional. A hard surface road and a water works plant lie southwest of Ashtabula River Wetland, and there are railroad tracks near the eastern side of the wetland. The wetland is under private ownership, and its location suggests that it is subject to severe development pressure (U.S.G.S. quadrangle map, Ashtabula North, Ohio, 1970).

Recreation

No known state or federal recreational facilities are present in the vicinity of Ashtabula River Wetland.

Mineral, Energy, and Forest Resources

Potential mineral resources in Ashtabula River Wetland include sand and gravel (Great Lakes Basin Commission, 1974). There are no known oil, gas, or forest resources in the vicinity.

Public Utilities and Facilities

Water works are located 0.1 mile southwest of Ashtabula River Wetland, and Walnut Beach Park lies 0.3 mile west of the wetland (U.S.G.S. quadrangle map, Ashtabula North, Ohio, 1970).

Pollution Sources

No NPDES permit holders are located adjacent to Ashtabula River Wetland. No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

The Ohio Historical Inventory indicates that eight historical sites are located in the vicinity of Ashtabula River Wetland: the Harbor R.R. Office (Conrail) located 0.5 mile southeast of the wetland; the Boys Club House (0.5

mile southwest); the Paul Goode Residence (0.5 mile southwest); the Bridge Street Basule Bridge (0.3 mile southeast); the Kavela Lodge (0.2 mile south); the Harbor Lift Bridge (0.3 mile southeast); the Ashtabula Harbor Commercial District (0.5 mile south); and the Colonel William Hubbard House (0.2 mile south). Further information regarding field research and exact locations can be obtained from the Ohio History Center (Ohio Historical Preservation Office).

RESEARCH PROJECTS LE 021

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

GENEVA-ON-THE-LAKE WETLAND

PHYSIOGRAPHIC SETTING LE 022

Setting

Geneva-on-the-Lake Wetland is located on the west side of the city of Geneva-on-the-Lake in northwestern Ashtabula County, Ohio, 1.1 miles west of the City Hall and 1.4 miles east of the Lake County line. This Palustrine wetland extends inland from the Lake Erie shore for 0.4 miles along the valley of an unnamed tributary which enters the lake 0.3 mile west of the mouth of Cowles Creek. The southern portion of the wetland is forested (U.S.G.S. quadrangle map, Geneva, Ohio, 1970).

Topography

The northerly portion of the wetland lies at or near the elevation of Lake Erie (571 feet above sea level), while the southerly portion rises to over 5 feet above lake level. The relief of the valley which holds the wetland is up to 30 feet within 0.5 miles of the Lake Erie shoreline (U.S.G.S. quadrangle map, Geneva, Ohio, 1970).

Surficial Geology

The Lake Erie bluffs in the vicinity of the wetland are low and consist of approximately 8 feet of lacustrine silt and clay deposits on top of 2 feet of glacial till clay. A shallow buried valley exists west of the mouth of Cowles Creek, in which the Devonian shale bedrock lies at about 17 feet below lake level (554 feet). Sandy beaches border the wetland at the lake shore (Pincus, 1961).

Soils

Soils in Geneva-on-the-Lake Wetland consist of the Holley and Willette series. Holley silt loam forms the southern part of the wetland and consists of nearly level, poorly drained alluvium soils along the floodplain of the stream. The northern part of the wetland has been mapped as Willette muck, which is high in organic content and occurs in depressions and lagoons next to Lake Erie where the soils are subject to flooding and ponding for long periods (Reeder, et al., 1978).

Hydrology

Geneva-on-the-Lake Wetland occupies the lower portion of relatively flat stream valley near its junction with Lake Erie. At least the lower portion of the wetland is influenced by the level of Lake Erie (U.S.G.S. quadrangle map, Geneva, Ohio, 1970).

Generalized groundwater information for the Ohio portion of the Lake Erie shore is available in Stout et al. (1943) and for Ashtabula County in Pree

(1960). Alluvium deposits are generally non-water-bearing and wells in the glacial till clay and shale yield generally less than 5 gallons per minute (Pree, 1960).

The literature search provided no site-specific data pertaining to groundwater drainage patterns and runoff, water quality, depth, or seasonal changes of this wetland.

Climate

Situated in the northeastern corner of Ohio, on the northwestern slope of the Appalachian Plateau, Ashtabula County has a climate that is classified as continental. However, Lake Erie, on the northern boundary, has a moderating effect on the climate throughout the county although the effect lessens as distance from the shore increases. The moderating effect of Lake Erie is greatest during cold periods, and because of this the growing season is lengthened a few days at each end. Lake Erie affects the weather primarily by moderating the temperature; the high temperature during the day is lowered in summer, and the low temperature is raised in winter when winds are blowing across warmer water. The most spectacular climatic effect of Lake Erie is seen in winter snowfall; most of Ashtabula County is in the snow belt of Ohio. Air masses passing over the open water of Lake Erie pick up moisture and heat. Then as the air is forced to rise over the bluff and ridges that parallel the lake, the excess moisture falls in the form of snow. The instability of the warmed air creates turbulence, which produces heavy snow squalls. This portion of Ohio receives more than twice as much snow as the state average (Reeder et al., 1973).

The nearest station reporting climatic data for Geneva-on-the-Lake Wetland is located in Erie, Pennsylvania. The average annual temperature is 47.1^{o}F based on the normal period from 1941-1970. The mean monthly low for January is 23.8^{o}F and the mean monthly high for July is 80.9^{o}F. The average annual precipitation is 38.20 inches, with a mean monthly precipitation of 2.47 inches in January and 3.52 inches in July. The growing season is approximately six months long, with the last killing frost (28^{o}F) in 1975 occurring on April 22 and the first killing frost on October 30 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Geneva-on-the-Lake Wetland (U.S.G.S. quadrangle map, Geneva, Ohio, 1970).

BIOTIC SETTING LE 022

Vegetation

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

Fish

A list of fish species associated with wetland habitat and aquatic vegetation in the Lake Erie area of Ohio is presented in Appendix A-3. However, the literature search yielded no site-specific data pertaining to major species, species composition, spawning and hatching areas, seasonal distribution and abundance, life histories, food sources, and recreational and commercial use of the fish populations in Geneva-on-the-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 Geneva-on-the-Lake Wetland.

Reptiles and Amphibians

Species of reptiles and amphibians which have been found in wetland habitat in Ashtabula County are listed in Appendix C-1. Although not specifically recorded from Driftwood Area Wetland, some of these species probably occur there. The literature search yielded no site-specific information pertaining to major species, seasonal abundance and distribution, density, recreational and commercial use, life histories, major food sources or relationship to water levels of the reptiles and amphibians in Geneva-on-the-Lake Wetland.

Avifauna

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 Geneva-on-the-Lake 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 Geneva-on-the-Lake 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; Ohio Division of Wildlife, 1976) were documented in Geneva-on-the-Lake Wetland by the literature search.

Health

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

Population

Geneva-on-the-Lake Wetland is located in Geneva Township of Ashtabula County, Ohio. The county is moderately populated, having a density of 146 persons per square mile. Table 3-7 indicates that Ashtabula County experienced moderate population growth, while Geneva Township underwent rapid population growth, between 1970 and 1975. Projections for 1990 indicate that Ashtabula County is expected to undergo slow population growth in the future.

Table 3-7. Population Data for the Vicinity of Geneva-on-the-Lake Wetland

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Ashtabula County	101,940	3.8	110,900
Geneva Township	12,295	10.8	--

[a] U.S. Bureau of the Census (1977)
[b] Northern Ohio Urban System, Series 11 Method of Population Projection (1977)

Land Use and Ownership

Land use within Geneva-on-the-Lake Wetland is largely suburban space. The surrounding area is predominantly residential. A hard surface road lies to the south of Geneva-on-the-Lake Wetland, and unimproved dirt roads run along the western and eastern ends. The wetland is under state ownership, it is subject to heavy development pressure due to an Ohio Department of Natural Resources proposal to construct a small boat harbor.

Recreation

No known state or federal recreational facilities are present in the vicinity of Geneva-on-the-Lake Wetland.

Mineral, Energy, and Forest Resources

Geneva-on-the-Lake Wetland is partially wooded, with a small potential forest resource to the south. There are no known oil or gas resources in the vicinity.

Public Utilities and Facilities

A sewage disposal facility is located approximately 0.5 mile east of Geneva-on-the-Lake Wetland (U.S.G.S. quadrangle map, Geneva, Ohio, 1970).

Pollution Sources

No NPDES permit holders are located adjacent to Geneva-on-the-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 or archaeological features are present within 500 feet of Geneva-on-the-Lake Wetland.

RESEARCH PROJECTS LE 022

A four season biological survey is currently being conducted in the Geneva-on-the-Lake Wetland. It is a proposed site for a small state boat harbor. The study objectives are 1) to identify the species composition and distribution of the flora and fauna, 2) to identify and evaluate the habitats important for the major taxonomic groups, and 3) to gather baseline data so the environmental impact of various project alternatives can be assessed. The U.S. Fish and Wildlife Service anticipates completion of the project in October, 1979.

MENTOR AREA WETLAND COMPLEX

PHYSIOGRAPHIC SETTING LE 023-024

Setting

The Mentor Area Wetland Complex is located in Lake County, Ohio, largely within the city limits of Mentor. The wetland complex is comprised of Mentor Marsh and Mentor-on-the-Lake Area Wetland. Mentor Marsh is a crescent-shaped strip of Palustrine wetland 3.5 miles in length and covering approximately 2 square miles, within 0.3 to 2.0 miles of Lake Erie. The marsh is mostly overgrown with trees and shrubs, having only a few open spaces. Shipman's Pond and Mentor Lagoon lie respectively at the east and west ends of the marsh. Both of these ponds have been modified; the former was enlarged by damming a small stream at Headlands Beach State Park in the late 1950's, and Mentor Lagoon was dredged in the 1920's to form Mentor Harbor (Herdendorf, 1965). Mentor-on-the-Lake Area Wetland is a small, non-wooded, Palustrine marsh located on a narrow strip of land between Mentor Lagoon and Lake Erie (U.S.G.S. quadrangle map, Mentor, Ohio, 1970).

Topography

Mentor Marsh and the smaller adjacent wetland have less than 10 feet of relief, lying at or near the elevation of Lake Erie (571 feet above sea level). Both lie in the low lake plain which rises to 50 feet above lake level within 2 miles south of the shoreline. Mentor Headlands, between Mentor Marsh and Lake Erie, consist of 30-40 feet bluffs which are rapidly eroding at a rate of 5-9 feet/year (Carter, 1976; U.S. Army Corps of Engineers, 1973).

Surficial Geology

The surficial deposits in the vicinity of the Mentor Area Wetland Complex consist of unconsolidated glacial till, glaciolacustrine sediments and Devonian shale. The till which unconformably overlies the shale is exposed at or near lake level in the bluffs and consist of tough, compact material with approximately 80% silt and clay (Carter, 1976). The lake deposited clay and sand beds which overlie the till are commonly interbedded in distinct layers. Bedrock lies at a depth of about 20 feet below lake level (Pincus, 1961).

Soils

A general soils map of Lake County, Ohio (Reeder and Sobol, 1973) shows one principal soil association (Conneaut-Painesville) along the shore in the vicinity of Mentor. This association is developed primarily on till or glaciolacustrine clay. The soil of Mentor Marsh is mapped as Marsh. This soil material, to an approximate depth of 6 inches, is high in organic matter. Below this depth are soft to firm sediments of varying textures.

Hydrology

The origin of Mentor Marsh is related to erosion of the Lake Erie shoreline and the relocation of the mouth of the Grand River which now lies 0.5 mile east of the wetland. As the lake shore gradually retreated, a loop of the river nearest the shore eventually broke through, allowing the river to flow directly into Lake Erie near its present mouth at Fairport Harbor (Gault, 1957). With the full flow of water cut off from the remaining western portion of the river bed, silt and vegetation gradually filled the area to form Mentor Marsh. Zimmerman (1964) estimates that the old river course has been filled to depths of 7 to 20 meters with the remains of past vegetation.

The main outlet for Mentor Marsh is located at the extreme western edge of the wetland where the main stream that flows through the marsh from east to west empties into Mentor Lagoons. The main stream through the marsh is the continuation of a small stream which enters the marsh near the southeast corner of the wetland. This stream is locally referred to as "Salty Run" (Rand Development Corp., 1970). There is also another small outlet at the northeast end of the marsh which empties into the Grand River by way of a man-made ditch. Because the water level in the marsh is about the same height as that of Lake Erie, there are many occasions when the flow at the western end of the marsh is reversed. At these times the rising waters of Lake Erie, along with flow from marsh Creek which enters Mentor lagoons from the south, pass into the marsh.

The results of a pollution study of Mentor Marsh and Mentor Creek by the Rand Development Corporation (1970) are presented in Table 3-8. The main conclusions of the study are: 1) the marsh does not contribute significant amounts of BOD to Lake Erie; 2) dissolved oxygen levels in the marsh are often below 5 mg/l; 3) total PO_4 content of the marsh is relatively high in comparison to natural waters of the area; 4) suspended solids are not excessive, 5) total solids are high as a result of salt (NaCl) contamination to the marsh from a water salt landfill on Salty Run.

Table 3-8. Summary of Weekly Analyses of Mentor Marsh and Marsh Creek Samples, 19680-1970[a]

Location	Parameter (mg/l)				
	Suspend solids	Total solids	BOD	Total PO_4	Dissolved oxygen
Marsh Creek	38.2	568	2.1	1.04	7.5
Mentor Marsh	59.8	2783	4.2	1.78	3.5
Mentor Lagoons	16.3	745	3.5	0.65	6.4

Rand Development Corp. (1970)

Groundwater measurements show yields of less than 5 gallons per minute along the shore of Lake County (Pree, 1960). This low yield is directly related to the low porosity and permeability of the underlying clay, till, and shale.

Climate

The closest weather station providing climatic data for the Mentor Area Wetland Complex is located in Painesville, Ohio. The average monthly temperature was 51.2°F in 1975. The mean low for January was 25.2°F and the mean high for July was 82.5°F. The total precipitation in 1975 was 41.92 inches, with a mean monthly precipitation of 2.89 inches in January and 2.52 inches in July. The growing season is approximately six months long, with the last killing frost (28°F) in 1975 occurring on April 14 and the first killing frost on October 31 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of the Mentor Area Wetland Complex (U.S.G.S. quadrangle map, Mentor, Ohio, 1970).

BIOTIC SETTING — LE 023-024

Vegetation

Mentor Marsh may be described as a level, broadly horseshoe shaped expanse dominated by cattails (*Typha angustifolia*, *T. latifolia*) and reed grass (*Phragmites communis*), with low wooded banks. Aquatic habitat is provided by the three to four acre Shipman Pond in the northeastern area where Headlands Road crosses the marsh, several small shallow ponds near the end of Becker Road, and a large area of open water with standing dead trees at the northwest end of the marsh. Additionally, several small creeks and intermittent streams flow into the marsh, whereupon they become distributary, flowing under or through the mat of vegetation.

Izard (1966, 1967) reported the presence of five plant communities in Mentor Marsh. The open marsh was described as a cattail-nightshade (*Solanum duloamara*) community. Along the margins of the marsh was a swamp forest dominated by elm (*Ulmus rubra*), ash (*Fraxinus americana*) and maple (*Acer rubrum*). At the extreme eastern end of the marsh was a mixed oak swamp forest. Buttonbush (*Cephalanthus occidentalis*) and willow (*Salix* sp.) dominated the banks of Shipman Pond. On the better drained slopes around the marsh was a forest of beech (*Fagus* sp.) and maple (*Acer* sp.). However, the vegetational composition of Mentor Marsh has changed considerably since Izard's descriptions of 1966 and 1967, according to Tandy (1976).

The open marsh is now a cattail-reed grass community. Reed-grass has now spread throughout the marsh among stands of common cattail (*Typha latifolia*) and narrow-leaved cattail (*T. angustifolia*) to form monodominant stands of two to three acres. Nightshade currently occurs near tree or stump bases and in "weedy" locations throughout the marsh. Few additional species occur in the open marsh.

In 1959, much of the elm-ash-maple forest began to die, presumably from flooding. At present this forest occurs as scattered groups of trees along the lower banks. The mixed oak (Quercus spp.) forest reported by Izard currently appears to be largely composed of red maple (Acer rubrum) and is described by Tandy as pin oak (Quercus palustris)-red maple forest. This forest has been under approximately two feet of water since 1973 and trees in the inundated area are now dead or dying. A portion of this forest remains in the northeastern section of Mentor Marsh bordering Shipman Pond. The buttonbush-willow community reported by Izard remains as an understory of the pin-oak-red maple forest around Shipman Pond, but is much reduced, extending only a few feet into the forest. Additionally, species occurring in this site include cinnamon fern (Osmunda cinnamonea), royal fern (O. regalis), sensitive fern (Onoclea sensibilis) and dock (Rumex crispus), all low-light tolerant species. Swamp forests composed of elm (Ulmus rubra) and ash (Fraxinus americana) occur in low, poorly drained areas south and west of Shipman Pond, in intermittent streams, such as those dissecting the northern mid-marsh ridge, and in low-lying mud flats such as those at the end of Becker Road. Over narrow steep banked streams red maple, silver maple (Acer saccharinum) and beech predominate with associated species such as red oak (Quercus borealis), white oak (Q. alba), tuliptree (Liriodendron tulipifera), and black cherry (Prunus serotina). To the west of Shipman Pond is a hawthorn meadow composed of hawthorns (Crataegus spp.), crabapple (Pyrus coronaria), cherries (Prunus spp.) and dogwoods (Cornus spp.).

Disturbed areas in Mentor Marsh include the roadsides and the ditches of the short access road east of Shipman Pond, and the field north of the Marsh House on Corduroy Road. In these locations non-indigenous species occur (Tandy, 1976).

The literature search yielded no site-specific data concerning density or productivity of the vegetation in Mentor Marsh, or to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Mentor-on-the-Lake Area Wetland.

Fish

The presence in Mentor Marsh of bluegill (Lepomis macrochirus) and banded killifish (Fundulus diaphanus) have been documented (Herdendorf, 1965).

The literature search yielded no further information pertaining to major species, species composition, spawning and hatching areas, seasonal distribution and abundance, life histories, food sources, or recreational and commercial use of the fish populations in the two wetlands of the Mentor Area Complex.

Invertebrates

Information regarding seasonal distribution and abundance, density and productivity, life histories, and relationship to water levels for the mosquitoes inhabiting Mentor Marsh is available in Teraguchi (1976). Table 3-9 presents the species of mosquitoes collected in Mentor Marsh during 1975 and 1976. Aedes canadensis, Coquillitidea perturbans, and Culex salinarus have been reported as potential vectors for human viruses by Gillett (1972). Of these offending species, *C. perturbans* and *C. salinarus* were the most abundant species taken in adult emergence collections within the wetland in June-August, 1976 (Teraguchi, 1976).

Table 3-9. Species of Mosquitoes Collected in Mentor Marsh in 1975 and 1976[a]

Species	Species
Aedes cantator	*Aedes grossbecki*
Culex restuans	*Aedes riparius*
Culex pipiens	*Aedes vexans*
Aedes canadensis	*Coquillitidea perturbans*
Aedes communis	*Uranotaenia sapphirina*
Culex territans	*Aedes sollicitans*
Culex salinarus	*Aedes trivittatus*
Anopheles quadrimaculatus	*Aedes stimulans*
Aedes flavescens	*Anopheles punctipennis*
Culiseta inornata	*Aedes aurifer*
Aedes impigier	*Aedes dorsalis*
Aedes cinerus	*Aedes sticticus*
Aedes intrudens	*Anopheles barberi*

[a] Terraguchi (1976)

The literature search provided no site-specific data regarding seasonal distribution and abundance, density and productivity, life histories, major food sorces and relationship to water levels of the invertebrates present in Mentor-on-the-lake Area Wetland.

Reptiles and Amphibians

The following reptiles have been recorded from Mentor Marsh (Conant, 1951): northern water snake (*Natrix sipedon sipedon*), snapping turtle (*Chelydra serpentina*), spotted turtle (*Clemmys guttata*), Blanding's turtle (*Emydoidea blandingi*), and midland painted turtle (*Chrysemys picta marginata*). Other reptiles and amphibians reported from wetland habitats in Lake County are listed in Appendix C-1.

The literature search search yielded no site-specific information pertaining to seasonal abundance and distribution, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in the Mentor Area Wetland Complex, nor to major species in Mentor-on-the-Lake Area Wetland.

Avifauna

Bernstein (1977) studied the nesting density of red-winged blackbirds (*Agelaius phoeniceus*) in optimum habitat at Mentor Marsh. There were 0.57 active nests per acre with an average clutch size of 2.13 eggs. Table 3-10 presents an annotated list of birds for Mentor Marsh, which may also be applicable to Mentor-on-the-Lake Area Wetland. The sharp-shinned hawk (*Accipiter striatus*) and king rail (*Rallus elegans*), presently on the Ohio Endangered Species List, have been recorded in this wetland (Bernstein, 1977). The bald eagle (*Haliaeetus leucocephalus*), which is on the Federal and Ohio Endangered Species lists, has also been observed, probably as a transient.

The literature search provided no site-specific information pertaining to recreational and commercial use, life histories, relationship to water levels, and major food sources for the birds utilizing either of the wetlands of the Mentor Area Wetland Complex, or to seasonal abundance, density, and productivity of the birds utilizing Mentor-on-the-Lake Area Wetland.

Mammals

Several articles found in popular literature (Pallister, 1962; Zimmerman, 1964; McCoy, 1967) have brief discussions of the mammalian fauna of Mentor Marsh. More technical publications (Bole and Moulthrop, 1942; Izard, 1967) provide a list of mammalian species present in Mentor Marsh and information on their relative abundance (Table 3-11). The greatest population of the short-tailed shrew (*Blarina brevicauda*) occurs from late summer to early fall in the marsh (Izard, 1967).

Table 3-10. Annotated List of the Birds of Mentor Marsh[a]

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pied-billed grebe
    observed at Becker Pond on a few occasions
great blue heron
    often seen at Becker Pond in spring, summer and fall
green heron
    common in the vicinity of Becker Pond and Wakerobin Trail in spring, summer and fall
little blue heron
    reported at Becker Pond in summer of 1976
great egret
    a common migrant seen at Becker Pond
snowy egret
    recorded as a migrant
black-crowned night heron
    often seen, but no nesting records exist
least bittern
    observed only in the spring
American bittern
    observed only in the spring
whistling swan
    recorded as a migrant
Canada goose
    common at Becker Pond in spring, summer and fall
mallard
    present in spring, summer and fall throughout the marsh; greatest numbers were at Becker Pond where there were always between 10 and 20 birds
black duck
    present in spring, summer and fall throughout the marsh
gadwall
    recorded as a migrant
pintail
    recorded as a migrant
green-winged teal
    recorded as an uncommon migrant
blue-winged teal
    present in large numbers along Wakerobin Trail during spring migration; also seen in fall at Becker Pond
American wigeon
    a common migrant
northern shoveler
    recorded as an uncommon migrant
wood duck
    common in spring, summer and fall
turkey vulture
    uncommon, observed in the spring
sharp-shinned hawk
    recorded for the area

-continued-

Table 3-10. (continued)

Cooper's hawk
  recorded in 1939, 1966 and 1975
red-tailed hawk
  observed regularly in the spring
red-shouldered hawk
  recorded in the area
broad-winged hawk
  recorded in 1968 and 1974
bald eagle
  recorded in 1939, 1974 and 1975
marsh hawk
  recorded
osprey
  recorded in 1939, 1972, 1973 and 1974
American kestrel
  uncommon
king rail
  recorded in 1972
Virginia rail
  common in spring and summer, probably present in fall
sora
  common in spring and summer, probably present in fall
black rail
  recorded in 1965
purple gallinule
  recorded in 1963 and 1965
common gallinule
  observed during the summer
American coot
  common at Becker Pond in spring, summer and fall
killdeer
  common in spring, summer and fall at Becker Pond
American woodcock
  uncommon, observed in spring
common snipe
  observed frequently in spring along Wakerobin Trail, possibly a summer resident
upland sandpiper
  recorded as a migrant
spotted sandpiper
  common at Becker Pond in spring, summer and fall
solitary sandpiper
  observed as a migrant at Becker Pond in spring and fall
greater yellowlegs
  observed in spring and fall at Becker Pond
lesser yellowlegs
  observed in spring and fall at Becker Pond
pectoral sandpiper
  recorded as a migrant

-continued-

Table 3-10 . (continued)

white-rumped sandpiper
    recorded as a migrant in 1945 and 1972
least sandpiper
    recorded as a migrant
dunlin
    recorded as a migrant
semipalmated sandpiper
    recorded as a migrant
red phalarope
    recorded as a migrant for 1972
Wilson's phalarope
    recorded as a migrant for 1974
parasitic jaeger
    recorded in 1946
pomerine jaeger
    recorded in 1956
herring gull
    present year-round
ring-billed gull
    present year-round
laughing gull
    recorded in 1951, 1968 and 1969
Bonaparte's gull
    observed in spring and fall
black-billed cuckoo
    recorded
barred owl
    one pair observed at school forest
short-eared owl
    recorded
whip-poor-will
    uncommon, recorded for 1973
common nighthawk
    a common summer resident
chimney swift
    a common summer resident
ruby-throated hummingbird
    observed in spring, summer and fall
belted kingfisher
    common in spring, summer and fall
common flicker
    common in spring, summer and fall
pileated woodpecker
    observed in school forest in spring
red-bellied woodpecker
    common in spring and summer
red-headed woodpecker
    common in spring, summer and fall
yellow-bellied sapsucker
    common in spring, summer and fall

-continued-

Table 3-10. (continued)

hairy woodpecker
    common in the marsh in spring, summer and fall;
    observed in the upland forests in winter
downy woodpecker
    common in the marsh in spring, summer and fall;
    observed in the upland forests in winter
eastern kingbird
    recorded in the marsh
common crow
    observed year-round
long-billed marsh wren
    observed in spring, summer and fall; records indicate that the wrens are increasing in numbers within the marsh; greatest concentrations are along Wakerobin Trail
short-billed marsh wren
    one individual observed on May 1, 1976, along Becker Trail
brown thrasher
    observed in the spring, summer and fall
wood thrush
    observed in spring
hermit thrush
    observed in spring
Swainson's thrush
    observed in spring and fall
gray-cheeked thrush
    recorded in the marsh
veery
    observed in spring and summer
northern waterthrush
    recorded in the marsh
Louisiana waterthrush
    observed in spring, 1976, probably also present in fall
bobolink
    recorded in 1938 and 1966
eastern meadowlark
    recorded in the marsh
yellow-headed blackbird
    recorded in 1973
red-winged blackbird
    observed in large numbers in spring, summer and fall and in small flocks (5-10 individuals) in winter, 1976
orchard oriole
    recorded in 1938 and 1940
northern oriole
    recorded in the marsh
rusty blackbird
    observed in spring and fall
common grackle
    observed in spring and fall

-continued-

Table 3-10. (concluded)

brown-headed cowbird
    observed in spring and fall
savannah sparrow
    recorded in the area
sharp-tailed sparrow
    recorded for 1931
vesper sparrow
    recorded in the marsh
chipping sparrow
    observed in spring, 1976; probably present in fall
field sparrow
    observed in spring, 1976; probably present in fall
swamp sparrow
    observed in spring and fall
song sparrow
    observed year round

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[a]Taken from Bernstein (1977).

Table 3-11. The Relative Abundance of Mammalian Species of Mentor Marsh[a]

Common Name	Relative abundance[b]
Virginia opossum	T
masked shrew	B
short-tailed shrew	C
star-nosed mole	B
bats[c]	P
eastern cottontail	U
eastern chipmunk	B
fox squirrel	C
red squirrel	U
southern flying squirrel	P
white-footed mouse	C
meadow vole	P
muskrat	C
house mouse	LC
meadow jumping mouse	P
red fox	T
gray fox	P
raccoon	C
mink	R
striped skunk	T
white-tailed deer	T

[a] Bole and Moulthrop (1942); Izard (1967).

[b] C=common, LC=locally common, U-uncommon, R=rare, T=transient, P=present, B=recorded only by Bole and Moulthrop, 1942.

[c] bat species, not identified, utilize Mentor Marsh as foraging area.

The literature search provided no site-specific information pertaining to density and productivity, recreational and commercial use, life histories, major food sources, or relationship to water levels of the mammals inhabiting the Mentor Area Wetland Complex, or to species composition and seasonal distribution and abundance of mammals in Mentor-on-the-Lake Area Wetland. However, information discussed for Mentor Marsh may apply to this wetland because of the proximity of the two wetlands.

Endangered Species

The banded killifish, a fish endangered in Ohio (Ohio Division of Wildlife, 1976), has been recorded in Mentor Marsh (Herdendorf, 1961). The spotted turtle was documented in this wetland in 1951 (Conant, 1951). The sharp-shinned hawk and the king rail (*Rallus elegans*), both endangered birds in Ohio, have been recorded here (Bernstein, 1977), as well as transient bald eagles. The bald eagle is on the federal list of endangered species (U.S. Fish and Wildlife Service, 1977).

Health

A high diversity of vegetation, birds and mammals as well as the presence of endangered fish and reptilian species indicates that the environmental quality of the Mentor Area Wetland Complex is good. However, a small sewage plant discharges a significant amount of total phosphate into Mentor Marsh and may have some effect on its health.

CUTLURAL SETTING

LE 023-024

Population

Mentor-on-the-Lake Area Wetland and part of Mentor Marsh are located within the city of Mentor in Lake County, Ohio. The remainder of Mentor Marsh is located in Painesville Township of Lake County, Ohio. Lake County is moderately populated, having a density of 896 persons per square mile. Table 3-12 indicates that Lake County and Painesville Township experienced moderate population growth, while Mentor (city) underwent rapid population growth, between 1970 and 1975. Projections for 1990 indicate that Lake County is expected to undergo rapid population growth in the future.

Table 3-12. Population Data for the Vicinity of the Mentor Area Wetland Complex

	Estimated Population 1975[a]	Estimated % Δ 1970-1975[a]	Projected Population 1990[b]
Lake County	206,881	4.9	257,100
City of Mentor	39,523	7.1	--
Painesville Township	15,651	3.3	--

[a] U.S. Bureau of the Census (1977)
[b] Northern Ohio Urban System, Series 11 Method of Population Projection (1977)

Land Use and Ownership

Land use within the Mentor Area Wetland Complex is rural open space. The surrounding area is predominantly residential. A harbor and boat docks lie south of Mentor-on-the-Lake Area Wetland, and to the west of Mentor Marsh. Mentor-on-the-Lake Area Wetland is potentially subject to high development pressure due to its location in the vicinity of a marina. A few hard surface roads pass around Mentor Marsh and one crosses through the center. A sewage disposal facility is located in the northwest portion of Mentor Marsh and there is a cemetery to the south. The wetland is under private ownership, and its location suggests that it is subject to moderate development pressure (U.S.G.S. quadrangle map, Mentor, Ohio, 1963).

Recreation

No known state or federal recreational facilities are present in the vicinity of the Mentor Area Wetland Complex.

Mineral, Energy, and Forest Resources

Potential resources in the Mentor Area Wetland Complex include salt and gas. The wetlands are wooded, but do not represent a significant forest resource.

Public Utilities and Facilities

Painesville Waterworks is located approximately 0.2 mile north of Mentor Marsh (U.S.G.S. quadrangle map, Mentor, Ohio, 1963).

Pollution Sources

A small package aeration plant (sewage treatment) is located at the southern edge of Mentor Marsh approximately 0.5 mile west of Corduroy Road. The effluent from this plant, which serves 10 houses and a church, enters the marsh at a rate of 5000 gallons per day. The effluent from this plant is low in BOD but averages 26 mg/l total phosphate as PO_4 (Rand Development Corporation, 1970).

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

Historical and Archaeological Features

No known historical or archaeological features are present within 500 feet of the Mentor Area Wetland Complex.

RESEARCH PROJECTS

LE 023-024

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

BEAVER CREEK WETLAND

PHYSIOGRAPHIC SETTING

LE-025

Setting

Beaver Creek Wetland is located in Lorain County, Ohio, within the Lorain city limits and 4 miles west of the center of Lorain, 6 miles east of the center of the city of Vermilion and 3 miles north of the city of Amherst. This Palustrine, non-wooded wetland occupies the easterly floodplain of Beaver Creek, about 0.3 mile inland from the stream's mouth at Lake Erie (U.S.G.S. quadrangle map, Lorain, Ohio, 1969).

Topography

The wetland lies adjacent to the estuarine, lower portion of Beaver Creek, and therefore it is at or near the mean elevation of Lake Erie (571 feet above mean sea level). The mouth of Beaver Creek is fronted with a sandy barrier beach which helps maintain the interior wetland (Herdendorf, 1963). The wetland has very little relief (5 feet), but lake and stream valley bluffs adjacent to the wetland are 25-30 feet high (U.S.G.S. quadrangle map, Lorain, Ohio, 1969).

Surficial Geology

Beaver Creek Wetland is on the glaciated lake plain. The area is covered by a thin sheet of glacial drift and lacustrine deposits of silt and clay. The 30-foot lake bluffs are till, capped by 10 feet of lacustrine clay. Devonian shale lies at a depth of 35 feet below lake level (Pincus, 1961).

Soils

Ernst et al. (1976) mapped the soils of Lorain County, and designated the soils of Beaver Creek Wetland as Orrville silt loam. This nearly level soil generally occurs along smaller streams and wet spots on the floodplain where it formed from recent, fine-textured alluvium.

Hydrology

Beaver Creek, which empties into Lake Erie 4 miles west of Lorain, rises only 11 miles inland and has a drainage area of about 45 square miles (U.S. Army Corps of Engineers, 1953 and Cross, 1967). Generalized groundwater information for this portion of the Ohio shore of Lake Erie is available in Stein (1962). The valley of Beaver Creek lies in an area in which well yields of less than 5 gallons per minute are normally developed. The literature provided no site-specific data pertaining to water level fluctuations, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes of this wetland.

Climate

The closest weather station providing climatic data for Beaver Creek Wetland is at Cleveland, Ohio. The average annual temperature is 49.7°F based on the normal period from 1941-1970. The mean monthly low for January is 25.4°F and the mean monthly high for July is 82.2°F. The average annual precipitation is 34.99 inches, with a mean monthly precipitation of 2.56 inches in January and 3.45 inches in July. The growing season is approximately six months long, with the last killing frost (28°F) in 1975 occurring on April 14 and the first killing frost on October 31 (National Oceanic and Atmospheric Administration, 1975).

Special Features

A canal is adjacent to Beaver Creek Wetland on the northwest. Off the northeast corner of the wetland is a twenty foot rise in elevation (U.S.G.S. quadrangle map, Lorain, Ohio, 1969).

BIOTIC SETTING

LE 025

Vegetation

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

Fish

A list of fish species associated with wetland habitat and aquatic vegetation in the Lake Erie area of Ohio is presented in Appendix A-3, and some of these species may utilize Beaver Creek Wetland. However, the literature search yielded no site-specific data pertaining to major species, species composition, spawning and hatching areas, seasonal distribution and abundance, life histories, food sources, or recreational and commercial use of the fish populations in Beaver 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 Beaver Creek Wetland.

Reptiles and Amphibians

Species of reptiles and amphibians recorded from wetland habitats in Lorain County are listed in Appendix C-1. Although not specifically reported from Beaver Creek Wetland, some of these species may occur there. The literature search yielded no site-specific information pertaining to major species, seasonal abundance and distribution, density, recreational and commercial use, life histories, major food sources or relationship to water levels of the reptiles and amphibians in Beaver Creek Wetland.

Avifauna

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 Beaver Creek 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 Beaver 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; Ohio Division of Wildlife, 1976) were documented in Beaver 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 LE 025

Population

Beaver Creek Wetland is located within the city limits of Lorain in Lorain County, Ohio. The county is moderately populated, having a density of 543 persons per square mile. Table 3-13 indicates that Lorain County underwent moderate population growth, while Lorain experienced rapid population growth, between 1970 and 1975. Projections for 1990 indicate that Lorain County is expected to undergo rapid population growth in the future.

Table 3-13. Population Data for the Vicinity of Beaver Creek Wetland

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Lorain County	268,579	4.6	110,900
City of Lorain	84,907	8.6	--

[a] U.S. Bureau of the Census (1977)
[b] Northern Ohio Urban System, Series 11 Method of Population Projection (1977)

Land Use and Ownership

Land use within Beaver Creek Wetland is rural open space. The surrounding area is predominantly residential. The wetland is under private ownership, and its location suggests that it is subject to moderate development pressure (U.S.G.S. quadrangle map, Lorain, Ohio, 1969).

Recreation

No known state or federal recreational facilities are present in the vicinity of Beaver Creek Wetland.

Mineral, Energy, and Forest Resources

No significant mineral, oil, gas, or forest resources are known to be present in the vicinity of Beaver Creek Wetland.

Public Utilities and Facilities

No public utilities or facilities are located within 0.5 mile of Beaver Creek Wetland (U.S.G.S. quadrangle map, Lorain, Ohio, 1969).

Pollution Sources

No NPDES permit holders are located adjacent to Beaver Creek 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 or archaeological features are present within 500 feet of Beaver Creek Wetland (Ohio Historic Preservation Office).

RESEARCH PROJECTS

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

OLD WOMAN CREEK WETLAND

PHYSIOGRAPHIC SETTING

LE 026

Setting

Old Woman Creek Wetland is located in Berlin Township of Erie County, Ohio, 2 miles east of the city of Huron and 8 miles west of Vermilion. It occupies the lower estuarine portion (1.3 miles) of Old Woman Creek and is 0.4 mile wide at its point of greatest breadth. The wetland is separated from Lake Erie by a narrow barrier beach at the stream's mouth. Palustrine and Lacustrine types of wetlands are found in this area. Old Woman Creek Wetland is mostly non-wooded but some forested wetland occurs along the east bank of the stream and in the southern portion (U.S.G.S. quadrangle maps, Huron, Ohio, 1969; Milan, Ohio, 1969). This wetland area was designated in 1977 as the first National Estuarine Sanctuary on the Great Lakes by the Office of Coastal Zone Management, NOAA, and the Ohio Department of Natural Resources.

Topography

Because Old Woman Creek Wetland occupies the estuarine portion of the stream, its elevation is at or near that of Lake Erie (571 feet above sea level). The bluff that faces Lake Erie rises 595 feet above sea level while those along the creek rise to 610 feet adjacent to the wetland. The 1.3 mile reach of wetland along the creek is very low in relief, but a small island (Star Island) near the center of the estuary rises to a height of 30 feet above lake level (U.S.G.S. quadrangle maps, Huron, Ohio, 1969; Milan, Ohio, 1969).

Surficial Geology

Old Woman Creek Wetland is on the glaciated lake plain. The barrier beach which fronts the wetland consists dominantly of quartz sand with patches of garnet and magnetite. The size of the beach sand ranges from medium-to coarse-grained. A gravel and pebble zone occurs at the water line. Sediments within the wetlands are predominantly silt and clay muds. The beach sand has a maximum thickness of 24 feet and overlies glacial till which is exposed near lake level east of the beach. Landward of the barrier bar, on the east side of the creek, is a roughly circular marsh area. This pondlike area is approximately 600 feet in diameter and is bordered by the creek on the west, the barrier beach on the north, and 25-foot high bluffs of glacial till and lacustrine clay on the east and south (Herdendorf, 1963).

Ancient drainage systems carved valleys into the bedrock surface in the vicinity of Old Woman Creek. This old valley extended from the present Huron River valley in a northeasterly direction through the wetland out into Lake Erie. The valley is presently filled with up to 147 feet of glacial material, composed of thick layers of clay and till interbedded with less extensive discontinuous layers of sand and gravel. At the mouth of the stream, interlaminations of silt and clay are visible, indicating the cyclic sedimentation of a glacial lake greater in size than Lake Erie. The underlying

Devonian bedrock is the black shale member (Huron) of the Ohio Shale Formation (Herdendorf, 1963 and 1966; Stein, 1962).

Soils

The dominant soil association in the study area is the Kibbie-Tuscola-Colwood association, characterized by deep, level to gently sloping, moderately well-drained to very poorly drained soils. The subsoil is comprised of silt loam or silt clay loam which formed under the glacial lake. The southeastern part of the estuary is marked by the Del Rey-Lenawee association, whose characteristics are the same as the above association except for poorer drainage characteristics.

The major soil type found in the inundated portion of the Kibbie-Tuscola-Colwood association is marsh soil, characterized by a high percentage of organic matter throughout a large portion of the profile. The inundated portions of the Del Rey-Lenawee association are composed of Lenawee silt loam, which is made up of dark soil in the upper profile progressing to higher percentages of sand as the depth increases.

The banks surrounding the estuary are primarily composed of Sission silt loam soil. This soil type is on slopes varying from 2 to 25 percent. It is a well-drained soil formed by water-laid silt and sand covered by hardwood forest throughout the area (Redmond et al., 1971).

Hydrology

Old Woman Creek has a drainage area of 26.6 square miles (Cross, 1967). A 1,700-foot-long barrier beach separates Lake Erie from the creek and wetlands in the valley. The beach extends 900 feet to the west and 900 feet to the east of the creek mouth. Normally the creek mouth is barred; it is open only during periods of high water. The beach is nearly 200 feet wide near its center, tapering to 50 feet wide on the ends. Sand dunes along the eastern half of the bar are actively being cut by wave action as the bar migrates landward. The western half of the beach appears to be fairly stable, but east of the creek the rate of recession averages several feet per year (Herdendorf, 1963).

At its source, Old Woman Creek has an elevation of 829 feet. From this source the creek meanders 10 miles, falling 257 feet to an elevation of 571 feet at its mouth at the Lake Erie shoreline. This yields an average gradient of 25.7 feet per mile. Owing to agricultural runoff this stream carries a heavy silt load, which causes the water to remain turbid throughout most of the year (Marshall and Stuckey, 1974; Marshall, 1977).

Silt, salt, nutrient (primarily nitrate and phosphate), and pesticide loads are present within the Old Woman Creek estuary. Sediment from agricultural lands and construction creates some turbidity. Nitrates measured in December, 1974, at 18 mg/liter, approached Ohio's Environmental Protection Agency standards for nitrates of 20 mg/liter. Other nutrients have not been measured. The only pesticide measured has been DDT and its metabolites. Samples taken in February, 1975, indicate sediment concentrations of about 10 ppb on a wet or 22 ppb on a dry weight basis (Office of Coastal Zone Management, 1977).

Because of the high water levels experienced in Lake Erie during the early 1970's the wetlands in the low-lying floodplain of Old Woman Creek have been submerged deeper than normal. This condition has produced a flooded area approximately 74 acres in size, affecting water level in the stream as far as 1.3 miles from the mouth (Brant and Herdendorf, 1972).

The buried valley in the vicinity of the Old Woman Creek Wetland contains thin to thick lenses of sand and gravel interbedded in thick layers of clay. Stein (1962) reported that water wells in this material yield 25 to 100 gallons per minute.

Climate

The closest weather station providing climatic data for Old Woman Creek Wetland is located in Sandusky, Ohio. The average annual temperature is 51.2^{o}F based on the normal period from 1941-1970. The mean monthly low for January is 25.0^{o}F and the mean monthly high for July is 84.0^{o}F. The average annual precipitation is 34.08 inches, with a mean monthly precipitation of 2.27 inches in January and 4.14 inches in July. The growing season is approximately seven months long, with the last killing frost (28^{o}F) in 1975 occurring on April 6 and the first killing frost on November 15 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Old Woman Creek Wetland (U.S.G.S. quadrangle maps, Milan, Ohio, 1969; Huron, Ohio, 1969).

BIOTIC SETTING

LE 026

Vegetation

Within Old Woman Creek Wetland, four aquatic and wetland habitat types exist. These include open water, shoreline, remnant embayment marshes and mud flats. Owing to high water levels in Lake Erie, the entire low-lying flood plain of the mouth of Old Woman Creek is inundated. Vascular aquatic plants occurring in the open water habitat include American lotus (*Nelumbo lutea*), spatterdock (*Nuphar advena*), arrow arum (*Peltandra virginica*), coontail (*Ceratophyllum demersum*), pond weeds (*Potamogeton nodosus*, *P. pectinatus*), and duck weeds (*Lemna minor*, *Spirodela polyrhiza*). American lotus and arrow arum are codominant species of this habitat; however, neither is particularly abundant (Marshall, 1977).

Within the shoreline habitat, no species is particularly abundant. However, the most frequently occurring species include buttonbush (*Cephalanthus occidentalis*), dogwood (*Cornus drummondi*), blue flag (*Iris versicolor*), money wort (Lysimachia nummularia), arrowhead (Sagittaria latifolia), river bulrush (Scirpus fluviatilis), burreed (Sparganium eurycarpum), and common cattail (Typha latifolia). Major species occurring along the shoreline of the barrier beach are members of the genus Bidens (beggar's ticks) (Marshall, 1977).

Since high water levels have eliminated most of the formerly available marsh habitat, species characteristic of this habitat have survived in remnant embayment marshes. These areas are few in number and subject to encroachment and retreat of fluctuating water levels, as well as to shading from the forest canopy. Major species of this habitat include cut grass (Leersia oryzoides), dock, lizard's tail (Saururus cernuus), river bulrush, burreed and common cattail. Not all of the above species occur in any one remnant embayment marsh, but throughout the wetland they are more prevalent than other wetland species. Differences in the physical characteristics of each remnant embayment marsh are reflected in their vegetational composition (Marshall and Stuckey, 1974).

Two major mud flats are present in the Old Woman Creek Wetland. One mud flat exists along the former western shoreline of the stream, between Star Island and the railroad. This area is marked in mid-summer by marsh-mallow (Hibiscus palustris) and water-smartweed (Polygonum coccineum). The second mud flat is located in the southwestern corner of the inundated floodplain, north of the railroad. Major species on this mudflat include marsh-mallow, water-smartweed and burreed (Marshall, 1977).

A mixed hardwood forest covers the steep banks on either side of the wetland, as well as Star Island. An oak-hickory forest covers the eastern and western banks of the wetland, dominated by white oak (Quercus alba) and shag-bark hickory (Carya ovata). Associate species of the oak-hickory forest include pin oak (Quercus palustris), red oak (Quercus rubra), white ash (Fraxinus americana), black-haw (Viburnum prunifolium), and sassafras (Sassafras albidum).

A maple forest association occupies the small eastern bluff at the mouth of the stream. Dominant species at this site are silver maple (Acer saccharinum) and red maple (Acer rubrum). Associated woody species include cottonwood (Populus deltoides), witch-hazel (Hammamelis virginica), smooth sumac (Rhus glabra) and flowering dogwood (Cornus florida).

A third forest association exists on Star Island. This forest is primarily composed of sassafras, with white oak and shag-bark hickory comprising the major woody associates. Individuals of these species on Star Island are in general younger than individuals in the woodlands of the eastern and western banks, indicating more recent clearing (Marshall, 1977).

The literature search yielded no site-specific data pertaining to density and productivity of the vegetation of Old Woman Creek Wetland.

Fish

Major fish species present in Old Woman Creek estuary include bowfin (Amia calva), longnose gar (Lepisosteus osseus), northern pike (Esox lucius), carp (Cyprinus carpio), goldfish (Carassius auratus), gizzard shad (Dorosoma cepedianum), quillback (Carpiodes cyprinus), bigmouth buffalo (Ictiobus cyprinellus), black bullhead (Ictalurus melas), brown bullhead (Ictalurus nebulosus), yellow bullhead (Ictalurus natalis), flathead catfish (Pylodictis olivaris), white crappie (Pomoxis annularis), black crappie (Pomoxis nigromaculatus), longear sunfish (Lepomis megalotis), green sunfish (Lepomis cyanellus), bluegill (Lepomis macrochirus), largemouth bass (Micropterus salmoides), and freshwater drum (Aplodinotus grunniens) (Ohio Department of Natural Resources, 1974; Marshall, 1977; National Oceanic and Atmospheric Administration, 1977). Most of these species probably utilize the wetland for feeding, cover, or spawning. Flathead catfish form a relic population in the estuary, and the marsh habitat required by three Ohio endangered fishes, the spotted gar (Lepisosteus oculatus), banded killifish (Fundulus diaphanus), and pugnose minnow (Notropis emiliae) is present. These endangered species require clear water (Trautman, 1957), and the present high turbidity and situation rates of the estuary (Marshall, 1977) largely preclude the presence of these species in the wetland. The rooting of carp during feeding and spawning apparently contributes to turbidity in the estuary (Marshall, 1977). As recently as 1957 Old Woman Creek was a primary spawning area for northern pike. Pike entered the creek soon after ice-out in spring and provided one of the best recreational pike fisheries in Ohio. A sand bar often blocked the mouth of the creek after recession of spring flooding and trapped many pike in the estuary (Miller, 1957). The present heavy siltation in the estuary has evidently greatly reduced the utilization of the area by pike. Although largemouth bass fishing was light, many "four and five-pound" largemouth were present in the lower creek prior to 1957 (Miller, 1957). A list of fish species associated with wetland habitats and aquatic vegetation in the Lake Erie area of Ohio is presented in Appendix A-3, and some of these species may utilize Old Woman Creek Wetland. However, the literature search yielded no site-specific data pertaining to food sources or to commercial use of the fish populations in Old Woman 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 Old Woman Creek Wetland.

Reptiles and Amphibians

The northern water snake (Natrix sipedon sipedon) was reported from Old Woman Creek (Conant, 1951). Several other species of reptiles and amphibians have been recorded from wetland habitats elsewhere in Erie County and are listed in Appendix C-1. The literature search yielded no site-specific information pertaining to seasonal abundance and distribution, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in Old Woman Creek Wetland.

Avifauna

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 Old Woman Creek Wetland.

Mammals

Virginia opossum (*Didelphis virginiana*), woodchuck (*Marmota monax*), squirrel species, muskrat (*Ondatra zibethicus*), red fox (*Vulpes vulpes*), raccoom (*Procyon lotor*), and striped skunk (*Mephitis mephitis*) are found on Old Woman Creek Wetland (Miller, 1957; U.S. Department of Commerce, 1974; Ohio Department of Natural Resources, 1977). The literature search provided no site-specific data pertaining to seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, major food sources, or relationship to water levels for the mammals inhabiting this 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; Ohio Division of Wildlife, 1976) were documented in this wetland by the literature search.

Health

A great diversity of plant and fish species indicates that the environmental quality of Old Woman Creek Wetland is good. The wetland is also the first to be designated as a National Estuarine Sanctuary on the Great Lakes by the Office of Coastal Zone Management, NOAA, and the Ohio Department of Natural Resources.

CULTURAL SETTING

LE 026

Population

Old Woman Creek Wetland is located in Berlin Township of Erie County, Ohio. The county is moderately populated, having a density of 293 persons per square mile. Table 3-14 indicates that Erie County experienced slow population growth, while Berlin Township experienced moderate population growth, between 1970 and 1975. Projections for 1990 indicate that Erie County is expected to undergo moderate population growth in the future.

Table 3-14. Population Data for the Vicinity of Old Woman Creek Wetland

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Erie County	77,327	1.9	85,200
Berlin Township	3,153	3.4	--

[a] U.S. Bureau of the Census (1977)
[b] Northern Ohio Urban System, Series 11 Method of Population Projection (1977)

Land Use and Ownership

Land use within Old Woman Creek Wetland is rural open space. The surrounding area is predominantly residential. State route 2 will be constructed as a pylon bridge across the southern tip of Old Woman Creek Wetland in the spring of 1979. U.S. route 6 passes across the northern part of the wetland, and railroad tracks pass through the southern part. The wetland is under public and private ownership. Its location suggests that it is subject to moderate development pressure (U.S.G.S. quadrangle maps, Huron, Ohio, 1969; Milan, Ohio, 1969).

Recreation

No known state or federal recreational facilities are present in the vicinity of Old Woman Creek Wetland.

Mineral, Energy, and Forest Resources

Potential mineral resources in the vicinity of Old Woman Creek Wetland include sand and gravel (Great Lakes Basin Commission, 1974).

Public Utilities and Facilities

No public utilities or facilities are located within 0.5 mile of Old Woman Creek Wetland (U.S.G.S. quadrangle maps, Milan, Ohio, 1969; Huron, Ohio, 1969).

Pollution Sources

No NPDES permit holders are located adjacent to Old Woman Creek 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 or archaeological features are present within 500 feet of Old Woman Creek Wetland (Ohio Historic Preservation Office).

Old Woman Creek Wetland has been designated as a national estuarine sanctuary. The sanctuary was established for the preservation of the wetland as well as for research and education. It is anticipated that many research projects will soon be initiated in this area. Currently, only one has been funded. The project title is "Transport Properties of the Great Lakes Seiche-Affected River Mouths". The project objective is to determine the detailed flow physics of transport descriptions caused by flow reversals, and the best analytical methodology to measure and empirically quantify these episodes. The project is funded by the office of Water Resources Research for a period of three years (October 1, 1978-September 30, 1981).

HURON RIVER WETLAND

PHYSIOGRAPHIC SETTING

LE 027

Huron River Wetland is located in Erie County, Ohio within the city limits of Huron. This Palustrine, non-wooded wetland lies on the westerly floodplain of the Huron River near the mouth of Mud Brook at its junction with the river. The wetland is within the lower, estuarine portion of the Huron River, approximately 0.6 mile inland from the river's mouth at Lake Erie. Larger, more extensive wetlands occupy the upstream floodplain of the Huron River, but these are outside of the coastal limits of the present inventory (U.S.G.S. quadrangle maps, Huron, Ohio, 1969; Milan, Ohio, 1969).

Topography

Huron River Wetland lies at or near the mean elevation of Lake Erie (571 feet above mean sea level). The wetland has less than four feet of relief, but the adjacent bluffs of Mud Brook rise to 30 feet above lake level. The depth of the Huron River adjacent to the wetland is 15 feet while the bed of Mud Brook is only 4 feet below low water datum (568.6 feet). The floodplain in the vicinity of the wetland is 0.3 mile wide (U.S.G.S. quadrangle map, Huron, Ohio, 1969).

Surficial Geology

Huron River Wetland is situated on the glaciated lake plain, where the surficial material is recently deposited alluvium. Older lacustrine sediments and glacial till underly these deposits. Devonian bedrock of the Ohio Shale Formation occurs at approximately 25 feet below lake level near the mouth of the Huron River (Pincus, 1961).

Soils

Redmond et al. (1971) mapped the soils of the Huron River Wetland as Marsh. These areas are submerged part of the year, but they are dry long enough to permit the growth of cattails, sedges, and other water-tolerant plants. The soil consists of dark-colored, organic, medium- to fine-textured materal, which is very poorly drained.

Hyrology

The Huron River, which borders the wetland on the east, has a drainage area of 403 square miles, a mean discharge of 310 cubic feet per second (0.77 cfs/sq. mi.), an estimated annual suspended sediment load of 12,000 tons and an estimated dissolved solids load to Lake Erie of 50,000 tons per year (Herdendorf, 1975). Water quality measurements made in the river south of Huron by the U.S. Geological Survey in 1976 are presented in Table 3-15. Stein (1962) reported that groundwater supplies from wells in the vicinity of the wetland yield an average of less than 5 gallons per minute. The literature

Table 3-15. Water Quality Measurements in Huron River Below Huron, Ohio

Parameter	Units	March 11, 1976	June 29, 1976
Time	minutes	1445	1500
Discharge	cfs	279	55
Conductivity	umhos	612	700
pH	units	7.5	8.5
Temperature	°C	4.5	27.0
Dissolved Oxygen	mg/l	10.9	12.3
Dissolved Oxygen	% sat.	81	150
B.O.D. (5-day)	mg/l	0.8	3.4
Hardness (Ca, Mg)	mg/l	280	330
Non-Carbonate Hardness	mg/l	130	170
Dissolved Calcium (Ca)	mg/l	80	90
Dissolved Magnesium (Mg)	mg/l	19	25
Dissolved Sodium (Na)	mg/l	16	23
Dissolved Potassium (K)	mg/l	3.3	4.4
Bicarbonate (HCO_3)	mg/l	178	178
Carbonate (CO_3)	mg/l	0	6
Alkalinity as $CaCO_3$	mg/l	146	156
Carbon Dioxide (CO_2)	mg/l	9.0	1.0
Dissolved Sulfate (SO_4)	mg/l	120	160
Dissolved Chloride (Cl)	mg/l	31	38
Dissolved Fluoride (F)	mg/l	0.2	0.2
Dissolved Silica (SiO_2)	mg/l	7.8	6.6
Dissolved Solids	mg/l	365	441
Total Nitrate (N)	mg/l	2.7	2.0
Total Nitrite (Na)	mg/l	0.03	0.10
Total Ammonia Nitrogen (N)	mg/l	0.13	0.14
Total Phosphorus (P)	mg/l	0.16	0.23
Total Arsenic (As)	µg/l	2	4
Total Chromium (Cr)	µg/l	<10	10
Total Cooper (Cu)	µg/l	10	10
Dissolved Iron (Fe)	µg/l	30	10
Total Lead (Pb)	µg/l	4	2
Dissolved Manganese (Mn)	µg/l	40	10
Total Mercury (Hg)	µg/l	<0.5	<0.5
Total Zinc (Zn)	µg/l	10	20
Total Organic Carbon (C)	mg/l	7.5	12

Data Source: U.S. Geological Survey Water-Data Report OH-76-2
Period of Record: Water Year October 1975 to September 1976

search provided no site-specific data pertaining to water level fluctuations, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in this wetland.

Climate

The closest weather station providing climatic data for Huron River Wetland is located in Sandusky, Ohio. The average annual temperature is 51.2^{o}F based on the normal period from 1941-1970. The mean monthly low for January is 25.0^{o}F and the mean monthly high for July is 84.0^{o}F. The average annual precipitation is 34.08 inches, with a mean monthly precipitation of 2.27 inches in January and 4.14 inches in July. The growing season is approximately seven months long, with the last killing frost (28^{o}F) in 1975 occurring on April 6 and the first killing frost on November 15 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Huron River Wetland (U.S.G.S. quadrangle map, Huron, Ohio, 1969).

BIOTIC SETTING

Vegetation

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

Fish

As late as 1957 Mud Brook, adjacent to Huron River Wetland, was a major spawning area for northern pike (Esox lucius) (Miller, 1957), and pike may have utilized Huron River Wetland at that time. Based on evidence of greatly increased turbidity in nearby Old Woman Creek Wetland (Marshall, 1977), extensive utilization of Huron River Wetland by pike at present is doubtful. An annotated list of fish species associated with wetland habitats or aquatic vegetation in the Lake Erie area of Ohio appears in Appendix A-3, and some of these species probably utilize Huron River Wetland. However, the literature search located no site-specific data pertaining to major species, species composition, spawning and hatching areas, seasonal distribution and abundance, life histories, food sources, or recreational and commercial use of the fish populations in Huron 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 Huron River Wetland.

Reptiles and Amphibians

The northern brown snake (*Storeria dekayi dekayi*), map turtle (*Graptemys geographica*), and eastern spiny softshell (*Trionyx spiniferus*) were recorded from the vicinity of Huron (Conant, 1951) and may occur in Huron River Wetland. Several other species of reptiles and amphibians recorded from wetland habitats elsewhere in Erie County are listed in Appendix C-1.

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

Avifauna

The diverse marsh habitat in this wetland attracts numerous species of shorebirds and passerines. Great blue herons (*Ardea herodias*), bitterns (*Botaurus* spp. and *Ixobrychus* spp.), killdeer (*Charadrius vaciferus*), plovers and blue-winged teal (*Anas discors*) are resident species while ospreys (*Pandion haliaetus*) and whistling swans (*Olor columbianus*) use the wetland during migration (Walton and Kasselmann, 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 Huron River 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 Huron 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; Ohio Division of Wildlife, 1976) were documented in Huron River 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   LE 027

Population

Huron River Wetland is located in Huron Township of Erie County, Ohio. The county is moderately populated, having a density of 293 persons per square mile.

Table 3-16 indicates that Erie County experienced slow population growth, while Huron Township underwent rapid population growth, between 1970 and 1975. Projections for 1990 indicate that Erie County is expected to undergo moderate population growth in the future.

Table 3-16. Population Data for the Vicinity of Huron River Wetland

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Erie County	77,327	1.9	85,200
Huron Township	9,289	7.5	--

[a] U.S. Bureau of the Census (1977)
[b] Northern Ohio Urban System, Series 11 Method of Population Projection (1977)

Land Use and Ownership

Land use within Huron River Wetland is rural open space. The surrounding area is predominantly residential. Railroad tracks pass adjacent to Huron River Wetland on the north. An unimproved dirt road terminates at the southern edge of the wetland, and a boat dock area is adjacent to the southeastern part. The wetland is under private ownership, and its location suggests that it is subject to severe development pressure (U.S.G.S. quadrangle map, Huron, Ohio, 1969).

Recreation

No known state or federal recreational facilities are present in the vicinity of Huron River Wetland.

Mineral, Energy, and Forest Resources

No significant mineral, oil, gas, or forest resources are known to be present in the vicinity of Huron River Wetland.

Public Utilities and Facilities

A sewage disposal facility is located approximately 0.3 mile north of Huron River Wetland (U.S.G.S. quadrangle map, Huron, Ohio, 1969).

Pollution Sources

No NPDES permit holders are located adjacent to Huron River Wetland. No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

The Ohio Archaeological Inventory indicates that there are two archaeological sites in the vicinity of Huron River Wetland. The Esch Mounds and Village Site is located 250 feet north of the wetland, and the Enderle Site is located 0.5 mile southeast. Further information regarding field research and exact locations can be obtained from the Ohio History Center (Ohio Historic Preservation Office).

RESEARCH PROJECTS

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

SAWMILL CREEK WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LE 028-030

The Sawmill Creek Wetland Complex consists of Sawmill Creek Area Wetlands #1, #2, and #3. This complex is located in Huron Township of Erie County, 2.5 miles west of the Huron River and immediately west of the community of Rye Beach. The wetlands in this complex are Palustrine and partially wooded. They are separated from Lake Erie by a narrow barrier beach that forms the base of Cedar Point spit. The complex extends for 0.7 mile along the lake shoreline, with the individual wetlands being separated by less than 0.1 mile of higher ground (U.S.G.S. quadrangle map, Huron, Ohio, 1969).

Topography

The Sawmill Creek Wetland Complex lies at or near the mean elevation of Lake Erie (571 feet above sea level). The complex has very low relief with no wetland development above the 575-foot contour. The lake plain rises gently to the south, reaching 25 feet above lake level about 0.5 mile south of the shoreline (U.S.G.S. quadrangle map, Huron, Ohio, 1969).

Surficial Geology

The wetland complex lies on the glaciated lake plain. The unconsolidated surface materials consist of laminated lake clay underlain by brown till clay. Devonian bedrock of the Ohio Shale Formation occurs 55 feet below lake level at the shoreline (Pincus, 1961).

Soils

Redmond et al. (1971) mapped the soils of the Sawmill Creek Wetland Complex as Marsh. These areas are submerged part of the year, but they are dry long enough to permit the growth of cattails, sedges, and other water-tolerant plants. The soil consists of dark-colored, organic, medium-to fine-textured material which is very poorly drained.

Hydrology

The Sawmill Creek Wetland Complex was originally the eastern most projection of Sandusky Bay. The wetlands were cut off from the bay in 1911 with the construction of the original causeway road to Cedar Point. Sawmill Creek, which once flowed through the wetland complex and then into Sandusky Bay, now enters Lake Erie at Rye Beach on the east side of the complex. Two small sewage treatment plants are located on this stream within 0.5 mile of the lake. One serves the new Sawmill Creek Resort which lies on the west side of the stream and the other serves Rye Beach. No surface streams flow into the wetlands (U.S.G.S. quadrangle map, Huron, Ohio, 1969).

Walker (1962) indicated that thin drift, basically clay, covers impermeable shale bedrock which yields less than 5 gallon per minute from water wells. The literature search provided no site-specific data pertaining to water level fluctuations, groundwater drainage patterns and runoff, water quality, depth, and seasonal changes in these wetlands.

Climate

The closest weather station providing climatic data for the Sawmill Creek Wetland Complex is located in Sandusky, Ohio. The average annual temperature is 51.2°F based on the normal period from 1941-1970. The mean monthly low for January is 25.0°F and the mean monthly high for July is 84.0°F. The average annual precipitation is 34.08 inches, with a mean monthly precipitation of 2.27 inches in January and 4.14 inches in July. The growing season is approximately seven months long, with the last killing frost (28°F) in 1975 occurring on April 6 and the first killing frost on November 15 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of the Sawmill Creek Wetland Complex (U.S.G.S. quadrangle map, Huron, Ohio, 1969).

BIOTIC SETTING LE 028-030

Vegetation

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

Fish

An annotated list of fish species associated with wetland habitats or aquatic vegetation in the Lake Erie area of Ohio appears in Appendix A-3, some of these species may utilize Sawmill Creek Wetlands #1, #2, and #3. However, the literature search located no site-specific data pertaining to major species, species composition, spawning and hatching areas, seasonal distribution and abundance, life histories, food sources, or recreational and commercial use 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 the Sawmill Creek Wetland Complex.

Reptiles and Amphibians

Species of reptiles and amphibians recorded from wetland habitats in Erie County are listed in Appendix C-1. Although not specifically reported from

Sawmill Creek Area Wetlands #1, #2, or #3, some of these species may occur there. The literature search yielded no site-specific information pertaining to major species, seasonal abundance and distribution, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in the Sawmill Creek Area Wetland Complex.

Avifauna

Mallards (Anas platyrhynchos), great blue herons (Ardea herodias), eastern kingbirds (Tyrannus tyrannus) and red-winged blackbirds (Agelaius phoeniceus) have been commonly seen in these wetlands. The prothonotary warbler (Protonotaria citrea) nests in the area known as Sheldon's Folly. Migratory birds, including ospreys (Pandion haliaetus) and bald eagles (Haliaeetus leucocephalus), use these areas for feeding and resting (Walton and Kasselmann, 1977). The bald eagle is currently on the Federal and Ohio State Endangered Species Lists.

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 the Sawmill Creek Wetland Complex.

Mammals

Muskrat (Ondatra zibethicus) have been observed on the three wetlands of the Sawmill Creek Wetland Complex (Walton and Kasselmann, 1977). However, the literature search provided no site-specific information pertaining to other major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, major food sources, or relationship to water levels of the mammals inhabiting these wetlands.

Endangered Species

Bald eagles which are on the Federal list of endangered species, are known to utilize the wetlands of this complex during migration (Walton and Kasselman, 1977).

No other plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Ohio Division of Wildlife, 1976) were documented in the Sawmill Creek 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, two NPDES permit holders discharge sanitary waste into Sawmill Creek, and this may have some effect on the health of the Sawmill Creek Wetland Complex.

Population

The Sawmill Creek Wetland Complex is located in Huron Township of Erie County, Ohio. The county is moderately populated, having a density of 293 persons per square mile. Table 3-17 indicates that Erie County experienced slow population growth, while Huron Township underwent rapid population growth, between 1970 and 1975. Projections for 1990 indicate that Erie County is expected to undergo moderate population growth in the future.

Table 3-17. Population Data for the Vicinity of the Sawmill Creek Wetland Complex

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Erie County	77,327	1.9	85,200
Huron Township	9,289	7.5	--

[a] U.S. Bureau of the Census (1977)
[b] Northern Ohio Urban System, Series 11 Method of Population Projection (1977)

Land Use and Ownership

Land use within the Sawmill Creek Wetland Complex is rural open space. The surrounding area is predominantly residential. A few residential dwellings lie in the eastern part of Sawmill Creek Area Wetland #1 and a sewage disposal facility is located in the southeastern portion. A hard surface road runs along the western edge of Sawmill Creek Area Wetland #3. The wetland is under private ownership, and its location suggests that it is subject to severe development pressure (U.S.G.S. quadrangle map, Huron, Ohio, 1969).

Recreation

No known state or federal recreational facilities are present in the vicinity of the Sawmill Creek Wetland Complex.

Mineral, Energy, and Forest Resources

No significant mineral, oil, gas, or forest resources are known to be present in the vicinity of the Sawmill Creek Wetland Complex.

Public Utilities and Facilities

A sewage disposal facility is located adjacent to Sawmill Creek Area Wetland #1 (U.S.G.S. quadrangle map Huron, Ohio, 1969).

Pollution Sources

Two NPDES permit holders discharge into Sawmill Creek, and may have an impact on the Sawmill Creek Wetlands Complex. East Erie Sewer District discharges chlorinated sanitary waste and Sawmill Lodge Waste Water Treatment plant discharges sanitary waste with extended activation.

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

Historical and Archaeological Features

The Ohio Archaeological Inventory indicates that one archaeological feature (the Sheldons Site) is located 0.5 mile southwest of the Sawmill Creek Wetland Complex. Further information regarding field research and exact location can be obtained from the Ohio History Center (Ohio Historic Preservation Office).

RESEARCH PROJECTS

LE 027

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

Table 3-18. Data Gaps-Lake Section 3

Data Gap*		Wetland Number	020	021	022	023–024	025	026	027	028–030
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	*	*	*	*	*		*	*
		Food Sources	*	*	*	*	*	*	*	*
	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	*	*	*	*	*	*	*	*
		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	*	*	*	*	*	*	*	*
		Endangered Species								
		Health	*	*	*		*		*	
Cultural Setting		Population								
		Land Use and Ownership								
		Recreation								
		Mineral, Energy, Forest Resourc								
		Public Utilities/Facilities								
		Point Pollution Sources								
		Non-Point Pollution Sources	*	*	*	*	*	*	*	*
		Historic Features								
		Archaelogic Features								

LAKE SECTION 4

INTRODUCTION

Lake Section 4 extends along the southern shoreline of Lake Erie from Cedar Point to Marblehead in Ottawa County, Ohio and includes Sandusky Bay. The region features gently sloping topography in the vicinity of the wetlands. The predominant shore type along this 45 mile stretch of shoreline is low plain.

Figures 4-1 and 4-2 show the approximate location of the 20 coastal wetlands in Lake Section 4. Data concerning latitude, longitude, acreage, and classification for each of these wetlands are presented in Table 4-1. The wetlands of Lake Section 4 lie at an elevation of 571 feet above sea level, which is the approximate mean elevation of Lake Erie. These wetlands are classified as Palustrine, Lacustrine, and Riverine.

Available information related to physiographic and cultural features of the 20 coastal wetlands is summarized in the individual wetland naratives presented in this chapter. Published sources lack site-specific information related to the biotic characteristics of these wetlands in many instances.

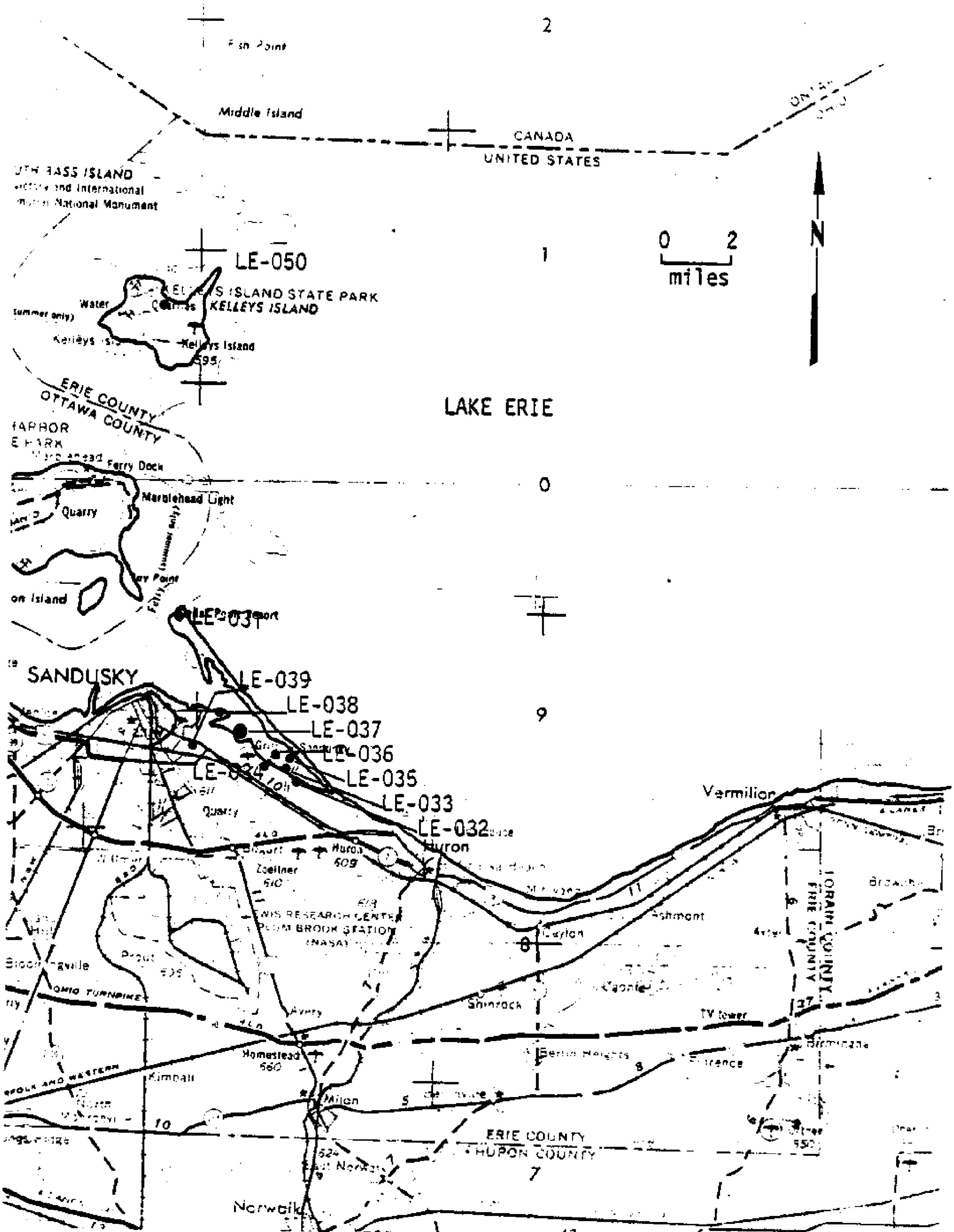

Figure 4-1. Lake Section 4 - East Bay Area

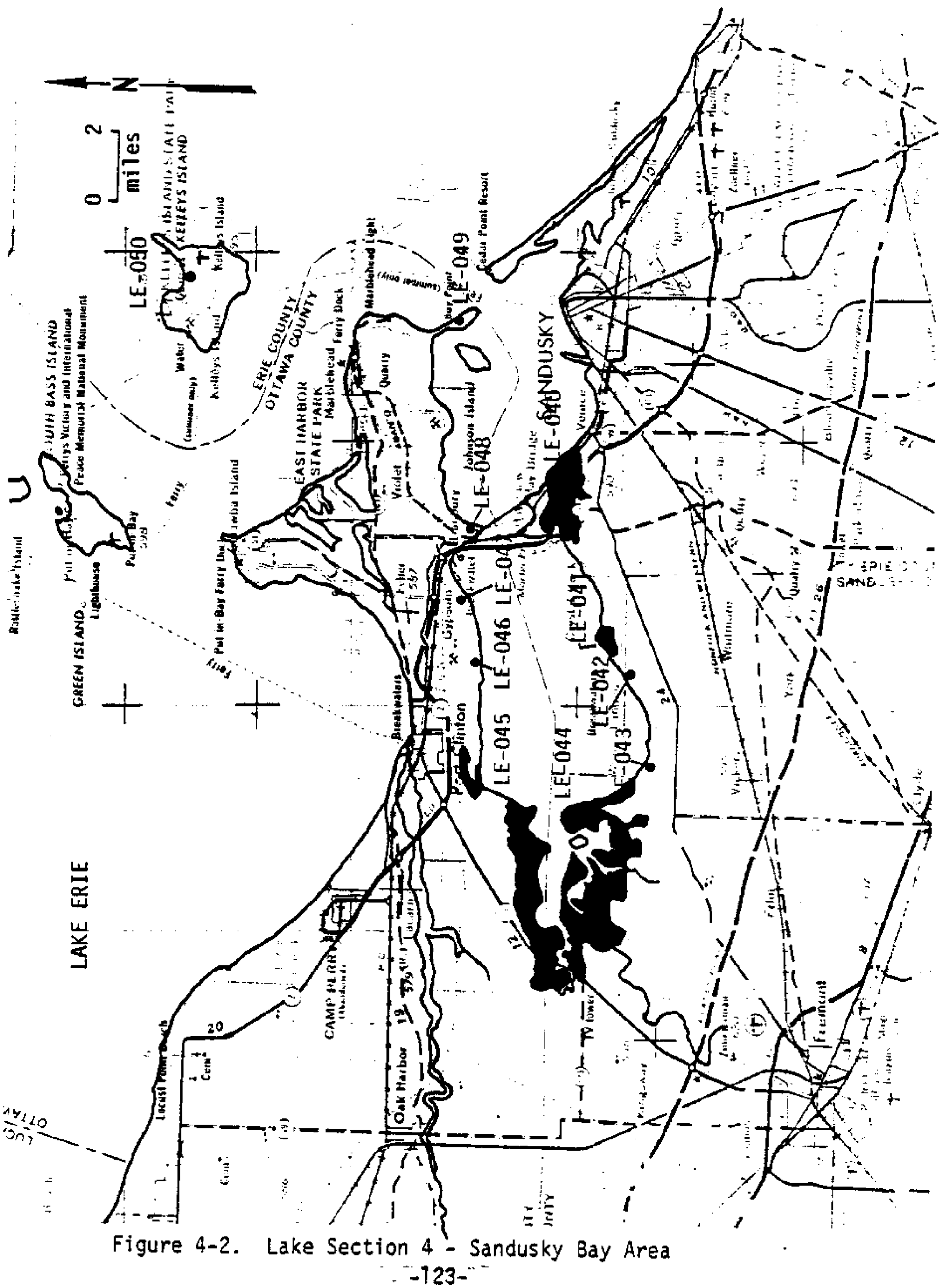

Figure 4-2. Lake Section 4 - Sandusky Bay Area

Table 4-1. Location, Acreage, and Classification of Wetlands in Lake Section 4

Wetland Number	Wetland	Latitude	Longitude	Acreage	Classification[a]
031	Cedar Point Wetland	41°29'22"	82°41'20"	10	P
	PLUM BROOK AREA WETLAND COMPLEX				
032	Plum Brook Area Wetland #1	41°25'22"	82°37'13"	7.5	P
033	Plum Brook Area Wetland #2	41°25'43"	82°37'40"	45.5	P
034	Plum Brook Creek Area Wetland	41°25'37"	82°38'21"	38.5	P
	EAST BAY WETLAND COMPLEX				
035	East Bay Wetland #1	41°25'93"	82°37'32"	1	L
036	East Bay Wetland #2	41°26'13"	82°38'13"	35	L
037	Hemming Ditch Wetland	41°26'06"	82°39'22"	177.5	P,L
	BIG ISLAND WETLAND COMPLEX				
038	Big Island Wetland	41°26'47"	82°40'12"	184	P,L
039	Pipe Creek Wetland	41°26'22"	82°40'47"	72	P,L
040	Bay View Wetland	41°27'30"	82°48'18"	640	P
	WILLOW POINT WETLAND COMPLEX				
041	Willow Point Wetland	41°26'19"	82°52'39"	205	P
042	Whites Landing	41°25'50"	82°53'50"	10	P
043	Pickerel Creek Wetland	41°25'16"	82°56'48"	10	P
044	Muddy Creek Bay Wetland	41°26'58"	83°00'33"	3122	L,P,R
045	Port Clinton Wetland	41°28'30"	82°56'58"	150	P
046	Lockwood Road Wetland	41°29'19"	82°53'33"	72	P
047	Portage Wetland	41°29'51"	82°51'30"	70	P
048	Danbury Wetland	41°29'52"	82°49'18"	15	P
049	Bay Point Wetland	41°29'50"	82°42'40"	45	P
050	Kelley's Island Wetland	41°36'39"	82°42'08"	17	P

[a]P=palustrine
L=lacustrine
R=riverine

CEDAR POINT WETLAND

PHYSIOGRAPHIC SETTING

LE 031

Setting

Cedar Point Wetland is located within the city of Sandusky in Erie County, Ohio. It occupies a shallow depression at the distal end of Cedar Point sand spit, adjacent to Moseley channel which connects Sandusky Bay to Lake Erie. The wetland is a Palustrine System and partially wooded along its northeastern edge. This wetland is 2.7 miles north-northwest of the center of Sandusky and lies within the Cedar Point Amusement Park (U.S.G.S. quadrangle map, Sandusky, Ohio, 1969). This wetland may by now have been partially filled for use as a recreational vehicle parking area for the amusement park.

Topography

The wetland lies less than 0.1 mile from the Lake Erie shore and has an elevation at or near the mean level of the lake (571 feet above mean sea level). The wetland has very little relief; it is entirely enclosed by the 575-foot contour line. The entire 7-mile-long Cedar Point spit has a relief of only 20 feet (U.S.G.S. quadrangle map, Sandusky, Ohio, 1969).

Surficial Geology

Cedar Point Wetland occupies a small depression at the northwest end of a sand spit. The spit was formed by westerly moving littoral currents which deposited sand eroded from the till and lacustrine bluffs to the east. These materials also underlie the sandy spit, and in turn cover Devonian bedrock. Bedrock at the northwestern end of the spit lies at elevations of 527 to 543 feet above sea level (Pincus, 1961). Sand dunes along the spit reach a height of 15-20 feet above lake level.

Soils

Redmond, et al. (1971) mapped the soil of Cedar Point Wetland as wet beaches. In these areas the water table is within 15 inches of the surface for part of the year; at times of high lake levels, particularly during northeast storms, the surface is inundated. The uppermost 1-8 inches of soil material has been darkened by organic staining and is black or very dark gray. The underlying material consists of thin layers of gray to brown sand mottled with yellowish brown.

Hydrology

No surface streams flow through Cedar Point Wetland. The water level in the wetland is largely controlled by the level of Lake Erie. Walker (1962) reported that the limestone/dolomite bedrock, covered with an average of 25 feet of glacial till, may supply 300, or more, gallons of water per minute at depths of around 200 feet. However, the literature search provided no site-specific data pertaining to water level fluctuations, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in this wetland.

Climate

The closest weather station providing climatic data for Cedar Point Wetland is located in Sandusky, Ohio. The average annual temperature is 51.2°F based on the normal period from 1941-1970. The mean monthly low for January is 25.0°F and the mean monthly high for July is 84.0°F. The average annual precipitation is 34.08 inches, with a mean monthly precipitation of 2.27 inches in January and 4.14 inches in July. The growing season is approximately seven months long, with the last killing frost (28°F) in 1975 occurring on April 6 and the first killing frost on November 15 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are located in the vicinity of Cedar Point Wetland (U.S.G.S. quadrangle map, Sandusky, Ohio, 1969).

BIOTIC SETTING LE 031

Vegetation

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

Fish

An annotated list of fish species associated with wetland habitats or aquatic vegetation in the Lake Erie area of Ohio appears in Appendix A-3. Some of these species may utilize Cedar Point Wetland. However, the literature search located no site-specific data pertaining to major species, species composition, spawning and hatching areas, seasonal distribution and abundance, life histories, food sources, or recreational and commercial use of the fish populations in this wetland.

Invertebrates

Historical data on the Naiades and Trichoptera of Cedar Point, Ohio are available in Marshall (1939) and Gary (1910). However, the review of literature yielded no site-specific data regarding current major species, distribution and abundance, density and productivity, major food sources, or relationship to water levels of the invertebrates present in Cedar Point Wetland.

Reptiles and Amphibians

The northern brown snake (Storeria dekayi dekayi), northern ribbon snake (Thamnophis sauritus septentronalis), eastern garter snake (Thamnophis sirtalis sirtalis), stinkpot (Sternotherus odoratus), Blanding's turtle (Emydoidea blandingi), and American toad (Bufo americanus americanus) have been reported from Cedar Point (Conant, 1951; Morse, 1904) and may occur in Cedar Point Wetland. Other reptiles and amphibians recorded from wetland habitats in Erie County are listed in Appendix C-1. Although not specifically reported from Cedar Point Wetland, some of these species may occur there.

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

Avifauna

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 Cedar Point Wetland.

Mammals

General information concerning the wetlands of southwestern Lake Erie (Bednarik 1953, 1956; Donohoe, 1961) may apply to Cedar Point Wetland. Also, information discussed concerning Muddy Creek Bay Wetland (LE 044) and Magee Marsh (LE 062) may apply to this wetland. However, 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 Cedar 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; Ohio Division of Wildlife, 1976) were documented in Cedar Point 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 LE 031

Population

Cedar Point Wetland is located within the city of Sandusky in Erie County, Ohio. The county is moderately populated, having a density of 293 persons per square mile. Table 4-2 indicates that Erie County underwent slow population growth, while Sandusky (city) experienced a slow decline in population between 1970 and 1975. Projections for 1990 indicate that Erie County is expected to undergo moderate population growth in the future.

Table 4-2. Population Data for the Vicinity of Cedar Point Wetland

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Erie County	77,327	1.9	85,200
City of Sandusky	32,023	-2.0	--

[a] U.S. Bureau of the Census (1977)
[b] Northern Ohio Urban System, Series 11 Method of Population Projection (1977)

Land Use and Ownership

Land use within Cedar Point Wetland is rural open space. The surrounding area is predominantly commercial. The wetland is under private ownership, and its location suggests that it is subject to moderate development pressure (U.S.G.S. quadrangle map, Sandusky, Ohio, 1969).

Recreation

Cedar Point Wetland is located in the privately owned Cedar Point Amusement Park. Amusement rides, boat trips, live entertainment, and swimming beaches are available within the park.

Mineral, Energy, and Forest Resources

Potential mineral resources in Cedar Point Wetland include limestone and dolomite (Great Lakes Basin Commission, 1974). No significant oil, gas, or forest resources are known to be present in the vicinity.

Public Utilities and Facilities

A Coast Guard Station is located approximately 0.2 mile southwest of Cedar Point Wetland (U.S.G.S. quadrangle map, Sandusky, Ohio, 1969).

Pollution Sources

There are no NPDES permit holders are located adjacent to Cedar Point 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 ft of Cedar Point Wetland (Ohio Historical Preservation Office).

No known archaeological resources exist in the Cedar Point Wetland vicinity, but this area has not yet been systematically surveyed by a professional archaeologist (Ohio Historical Preservation Office).

RESEARCH PROJECTS

LE 031

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

PLUM BROOK AREA WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LE 032-034

Setting

The Plum Brook Area Wetland Complex is located in Huron Township of Erie County, Ohio. The complex consists of three wetlands: Plum Brook Area Wetland #1, Plum Brook Area Wetland #2, and Plum Brook Creek Area Wetland, all of which lie along the southern shore of the western extension of Sandusky Bay, approximately 4 miles southeast of downtown Sandusky. Plum Brook Area Wetland #1 is 0.3 mile east of the Cedar Point Chaussee and Plum Brook Area Wetland #2 is 0.1 mile west of this roadway. Plum Brook Creek Area Wetland lies about 1 mile west of the Chaussee at the mouth of Plum Brook at Sandusky Bay. These Palustrine Systems are non-wooded except for a small portion on the west side of the Plum Brook mouth (U.S.G.S. quadrangle maps, Huron, Ohio, 1969; Sandusky, Ohio 1969).

Topography

The Plum Brook Area Wetland Complex lies at or near the mean elevation of Lake Erie and Sandusky Bay (571 feet above mean sea level). The wetlands have very little relief; all are enclosed by the 575 foot contour line. The land to the south of Sandusky Bay rises gently to an elevation of 600 feet within about a mile of the shore (U.S.G.S. quadrangle maps, Huron, Ohio, 1965; Sandusky, Ohio, 1969).

Surficial Geology

Approximately 29 feet of glacial till and lacustrine sediments overlie Devonian shale bedrock (Walker, 1962) in the vicinity of the mouth of Plum Brook. The till is a heterogeneous mixture of clay, sand and gravel with a predominance of clay. The lacustrine sediments consist of clay, silt, and fine sand deposited in glacial lakes.

Soils

Redmond, et al. (1971) mapped the soils of this wetland complex as Marsh. Marsh soils are submerged part of the year, but they are dry long enough to permit the growth of cattails, sedges, and other water-tolerant plants. The material underlying the marsh is similar to the material in the lower part of the profile of Lenawee and Colwood soils.

Hydrology

Plum Brook Area Wetlands #1 and #2 lie adjacent to the shore of Sandusky Bay and are therefore influenced by water level fluctuations in Lake Erie. Plum Brook Creek Wetland lies at the mouth of Plum Brook and is affected by water levels in this estuarine portion of the brook as well as levels in Sandusky Bay. No other streams flow through the complex.

Walker (1962) reported that water well yields from the thin glacial drift and the impermeable shale bedrock of this area average less than 2 gallons per minute. However, the literature search provided no site-specific data pertaining to water level fluctuations, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in this wetland complex.

Climate

The closest weather station providing climatic data for the Plum Brook Area Wetland Complex is located in Sandusky, Ohio. The average annual temperature is 51.2°F based on the normal period from 1941-1970. The mean monthly low for January is 25.0°F and the mean monthly high for July is 84.0°F. The average annual precipitation is 34.08 inches, with a mean monthly precipitation of 2.27 inches in January and 4.14 inches in July. The growing season is approximately seven months long, with the last killing frost (28°F) in 1975 occurring on April 6 and the first killing frost on November 15 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of the Plum Brook Area Wetland Complex (U.S.G.S. quadrangle maps, Sandusky, Ohio, 1969; Huron, Ohio, 1969).

BIOTIC SETTING LE 032-034

Vegetation

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

Fish

An annotated list of fish species associated with wetland habitats or aquatic vegetation in the Lake Erie area of Ohio appears in Appendix A-3. Some of these species probably utilize the three wetlands of the Plum Brook Area Wetland Complex. 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 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 the Plum Brook Area Wetland Complex.

Reptiles and Amphibians

The eastern fox snake (*Elaphe vulpina gloydi*), Kirtland's water snake (*Natrix kirtlandi*), Butler's garter snake (*Thamnophis butleri*), northern ribbon snake (*Thamnophis sauritis*), eastern garter snake (*Thamnophis sirtalis sirtalis*), stinkpot (*Sternotherus odoratus*), snapping turtle (*Chelydra serpentina*), Blanding's turtle (*Emydoidea blandingi*), map turtle (*Graptemys geographica*), midland painted turtle (*Chrysemys picta marginata*), eastern spiny softshell (*Trionyx spiniferus spiniferus*), and mudpuppy (*Necturus maculosus*) have been recorded in the vicinity of Sandusky (Conant, 1951; Morse, 1904) and may occur in Plum Brook Area Wetlands #1 and #2, and Plum Brook Creek Area Wetland. Other reptiles and amphibians recorded from wetland habitats in Erie County are listed in Appendix C-1. Although not specifically reported from the three wetlands in this complex, some of these species may occur there.

The literature search yielded no site-specific information pertaining to seasonal abundance and distribution, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in Plum Brook Area Wetlands #1 and #2, or Plum Brook Creek Area Wetland.

Avifauna

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 the Plum Brook Area Wetland Complex.

Mammals

General information concerning the wetlands of southwestern Lake Erie (Bednarik 1953, 1956; Donohoe, 1961) may apply to the three wetlands of the Plum Brook Area Wetland Complex. Also, information discussed concerning Muddy Creek Bay Wetland (LE 044) and Magee Marsh (LE 062) may apply to these wetlands. However, 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 Plum Brook 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; Ohio Division of Wildlife, 1976) were documented in the Plum Brook 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.

Population

The Plum Brook Area Wetland Complex is located mainly in Huron Township of Erie County, Ohio, but part of Plum Brook Area Wetland #2 is located within the city of Sandusky. The county is moderately populated, having a density of 293 persons per square mile. Table 4-3 indicates that Erie County experienced slow population growth, Huron Township underwent rapid population growth, and Sandusky (city) experienced a slow decline in population between 1970 and 1975. Projections for 1990 indicate that Erie County is expected to undergo moderate population growth in the future.

Table 4-3. Population Data for the Vicinity of the Plum Brook Area Wetland Complex

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Erie County	77,327	1.9	85,200
Huron Township	9,289	7.5	--
City of Sandusky	32,023	-2.0	--

[a] U.S. Bureau of the Census (1977)
[b] Northern Ohio Urban System, Series 11 Method of Population Projection (1977)

Land Use and Ownership

Land use within the three wetlands comprising the Plum Brook Area Wetland Complex is rural, open space. The surrounding area is predominantly residential. A hard surface road runs along the eastern side of Plum Brook Area Wetland #2. U.S. Route 6 and railroad tracks pass near the southern tip of Plum Brook Creek Area Wetland, and several residences are located on its southeastern border. The wetlands are under private ownership, and their location suggests that they are subject to moderate development pressure (U.S.G.S. quadrangle maps, Huron, Ohio, 1969; Sandusky, Ohio, 1969).

Recreation

No known state or federal recreational facilities are present in the vicinity of the Plum Brook Area Wetland Complex.

Mineral, Energy, and Forest Resources

Potential mineral resources in the Plum Brook Area Wetland Complex include limestone and dolomite (Great Lakes Basin Commission, 1974). No significant oil, gas, or forest resources are known to be present in the vicinity.

Public Utilities and Facilities

No public utilities or facilities are located within 0.5 mile of the three wetlands comprising the Plum Brook Area Wetland Complex (U.S.G.S. quadrangle maps, Huron, Ohio, 1969; Sandusky, Ohio, 1969).

Pollution Sources

There are no NPDES permit holders adjacent to the Plum Brook Area Wetland Complex. However, the Plum Brook Station of NASA's Lewis Research Center lies within the drainage basin of Plum Brook, and low-level radioactive waste was routinely discharged into these streams during the 1960's (NASA, personal communication). 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 ft of the Plum Brook Area Wetland Complex (Ohio Historical Preservation Office).

No known archaeological resources exist in the Plum Brook Area Wetland Complex vicinity, but this area has not yet been systematically surveyed by a professional archaeologist (Ohio Historical Preservation Office).

RESEARCH PROJECTS LE 032-034

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

EAST BAY WETLAND COMPLEX

PHYSIOGRAPHIC SETTING LE 035-036

Setting

The East Bay Wetland Complex, comprised of East Bay Wetlands #1 and #2, is located in Huron Township of Erie County, Ohio. The complex lies within the central portion of the eastern extension of Sandusky Bay, midway between Cedar Point spit and the south shore of the bay and about 4 miles east-southeast of downtown Sandusky. East Bay Wetlands #1 and #2 lie 0.2 and 0.6 mile west of the Cedar Point Chaussee bridge, respectively. These emergent wetlands surrounded by the open waters of Sandusky Bay are classified as Lacustrine Systems (U.S.G.S. quadrangle map, Sandusky, Ohio, 1969).

Topography

The East Bay Wetland Complex lies at or near the mean elevation of Sandusky Bay and Lake Erie (571 feet above mean sea level). The wetlands have very little relief. The terrain to the south of Sandusky Bay rises gently to an elevation of 600 feet about a mile south of the complex (U.S.G.S. quadrangle maps, Huron, Ohio, 1969; Sandusky, Ohio, 1969). This wetland complex is closely associated with wetlands of the Plum Brook Area and Big Island Complexes.

Surficial Geology

Approximately 25 feet of glacial till and lacustrine sediments overlie the Devonian shale bedrock (Walker, 1962) on the south shore of eastern Sandusky Bay. The till is a heterogeneous mixture of clay, sand, and gravel with a predominance of clay. Lacustrine sediments consist of clay, silt, and fine sand deposited in glacial lakes.

Soils

Redmond, et al. (1971) mapped the soils of this wetland complex as Marsh. Marsh soils are submerged part of the year, but they are dry long enough to permit the growth of cattails, sedges, and other water-tolerant plants. The material underlying the marsh is similar to the material in the lower part of the profile of Lenawee and Colwood soils.

Hydrology

Wetlands of this complex lie in the center of eastern Sandusky Bay surrounded by open water. No surface streams flow through the complex, but the mouth of Plum Brook is only 0.3 mile to the south of East Bay Wetland #2. Water levels in the complex are controlled by fluctuations in Lake Erie.

Walker (1962) reported that water well yields from the thin glacial drift and the impermeable shale bedrock of this area average less than 2 gallons per minute.

The literature search provided no site-specific data pertaining to water level fluctuations, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in this wetland complex.

Climate

The closest weather station providing climatic data for the East Bay is located in Sandusky, Ohio. The average annual temperature is 51.2°F based on the normal period from 1941-1970. The mean monthly low for January is 25.0°F and the mean monthly high for July is 84.0°F. The average annual precipitation is 34.08 inches, with a mean monthly precipitation of 2.27 inches in January and 4.14 inches in July. The growing season is approximately seven months long, with the last killing frost (28°F) in 1975 occurring on April 6 and the first killing frost on November 15 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are located in the vicinity of the East Bay Wetland Complex (U.S.G.S. quadrangle map, Sandusky, Ohio, 1969).

BIOTIC SETTING LE 035-036

Vegetation

The literature search yielded no site-specific data pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of the two wetlands comprising the East Bay Wetland Complex.

Fish

An annotated list of fish species associated with wetland habitats or aquatic vegetation in the Lake Erie area of Ohio appears in Appendix A-3. Some of these species probably utilize the two wetlands of the East Bay Wetland Complex. 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 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 the East Bay Wetland Complex.

Reptiles and Amphibians

The eastern fox snake (Elaphe vulpina gloydi), Kirtland's water snake (Natrix kirtlandii), Butler's garter snake (Thamnophis butleri), northern ribbon snake (*Thamnophis sauritis septentrionalis*), eastern garter snake (*Thamnophis sirtalis sirtalis*), stinkpot (*Sternotherus odoratus*), snapping turtle (*Chelydra serpentina*), Blanding's turtle (*Emydoidea blandingi*), map turtle (*Graptemys geographica*), midland painted turtle (*Chrysemys picta marginata*), eastern spiny softshell (*Trionyx spiniferus spiniferus*), and mudpuppy (*Necturus maculosus*) have been recorded in the vicinity of Sandusky (Conant, 1951; Morse, 1904) and may occur in East Bay Wetlands #1 and #2. Other reptiles and amphibians recorded from wetland habitats in Erie County are listed in Appendix C-1. Although not specifically reported from the two wetlands in this complex, some of these species may occur there.

The literature search yielded no site-specific information pertaining to seasonal abundance and distribution, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in the East Bay Wetland Complex.

Avifauna

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 the East Bay Wetland Complex.

Mammals

General information concerning the wetlands of southwestern Lake Erie (Bednarik 1953, 1956; Donohoe, 1961) may apply to the two wetlands of the East Bay Wetland Complex. Also, information discussed concerning Muddy Creek Bay Wetland (LE 044) and Magee Marsh (LE 062) may apply to these wetlands. However, 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 East Bay Wetlands #1 and #2.

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; Ohio Division of Wildlife, 1976) were documented in the East 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.

Population

The East Bay Wetland Complex is located in Huron Township of Erie County, Ohio. The county is moderately populated having a density of 293 persons per square mile. Table 4-4 indicates that Erie County experienced slow population growth, while Huron Township underwent rapid population growth, between 1970 and 1975. Projections for 1990 indicate that Erie County is expected to undergo moderate population growth in the future.

Table 4-4. Population Data for the Vicinity of the East Bay Wetland Complex

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Erie County	77,327	1.9	85,200
Huron Township	9,289	7.5	--

[a] U.S. Bureau of the Census (1977)
[b] Northern Ohio Urban System, Series 11 Method of Population Projection (1977)

Land Use and Ownership

Land use within the East Bay Wetland Complex and most of the surrounding area is is rural open space. The wetlands are under public ownership (waters of Lake Erie), and their location suggests that they are subject to minimal development pressure (U.S.G.S. quadrangle map, Sandusky, Ohio, 1969).

Recreation

No known state or federal recreational facilities are present in the vicinity of the East Bay Wetland Complex.

Mineral, Energy, and Forest Resources

Potential mineral resources in the East Bay Wetland Complex include limestone and dolomite (Great Lakes Basin Commission, 1974). No significant oil, gas, or forest resources are known to be present in the vicinity.

Public Utilities and Facilities

No public utilities or facilities are located within 0.5 mile of the two wetlands comprising the East Bay Wetland Complex (U.S.G.S. quadrangle map, Sandusky, Ohio, 1969).

Pollution Sources

There are no NPDES permit holders adjacent to the East Bay Wetland Complex. 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 ft of the East Bay Wetland Complex (Ohio Historical Preservation Office).

No known archaeological resources exist in the East Bay Wetland Complex vicinity, but this area has not yet been systematically surveyed by a professional archaeologist (Ohio Historical Preservation Office).

RESEARCH PROJECTS

LE 035-036

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

HEMMING DITCH WETLAND

PHYSIOGRAPHIC SETTING

LE 037

Setting

Hemming Ditch Wetland is located within the city of Sandusky, Erie County, Ohio. This large, non-wooded wetland lies along the south shore of eastern Sandusky Bay and the estuarine valley of Hemming Ditch, about 3.4 miles east of downtown Sandusky. Palustrine and Lacustrine components make up this wetland (U.S.G.S. quadrangle map, Sandusky, Ohio, 1969).

Topography

Hemming Ditch Wetland lies at or near the mean elevation of Sandusky Bay and Lake Erie (571 feet above mean sea level). The wetland has very little relief; it is entirely enclosed by the 575-foot contour line. The land surface to the south of Sandusky Bay rises gently to an elevation of 600 feet about a mile south of the wetland (U.S.G.S. quadrangle map, Sandusky, Ohio, 1969).

Surficial Geology

Approximately 25 feet of glacial till and lacustrine sediments overlie the Devonian shale bedrock (Walker, 1962) on the south shore of eastern Sandusky Bay. The till is a heterogeneous mixture of clay, sand and gravel with a predominance of clay. Lacustrine sediments consist of clay, silt, and fine sand deposited in glacial lakes.

Soils

Redmond, et al. (1971) mapped the soils of this wetland as Marsh. Marsh soils are submerged part of the year, but they are dry long enough to permit the growth of cattails, sedges, and other water tolerant plants. The material underlying marsh is similar to the material in the lower part of the profile of Lenawee and Colwood soils.

Hydrology

Hemming Ditch Wetland lies adjacent to Sandusky Bay and Hemming Ditch estuary, so it is influenced by water level fluctuations in Lake Erie. No streams flow through the wetland other than Pipe Creek, which has its mouth at the western limit of this wetland.

Walker (1962) reported that water well yields from the thin glacial drift and the impermeable shale bedrock of this area average less than 2 gallons per minute. However, the literature search provided no site-specific data pertaining to water level fluctuations, water quality, groundwater drainage patterns and runoff, or seasonal changes in Hemming Dietch Wetland Complex.

Climate

The closest weather station providing climatic data for Hemming Dtich Wetland is located in Sandusky, Ohio. The average annual temperature is 51.2°F based on the normal period from 1941-1970. The mean monthly low for January is 25.0°F and the mean monthly high for July is 84.0°F. The average annual precipitation is 34.08 inches, with a mean monthly precipitation of 2.27 inches in January and 4.14 inches in July. The growing season is approximately seven months long, with the last killing frost (28°F) in 1975 occurring on April 6 and the first killing frost on November 15 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Hemming Ditch Wetland (U.S.G.S. quadrangle map, Sandusky, Ohio, 1969).

BIOTIC SETTING

LE 037

Vegetation

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

Fish

An annotated list of fish species associated with wetland habitats or aquatic vegetation in the Lake Erie area of Ohio appears in Appendix A-3. Some of these species may utilize Hemming Ditch Wetland. However, a search of the literature provided no site-specific data pertaining to major species, species composition, spawning and hatching areas, seasonal distribution and abundance, life histories, food sources, or recreational and commercial use 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 Hemming Ditch Wetland.

Reptiles and Amphibians

The eastern fox snake (*Elaphe vulpina gloydi*), Kirtland's water snake (*Natrix kirtlandii*), Butler's garter snake (*Thamnophis butleri*), northern ribbon snake (*Thamnophis sauritis septentrionalis*), eastern garter snake (*Thamnophis sirtalis sirtalis*), stinkpot (*Sternotherus odoratus*), snapping turtle (*Chelydra serpentina*), Blanding's turtle (*Emydoidea blandingi*), map turtle (*Graptemys geographica*), midland painted turtle (*Chrysemys picta* marginata), eastern spiny softshell (Trionyx spiniferus spiniferus), and mudpuppy (Necturus maculosus) have been recorded in the vicinity of Sandusky (Conant, 1951; Morse, 1904) and may occur in Hemming Ditch Wetland. Other reptiles and amphibians recorded from wetland habitats in Erie County are listed in Appendix C-1. Although not specifically reported from this wetland, some of these species may occur there.

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

Avifauna

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 Hemming Ditch Wetland.

Mammals

General information concerning the wetlands of southwestern Lake Erie (Bednarik 1953, 1956; Donohoe, 1961) may apply to Hemming Ditch Wetland. Also, information discussed concerning Muddy Creek Bay Wetland (LE 044) and Magee Marsh (LE 062) may apply to this wetland. However, 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 Hemming Ditch 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; Ohio Division of Wildlife, 1976) were documented in Hemming Ditch 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 — LE 037

Population

Hemming Ditch Wetland is located in both Huron Township and the city of Sandusky, which are within Erie County, Ohio. The county is moderately populated, having a density of 293 persons per square mile. Table 4-5 indicates that Erie County experienced slow population growth, Huron Township underwent rapid population growth, and Sandusky (city) experienced a slow decline in population between 1970 and 1975. Projections for 1990 indicate that Erie County is expected to undergo moderate population growth in the future.

Table 4-5. Population Data for the Vicinity of Hemming Ditch Wetland

	Estimated Population 1975[a]	Estimated % Δ 1970-1975[a]	Projected Population 1990[b]
Erie County	77,327	1.9	85,200
Huron Township	9,289	7.5	--
City of Sandusky	32,023	-2.0	--

[a] U.S. Bureau of the Census (1977)
[b] Northern Ohio Urban System, Series 11 Method of Population Projection (1977)

Land Use and Ownership

Land use within Hemming Ditch Wetland is rural open space. The surrounding area is predominantly residential. Numerous hard surface roads are adjacent to Hemming Ditch Wetland, and State Route 6 and railroad tracks cross the southern part of the wetland. Griffin-Sandusky Airport lies to the east and a sewage disposal facility is located to the southeast. The wetland is under private ownership, and its location suggests that it is subject to severe development pressure (U.S.G.S. quadrangle map, Sandusky, Ohio, 1969).

Recreation

No known state or federal recreational facilities are present in the vicinity of Hemming Ditch Wetland.

Mineral, Energy, and Forest Resources

Potential mineral resources in Hemming Ditch Wetland include limestone and dolomite (Great Lakes Basin Commission, 1974). No significant oil, gas, or forest resources are known to be present in the vicinity.

Public Utilities and Facilities

A sewage disposal facility is located adjacent to Hemming Ditch Wetland (U.S.G.S. quadrangle map, Sandusky, Ohio, 1969).

Pollution Sources

There are no NPDES permit holders are located adjacent to Hemming Ditch 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 ft. of Hemming Ditch Wetland (Ohio Historical Preservation Office).

No known archaeological resources exist in the Hemming Ditch Wetland vicinity, but this area has not yet been systematically surveyed by a professional archaeologist (Ohio Historical Preservation Office).

RESEARCH PROJECTS LE 037

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

BIG ISLAND WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LE 038-039

Setting

The Big Island Wetland Complex, comprised of Big Island Wetland and Pipe Creek Wetland, is located within the eastern part of the city of Sandusky in Erie County, Ohio. Big Island Wetland lies on a low peninsula which projects into Sandusky Bay at the mainland approach to the Cedar Point Causeway. Pipe Creek Wetland occupies the estuarine valley of Pipe Creek, which empties into Sandusky Bay along the southeast side of Big Island Peninsula. The complex is approximately 2 miles east of downtown Sandusky. Big Island Wetland has been modified by the construction of a water filtration plant and water intake pipeline operated by the city, and Pipe Creek Wetland has largely been destroyed by recent land filling activities. The U.S. Fish and Wildlife Service has located its Sandusky office in a recently constructed building on this land fill. Wetlands of this complex are non-wooded and classified as Palustrine and Lacustrine Systems (U.S.G.S. quadrangle map, Sandusky, Ohio, 1969).

Topography

The Wetlands of the Big Island Complex lie at or near the mean elevation of Sandusky Bay and Lake Erie (571 feet above mean sea level). The complex has very little relief; it is entirely enclosed by the 575-foot contour line. The land surface to the southwest of Sandusky Bay rises gently to an elevation of 600 feet about a mile inland of the complex (U.S.G.S. quadrangle map, Sandusky, Ohio, 1969).

Surficial Geology

Approximately 25 feet of glacial till and lacustrine sediments overlie the Devonian limestone bedrock (Walker, 1962) on the south shore of eastern Sandusky Bay. The till is a heterogeneous mixture of clay, sand, and gravel with a predominance of clay. Lacustrine sediments consist of clay, silt, and fine sand deposited on glacial lakes. Nearly 8 feet of swamp deposits are contained in the upper sediments (Pinus, 1961).

Soils

Redmond, et al. (1971) mapped the soils of this wetland complex as Marsh. Marsh soils are submerged part of the year, but they are dry long enough to permit the growth of cattails, sedges, and other water-tolerant plants. The material underlying the marsh is similar to the material in the lower part of the profile of Lenawee and Colwood soils.

Hydrology

Big Island Wetland lies adjacent to the shore of Sandusky Bay and is therefore influenced by water level fluctuations in Lake Erie. Pipe Creek

Wetland lies at the mouth of Pipe Creek and is affected by water levels in this estuarine portion of the creek as well as by levels in Sandusky Bay.

Walker (1962) reported that the limestone/dolomite bedrock, covered with an average of 25 feet of glacial till, may supply 300 or more gallons of water per minute at depths of around 200 feet. However, the literature search provided no site-specific data pertaining to water level fluctuations, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in these wetlands.

Climate

The closest weather station providing climatic data for the Big Island Wetland Complex is located in Sandusky, Ohio. The average annual temperature is 51.2°F based on the normal period from 1941-1970. The mean monthly low for January is 25.0°F and the mean monthly high for July is 84.0°F. The average annual precipitation is 34.08 inches, with a mean monthly precipitation of 2.27 inches in January and 4.14 inches in July. The growing season is approximately seven months long, with the last killing frost (28°F) in 1975 occurring on April 6 and the first killing frost on November 15 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of the Big Island Wetland Complex (U.S.G.S. quadrangle map, Sandusky, Ohio, 1969).

BIOTIC SETTING LE 038-039

Vegetation

The literature search yielded no site-specific data pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of the two wetlands comprising the Big Island Wetland Complex.

Fish

An annotated list of fish species associated with wetland habitats or aquatic vegetation in the Lake Erie area of Ohio appears in Appendix A-3. Some of these species probably utilize Big Island Wetland and Pine Creek Wetland. 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 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 the Big Island Wetland Complex.

Reptiles and Amphibians

The eastern fox snake (*Elaphe vulpina gloydi*), Kirtland's water snake (*Natrix kirtlandii*), Butler's garter snake (*Thamnophis butleri*), northern ribbon snake (*Thamnophis sauritis septentrionalis*), eastern garter snake (*Thamnophis sirtalis sirtalis*), stinkpot (*Sternotherus odoratus*), snapping turtle (*Chelydra serpentina*), Blanding's turtle (*Emydoidea blandingi*), map turtle (*Graptemys geographica*), midland painted turtle (*Chrysemys picta marginata*), eastern spiny softshell (*Trionyx spiniferus*), and mudpuppy (*Necturus maculosus*) have been recorded in the vicinity of Sandusky (Conant, 1951; Morse, 1904) and may occur in the Big Island Wetland Complex. Other reptiles and amphibians recorded from wetland habitats in Erie County are listed in Appendix C-1. Although not specifically reported from the two wetlands in this complex, some of these species may occur there. The literature search yielded no site-specific information pertaining to seasonal abundance and distribution, 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 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 the Big Island Wetland Complex.

Mammals

General information concerning the wetlands of southwestern Lake Erie (Bednarik 1953, 1956; Donohoe, 1961) may apply to the two wetlands of the Big Island Wetland Complex. Also, information discussed concerning Muddy Creek Bay Wetland (LE 044) and Magee Marsh (LE 062) may apply to these wetlands. However, 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 Big Island Wetland and Pipe 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; Ohio Division of Wildlife, 1976) were documented in the Big Island 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

LE 038-039

Population

The Big Island Wetland Complex is located mainly within the city limits of Sandusky, in Erie County, Ohio. The county is moderately populated, having a density of 293 persons per square mile. Table 4-6 indicates that Erie County experienced slow population growth, while Sandusky underwent a slow decline in population, between 1970 and 1975. Projections for 1990 indicate that Erie County is expected to undergo moderate population growth in the future.

Table 4-6. Population Data for the Vicinity of the Big Island Wetland Complex

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Erie County	77,327	1.9	85,200
City of Sandusky	32,023	-2.0	--

[a] U.S. Bureau of the Census (1977)
[b] Northern Ohio Urban System, Series 11 Method of Population Projection (1977)

Land Use and Ownership

Land use within the Big Island Wetland Complex is rural, open space. The surrounding area is predominantly residential. State Route 6 passes across the middle of Pipe Creek Wetland, and railroad tracks cross its southern tip. Other hard surface roads run adjacent to the wetlands of this complex; an unimproved dirt road extends into the central part of Big Island Wetland. A sewage disposal facility is located at the northern edge of Pipe Creek Wetland, and a filtration plant is located close to Big Island Wetland on the northeast. The wetlands are under private ownership, and their location suggests that they are subject to severe development pressure (U.S.G.S. quadrangle map, Sandusky, Ohio, 1969).

Recreation

No known state or federal recreational facilities are present in the vicinity of the Big Island Wetland Complex.

Mineral, Energy, and Forest Resources

Potential mineral resources in the Big Island Wetland Complex include limestone and dolomite (Great Lakes Basin Commission, 1974). No significant oil, gas, or forest resources are known to be present in the vicinity.

Public Utilities and Facilities

A filtration plant lies adjacent to Big Island Wetland, and a sewage disposal facility is located adjacent to Pipe Creek Wetland (U.S.G.S. quadrangle map, Sandusky, Ohio, 1969).

Pollution Sources

There are no NPDES permit holders are located adjacent to the Big Island Wetland Complex. 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 ft. of the Big Island Wetland Complex (Ohio Historical Preservation Office).

No known archaeological resources exist in the Big Island Wetland Complex vicinity, but this area has not yet been systematically surveyed by a professional archaeologist (Ohio Historical Preservation Office).

RESEARCH PROJECTS LE 038-039

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

BAY VIEW WETLAND

PHYSIOGRAPHIC SETTING

LE 040

Setting

Bay View Wetland is located in Margaretta Township of Erie County, Ohio. This extensive Palustrine wetland lies adjacent to the south shore of Sandusky Bay near the community of Bay View, about 5 miles west of downtown Sandusky. The wetland is largely non-wooded; it is diked with earthen mounds and managed for waterfowl (U.S.G.S. quadrangle map, Castalia, Ohio, 1969).

Topography

Bay View Wetland lies at or near the mean elevation of Lake Erie and Sandusky Bay (571 feet above sea level). The wetland has very little relief; it is entirely enclosed by the 575-foot contour line. The land surface to the south of Sandusky Bay rises very gently to an elevation of 600 feet about 2 miles south of the wetland (U.S.G.S. quadrangle map, Castalia, Ohio, 1969).

Surficial Geology

Approximately 30 feet of glacial till and lacustrine sediments overlie Devonian and Silurian limestone and dolomite bedrock (Pincus, 1961; Walker, 1962) in the vicinity of Bay View Wetland. The till is a heterogeneous mixture of clay, sand, and gravel with a predominance of clay. The lacustrine sediments consist of clay, silt, and fine sand deposited in glacial lakes. The earthen dikes which surround the Sandusky Bay margins of the wetland have provided adequate protection against shore erosion.

Soils

Redmond, et al. (1971) mapped the soils of this wetland as Marsh. Marsh soils are submerged part of the year, but they are dry long enough to permit the growth of cattails, sedges, and other water-tolerant plants. The material underlying the marsh is similar to the material in the lower part of the profile of Lenawee and Colwood soils.

Hydrology

Bay View Wetland lies adjacent to the shore of Sandusky Bay and is therefore influenced by water level fluctuations in Lake Erie. No surface streams flow through the wetland, but several drainage ditches enter it from higher ground to the south.

Walker (1962) reported that the limestone/dolomite bedrock, covered with an average of 25 feet of glacial till, may supply 300 or more gallons of water per minute at depths of around 200 feet. The literature search provided no site-specific data pertaining to water level fluctuations, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in this wetland.

Climate

The closest weather station providing climatic data for Bay View Wetland is located in Sandusky, Ohio. The average annual temperature is 51.2°F based on the normal period from 1941-1970. The mean monthly low for January is 25.0°F and the mean monthly high for July is 84.0°F. The average annual precipitation is 34.08 inches, with a mean monthly precipitation of 2.27 inches in January and 4.14 inches in July. The growing season is approximately seven months long, with the last killing frost (28°F) in 1975 occurring on April 6 and the first killing frost on November 15 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Bay View Wetland (U.S.G.S. quadrangle map, Castalia, Ohio, 1969).

BIOTIC SETTING

LE 040

Vegetation

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

Fish

General information regarding the fishes of Sandusky Bay has been published by Klippart (1877), Anon. (1939), Edmister (1940), Willis (1974), Hartley (1975), and Hartley and Herdendorf (1975). A composite list of species from Sandusky Bay, derived from these sources, is presented in Appendix A-4, indicating population trends and wetland associations of these species. Based on this information the major species utilizing Bay View Wetland probably include gizzard shad (*Dorosoma cepedianum*), goldfish (*Carassius auratus*), carp (*Cyprinus carpio*), white crappie (*Pomoxis annularis*), yellow perch (*Perca flavescens*), longnose gar (*Lepisosteus osseus*), goldenshiner (*Notemigonus crysoleucas*), white sucker (*Catostomus commersoni*), black bullhead (*Ictalurus natalis*), green sunfish (*Lepomis cyanellus*), pumpkinseed (*Lepomis gibbosus*), bluegill (*Lepomis macrochirus*), largemouth bass (*Micropterus salmoides*), black crappie (*Pomoxis nigromaculatus*), logperch (*Percina caprodes*), and bowfin (*Amia calva*). The northern pike (*Esox lucius*) and muskellunge (*Esox masquinongy*) were once common in Sandusky Bay, but the drainage of marshes and damming of tributaries has eliminated large areas of wetland spawning ground, resulting in a decline in abundance of these species.

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

Invertebrates

Information on the seasonal distribution, abundance, life histories, density and relationship to water levels for the Japanese snail (*Viviparus japonicus*), and the macroinvertebrate fauna of Sandusky Bay is available in Wolfert et al. (1968) and Herdendorf et al. (1975). The invertebrates collected during these studies may occur in Bay View Wetland owing to the proximity of this wetland to Sandusky Bay. The benthic macroinvertebrates collected by Herdendorf et al. (1975) in Sandusky Bay, 1972 to 1974, are listed in Appendix B-1. The molluscs taken from the bay in 1963 by Wolfert et al. (1968) are listed in order of abundance in Appendix B-2. Appendix B-3 presents the other invertebrate taxa collected by Wolfert et al. (1968).

The literature search yielded no site-specific information concerning productivity and major food sources of the invertebrates present in Bay View Wetland.

Reptiles and Amphibians

Species of reptiles and amphibians recorded from wetland habitats in Erie County are listed in Appendix C-1. Although not specifically reported from Bay View Wetland, some of these species may occur there. The literature search yielded no site-specific information pertaining to major species, seasonal abundance and distribution, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in Bay View Wetland.

Avifauna

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 Bay View Wetland.

Mammals

General information concerning the wetlands of southwestern Lake Erie (Bednarik 1953, 1956; Donohoe, 1961) may apply to Bay View Wetland. Also, information discussed concerning Muddy Creek Bay Wetland (LE 044) and Magee Marsh (LE 062) may apply to this wetland. However, 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 Bay View 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; Ohio Division of Wildlife, 1976) were documented in Bay View Wetland by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland. However, underground contamination due to disposal of sewage may have some effect on the health of the wetland.

CULTURAL SETTING LE 040

Population

Bay View Wetland is located in Margaretta Township of Erie County, Ohio. The county is moderately populated, having a density of 293 persons per square mile. Table 4-7 indicates that Erie County underwent slow population growth, while Margaretta Township experienced rapid population growth, between 1970 and 1975. Projections for 1990 indicate that Erie County is expected to undergo moderate population growth in the future.

Table 4-7. Population Data for the Vicinity of Bay View Wetland

	Estimated Population 1975[a]	Estimated % Δ 1970-1975[a]	Projected Population 1990[b]
Erie County	77,327	1.9	85,200
Margaretta Township	6,182	8.7	--

[a] U.S. Bureau of the Census (1977)
[b] Northern Ohio Urban System, Series 11 Method of Population Projection (1977)

Land Use and Ownership

Land use within Bay View Wetland and most of the surrounding area is rural open space. Railroad tracks run through the eastern side of Bay View Wetland and State Route 2 runs through the western side. There is an unimproved dirt road along the far eastern edge of the wetland. State Route 269 cuts across the northwestern corner. Numerous levees are present in the eastern, southern, and western portions of this wetland, and highway barrow pits are located on the western side. Railroad tracks run through the eastern side of Bay View Wetland and State Route 2 runs through the western side. There is an unimproved dirt road along the far eastern edge of the wetland. State Route 269 cuts across the northwestern corner. Numerous levees are present in the eastern, southern, and western portions of this wetland, and highway barrow pits are located on the western side. The wetland is under private ownership, but its location suggests that it is subject to moderate development pressure (U.S.G.S. quadrangle map, Castalia, Ohio, 1969).

Recreation

No known state or federal recreational facilities are present in the vicinity of Bay View Wetland.

Mineral, Energy, and Forest Resources

Potential mineral resources in Bay View Wetland include limestone and dolomite (Great Lakes Basin Commission, 1974). No significant oil, gas, and forest resources are known to be present in the vicinity.

Public Utilities and Facilities

A power transmission line runs through Bay View Wetland (U.S.G.S. quadrangle map, Castalia, Ohio, 1969).

Pollution Sources

There are no NPDES permit holders adjacent to Bay View Wetland. According to Walker (1962), the region in the vicinity of the wetland is heavily contaminated owing to underground disposal of sewage from Bellevue, Ohio, 12 miles to the south. However, 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 ft. of Bay View Wetland (Ohio Historical Preservation Office).

No known archaeological resources exist in the Bay View Wetland vicinity, but this area has not yet been systematically surveyed by a professional archaeologist (Ohio Historical Preservation Office).

RESEARCH PROJECTS

LE 040

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

WILLOW POINT WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LE 041-042

Setting

The Willow Point Wetland Complex is located partly in Margaretta Township of Erie County and partly in Townsend Township of Sandusky County, Ohio, approximately 10 miles west of the city of Sandusky. This complex, comprised of Willow Point Wetland and Whites Landing Wetland, lies on the south shore of Sandusky Bay near the communities of Springbrook and Whites Landing. These non-wooded, Palustrine wetlands are protected by earthen and rip-rap dikes, but during the high-water storms of the early 1950's and 1970's the dikes were breached and the bay flooded the interior portions of the marshes. These areas are managed for waterfowl hunting (U.S.G.S. quadrangle maps, Castalia, Ohio, 1969; Vickery, Ohio, 1969).

Topography

Willow Point Wetland lies at or near the mean elevation of Sandusky Bay and Lake Erie (571 feet above mean sea level). The wetland has very slight relief; it is entirely enclosed within the 575-foot contour line. Whites Landing Wetland lies nearly 0.2 mile south of the bay shoreline, and appears to be slightly above the level of Sandusky Bay at elevations between 571 and 580. The total relief of the Whites Landing Wetland is probably less than 5 feet. The land surface to the south of Sandusky Bay rises very gently to an elevation of 600 feet nearly 3 miles south of the complex (U.S.G.S. quadrangle maps, Castalia, Ohio, 1969; Vickery, Ohio, 1969).

Surficial Geology

Silurian dolomite bedrock along the south shore of western Sandusky Bay is covered by a 40-60 foot lay of glacial till and lacustrine deposits. Auger cores at Willow Point yielded 37 feet of lake clay capped by swampy marl and tufa, black swampy clay with shells and thin beach sand (Pincus, 1961). The till, composed mainly of silt and clay, is highly erodible (Forsyth, 1972). The major factors in shore erosion in Sandusky Bay are high winds and high lake levels. Because of the shallow nature of the bay waves seldom are higher than 30 inches, but this low wave action on the non-resistant bluffs is sufficient to cause a severe erosion problem. The average erosion rate is 5-8 feet a year (average of 125 years; 1820-1945). (U.S. Army Corps of Engineers, 1953). During cycles of high water (seasonal or long term) more rapid erosion occurs. Short term increases caused by high winds create a double erosion problem by increasing the water level and setting up wave action (Shaffer, 1951). The Ohio Department of Natural Resources (Hartley, 1961) estimated that in unprotected stretches nearly all of the Sandusky Bay shore shows rapid retreat, losing as much as 10-15 feet per year. Protected areas show little retreat.

The Sandusky Bay area is thought to be subsiding. The movement is usually ascribed to isostatic recovery of elevation following depression of the earth's crust owing to the weight of ice. This subsidence is causing the south shore of Lake Erie as well as Sandusky Bay to become lower with respect to the outlet of Lake Erie at Buffalo. The rate of relative subsidence of the earth's surface and corresponding increased depth of water at Sandusky Bay amounts to about six inches per 100 years (U.S. Army Corps of Engineers, 1953).

Soils

Redmond, et al. (1971) mapped the soils of this wetland complex as Marsh. Marsh soils are submerged part of the year, but they are dry long enough to permit the growth of cattails, sedges, and other water-tolerant plants. The material underlying the marsh is similar to the material in the lower part of the profile of Lenawee and Colwood soils.

Hydrology

The Willow Point Wetland Complex lies adjacent to the shore of Sandusky Bay and is therefore influenced by water level fluctuations of Lake Erie. Little Pickerel Creek enters Sandusky Bay at the western edge of Willow Point Wetland, and Millers Spring (also known as Millers Blue Hole) drainage stream enters the bay west of Whites Landing Wetland. Neither of these streams is important to the hydrology of the complex.

Walker (1962) reported that the limestone/dolomite bedrock, covered with an average of 25 feet of glacial till, may supply 300 or more gallons of water per minute at depths of around 200 feet. Water quality data for Sandusky Bay offshore from the complex are discussed by Hartley (1975). However, the literature search provided no site-specific data pertaining to water level fluctuations, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in these wetlands.

Climate

The closest weather station providing climatic data for the Willow Point Wetland Complex is located in Sandusky, Ohio. The average annual temperature is 51.2^{o}F based on the normal period from 1941-1970. The mean monthly low for January is 25.0^{o}F and the mean monthly high for July is 84.0^{o}F. The average annual precipitation is 34.08 inches, with a mean monthly precipitation of 2.27 inches in January and 4.14 inches in July. The growing season is approximately seven months long, with the last killing frost (28^{o}F) in 1975 occurring on April 6 and the first killing frost on November 15 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of the Willow Point Wetland Complex (U.S.G.S. quadrangle map, Vickery, Ohio, 1969).

Vegetation

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

Fish

General information regarding the fishes of Sandusky Bay as related to wetlands has been discussed in connection with Bay View Wetland (LE 040), and is also applicable to Willow Point Wetland and Whites Landing Wetland. However, a search of the literature provided no site-specific information pertaining to species composition, 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

Information on the seasonal distribution, abundance, life histories, density, and relationship to water levels for the Japanese snail, (*Viviparus japonicus*), and the macroinvertebrate fauna of Sandusky Bay is available in Herdendorf and Lindsay (1975) and Wolfert and Hiltunen (1968). The invertebrates collected during these studies probably occur in the two wetlands in Willow Point Wetland Complex owing to the proximity of this complex to Sandusky Bay.

Three species of oligochaetes, *Branchiura sowerbyi*, *Limnodrelus hoffmeisteri*, *Peloscolex ferox*, and three species of dipterans, *Chironomus c. plumosus*, *Procladius bellus*, *Coelotanypus scapularis*, (Appendix B-1) were the dominant organisms collected by Herdendorf and Lindsay (1975). *Viviparus japonicus*, *Campeloma decisum*, and *Pleurocera acuta* were the dominant molluscs collected by Wolfert and Hiltunen (1968). Appendix B-2 lists, in order of abundance, the molluscs taken from the bay in 1963 by Wolfert and Hiltunen (1968). A list of the other invertebrate taxa collected by Wolfert and Hiltunen (1968) appears in Appendix B-3.

The literature review provided no site-specific information concerning invertebrate productivity or major food sources in the two wetlands comprising this complex.

Reptiles and Amphibians

Species of reptiles and amphibians recorded from wetland habitats in Erie County are listed in Appendix C-1. Although not specifically reported from the Willow Point Wetland Complex, some of these species may occur there. The literature search yielded no site-specific information pertaining to major species, seasonal abundance and distribution, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in the two wetlands comprising the Willow Point Wetland Complex.

Avifauna

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 the Willow Point Wetland Complex.

Mammals

General information concerning the wetlands of southwestern Lake Erie (Bednarik 1953, 1956; Donohoe, 1961) may apply to the two wetlands of the Willow Point Wetland Complex. Also, information discussed concerning Muddy Creek Bay Wetland (LE 044) and Magee Marsh (LE 062) may apply to these wetlands. However, 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 Willow 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; Ohio Division of Wildlife, 1976) were documented in the Willow 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

LE 041-042

Population

Willow Point Wetland and a part of Whites Landing Wetland are located in Margaretta Township of Erie County, Ohio. The remainder of Whites Landing Wetland is located in Townsend Township of Sandusky County, Ohio. Erie County is moderately populated, with a density of 293 persons per square mile, and Sandusky County is also moderately populated, having a density of 154 persons per square mile. Table 4-8 indicates that population growth was slow in Erie County, rapid in Margaretta Township, and moderate in Sandusky County between 1970 and 1975. Townsend Township underwent a slow decline in population in that time period. Projections for 1990 indicate that future population growth will be moderate in Erie County and slow in Sandusky County.

Table 4-8. Population Data for the Vicinity of the Willow Point Wetland Complex

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Erie County	77,327	1.9	85,200
Margaretta Township	6,182	8.7	85,200
Sandusky County	63,019	3.3	68,700
Townsend Township	1,681	-1.6	--

[a] U.S. Bureau of the Census (1977)
[b] Northern Ohio Urban System, Series 11 Method of Population Projection (1977)

Land Use and Ownership

Land use within the Willow Point Wetland Complex is rural open space. The surrounding area is predominantly residential. An agricultural experimental station owned by The Ohio State University was formerly located in the southwest part of Willow Point Wetland. Levees are located in Willow Point Wetland. There are buildings within and adjacent to White's Landing Wetland, and paved roads in the vicinity. The wetlands are under private ownership, and their location suggests that they are subject to moderate development pressure (U.S.G.S. quadrangle maps, Castalia, Ohio, 1969; Vickery, Ohio, 1969).

Recreation

No known state or federal recreational facilities are present in the vicinity of the Willow Point Wetland Complex.

Mineral, Energy, and Forest Resources

Potential mineral resources in the Willow Point Wetland Complex include limestone and dolomite (Great Lakes Basin Commission, 1974). No significant oil, gas, or forest resources are known to be present in the vicinity.

Public Utilities and Facilities

No public utilities or facilities are located within 0.5 mile of the two wetlands comprising the Willow Point Wetland Complex (U.S.G.S. quadrangle maps, Castalia, Ohio, 1969; Vickery, Ohio, 1969).

Pollution Sources

There are no NPDES permit holders adjacent to the Willow Point Wetland Complex. 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 ft. of the Willow Point Wetland Complex (Ohio Historical Preservation Office).

No known archaeological resources exist in the Willow Point Wetland Complex vicinity, but this area has not yet been systematically surveyed by a professional archaeologist (Ohio Historical Preservation Office).

RESEARCH PROJECTS LE 041-042

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

PICKEREL CREEK WETLAND

PHYSIOGRAPHIC SETTING

LE 043

Setting

Pickerel Creek Wetland is located in Townsend Township of Sandusky County, Ohio, about 12 miles west of downtown Sandusky. The wetland is adjacent to the south shore of Sandusky Bay about 0.5 mile east of the mouth of Pickerel Creek. This largely wooded, Palustrine System occupies what appears to be the shallow depression of an abandoned channel of the creek (U.S.G.S. quadrangle map, Vickery, Ohio, 1969).

Topography

Pickerel Creek Wetland lies at or near the mean elevation of Sandusky Bay and Lake Erie (571 feet above mean sea level). The wetland has very little relief; it is totally enclosed within the 575-foot contour line. The land surface southwest of Sandusky Bay rises very gently to an elevation of 600 feet approximately 3 miles south of the wetland (U.S.G.S. quadrangle map, Vickery, Ohio, 1969).

Surficial Geology

Pincus (1961) reported that bedrock near the mouth of Pickerel Creek lies at an elevation below 551 feet (about 20 feet below mean lake level). Lake bluffs are only 4 feet high along the shore and are composed of lacustrine clay to a depth of 20 feet. The lake clays are underlain by at least 4 feet of glacial till. The bedrock consists of Silurian dolomite.

Soils

Jones (1974) prepared a generalized map of the soils of Sandusky county which categorized the vicinity of Pickerel Creek Wetland as Marsh Land Association, which is similar to those mapped as Marsh in Erie County by Redmond, et al. (1971). This association is composed of level to depressional, very poorly drained soils adjacent to Sandusky Bay, which formed in glacial lake deposited sediments and are affected by water level fluctuations. The major factors in shore erosion in Sandusky Bay are high winds and high lake levels. Because of the shallow nature of the bay waves seldom are higher than 30 inches, this low wave action on the non-resistant bluffs is sufficient to cause a severe erosion problem. The average erosion rate is 5-8 feet a year (average of 125 years; 1820-1845; U.S. Army Corps of Engineers, 1953). The bedrock outcrops are highly resistant but occur in few places (Humphris, 1953). During cycles of high water (seasonal or long term) more rapid erosion occurs. Short term increases caused by high winds create a double erosion problem by increasing the water level and setting up wave action (Shaffer, 1951). The Ohio Department of Natural Resources (Hartley, 1961) estimated that in unprotected stretches nearly all of the Sandusky Bay shore shows rapid retreat, losing as much as 10-15 feet per year. Protected areas show little retreat.

The Sandusky Bay area is thought to be subsiding. The movement is usually ascribed to isostatic recovery of elevation following depression of the earth's crust owing to the weight of ice. This subsidence is causing the south shore of Lake Erie as well as Sandusky Bay to become lower with respect to the outlet of Lake Erie at Buffalo. The rate of relative subsidence of the earth's surface and corresponding increased depth of water at Sandusky Bay amounts to about six inches per 100 years (U.S. Army Corps of Engineers, 1953).

Hydrology

Pickerel Creek Wetland is adjacent to Sandusky Bay and is therefore influenced by the level of Lake Erie. Short term water level changes in Sandusky Bay are caused by wind set-up resulting in free oscillation or tilting of the water surface (seiches). Seiches on Lake Erie are responsible for the extreme recorded instantaneous water levels of Sandusky Bay. The maximum instantaneous level was six feet above Low Water Datum at Sandusky during a 1972 storm (Herdendorf, 1973). The extreme instantaneous minimum occurred in January, 1942, recorded at 5 feet below Low Water Datum. According to Hartley (1975), the greatest seiche amplitude in Sandusky Bay is less than 2.5 feet with an average recurrence period of less than 12 months. Seiche activity in Sandusky Bay is often initiated by Lake Erie but is not limited to that source. Wind set-ups occur in both the western and eastern basins operating separately. Hartley (1975) showed the effect of a seiche on water levels in Lake Erie, and both basins of Sandusky Bay. The amplitude of a lake seiche is greatly reduced in the eastern basin. Moseley Channel, at the bay mouth, and the restriction at the Bay View bridges reduce the rate and force of the incoming seiche.

Although Pickerel Creek Wetland lies in a depression of a former channel of the creek, it is not influenced by the creek except during flood periods. Walker (1962) reported that the limestone/dolomite bedrock, covered with an average of 25 feet of glacial till, may supply 300 or more gallons of water per minute at depths of around 200 feet. Water quality data for Sandusky Bay offshore from the wetland are discussed by Hartley (1975). However, the literature search provided no site-specific data pertaining to water level fluctuations, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Pickerel Creek Wetland.

Climate

The closest weather station providing climatic data for Pickerel Creek Wetland is located in Sandusky, Ohio. The average annual temperature is 51.2^{o}F based on the normal period from 1941-1970. The mean monthly low for January is 25.0^{o}F and the mean monthly high for July is 84.0^{o}F. The average annual precipitation is 34.08 inches, with a mean monthly precipitation of 2.27 inches in January and 4.14 inches in July. The growing season is approximately seven months long, with the last killing frost (28^{o}F) in 1975 occurring on April 6 and the first killing frost on November 15 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are located in the vicinity of Pickerel Creek Wetland (U.S.G.S. quadrangle map, Vickery, Ohio, 1969).

BIOTIC SETTING

LE 043

Vegetation

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

Fish

General information regarding the fishes of Sandusky Bay as related to wetlands has been discussed in connection with Bay View Wetland (LE-040) and is also applicable to Pickerel Creek Wetland. However, a search of the literature provided no site-specific information pertaining to 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

Information on the seasonal distribution, abundance, life histories, density and relationship to water levels for the Japanese snail (*Viviparus japonicus*), and the macroinvertebrate fauna of Sandusky Bay is available in Wolfert and Hiltunen (1968) and Herdendorf and Lindsay (1975). The invertebrates collected during these studies probably occur in Pickerel Creek Wetland owing to the proximity of this wetland to Sandusky Bay.

Three species of oligochaetes, *Branchiura sowerbyi*, *Limnodrelus hoffmeisteri*, *Peloscolex ferox*, and three species of dipterans, *Chironomus c. plumosus*, *Procladius bellus*, *Coelotanypus scapularis*, (Appendix B-1) were the dominant organisms collected by Herdendorf and Lindsay (1975). *Viviparus japonicus*, *Campeloma decisum*, and *Pleurocera acuta* were the dominant molluscs collected by Wolfert and Hiltunen (1968). Appendix B-2 lists, in order of abundance, the molluscs taken from the bay in 1963 by Wolfert and Hiltunen (1968). Appendix B-3 presents the other invertebrate taxa collected by Wolfert and Hiltunen (1968).

The literature search yielded no site-specific information concerning invertebrate productivity or major food sources in Pickerel Creek Wetland.

Reptiles and Amphibians

Species of reptiles and amphibians recorded from wetland habitats in Sandusky County are listed in Appendix C-1. Although not specifically reported from Pickerel Creek Wetland, some of these species may occur there. The literature search yielded no site-specific information pertaining to major species, seasonal abundance and distribution, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in Pickerel Creek Wetland.

Avifauna

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 Pickerel Creek Wetland.

Mammals

General information concerning the wetlands of southwestern Lake Erie (Bednarik 1953, 1956; Donohoe, 1961) may apply to Pickerel Creek Wetland. Also, information discussed concerning Muddy Creek Bay Wetland (LE 044) and Magee Marsh (LE 062) may apply to this wetland. However, 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 Pickerel 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; Ohio Division of Wildlife, 1976) were documented in Pickerel 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 LE 043

Population

Pickerel Creek Wetland is located in Townsend Township of Sandusky County, Ohio. The county is moderately populated, having a density of 154 persons per square mile. Table 4-9 indicates that Sandusky County experienced moderate population growth, while Townsend Township underwent a slow decline in population growth, between 1970 and 1975. Projections for 1990 indicate that Sandusky County is expected to undergo slow population growth in the future.

Table 4-9. Population Data for the Vicinity of Pickerel Creek Wetland

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Sandusky County	63,019	3.3	68,700
Townsend Township	1,681	1.6	--

[a] U.S. Bureau of the Census (1977)
[b] Northern Ohio Urban System, Series 11 Method of Population Projection (1977)

Land Use and Ownership

Land use within Pickerel Creek Wetland and most of the surrounding area is rural open space. The wetland is under private ownership, but its location suggests that it is subject to minimal development pressure (U.S.G.S. quadrangle map, Vickery, Ohio, 1969).

Recreation

No known state or federal recreational facilities are present in the vicinity of Pickerel Creek Wetland.

Mineral, Energy, and Forest Resources

Potential mineral resources in Pickerel Creek Wetland include limestone and dolomite (Great Lakes Basin Commission, 1974). No significant oil, gas, and forest resources are known to be present in the vicinity.

Public Utilities and Facilities

No public utilities or facilities are located within 0.5 mile of Pickerel Creek Wetland (U.S.G.S. quadrangle map, Vickery, Ohio, 1969).

Pollution Sources

There are no NPDES permit holders are located adjacent to Pickerel Creek 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 ft. of Pickerel Creek Wetland (Ohio Historical Preservation Office).

No known archaeological resources exist in the Pickerel Creek Wetland vicinity, but this area has not yet been systematically surveyed by a professional archaeologist (Ohio Historical Preservation Office).

RESEARCH PROJECTS

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

MUDDY CREEK BAY WETLAND

3122 acres

PHYSIOGRAPHIC SETTING

LE 044

Setting

Muddy Creek Bay Wetland is the most extensive wetland on the Ohio shore of Lake Erie. It is located at the western end of Sandusky Bay in a shallow embayment (Muddy Creek Bay) at the mouths of the Sandusky River, Muddy Creek and several smaller streams. The wetland is located in Riley, Rice and Sandusky Townships of Sandusky County and Bay and Salem Townships of Ottawa County, Ohio, 6 miles south of Port Clinton and 15 miles west of Sandusky (U.S.G.S. quadrangle maps, Vickery, Ohio, 1969; Wightmans Grove, Ohio, 1969). This wetland is largely non-wooded and is protected by earthen dikes; it exhibits Lacustrine, Palustrine and Riverine components. Most of the wetland is managed for waterfowl hunting and propagation.

Topography

Muddy Creek Bay Wetland lies at or near the mean elevation of Sandusky bay and Lake Erie (571 feet above mean sea level). The wetland has very little relief; it is entirely enclosed by the 575-foot contour line. The land surface southwest of Muddy Creek Bay rises very gently to an elevation of 600 feet approximately 4 miles south of the wetland. North of the bay the land surface only reaches an elevation of 585 feet between the wetland and Lake Erie at Port Clinton (U.S.G.S. quadrangle maps, Vickery, Ohio, 1969; Lacarne, Ohio, 1967; and Port Clinton, Ohio, 1969).

Surficial Geology

In the Muddy Creek Bay area, Silurian dolomite (Bass Island Formation) bedrock is covered by a 40-foot layer of glacial till and a 20-foot layer of lacustrine clay to give a total of 60 feet of surficial material (Hartley, 1975). The till is compact and calcareous, composed dominantly of clay and silt with a small amount of sand and pebble sized material and rare boulders. The lake clay is capped in places by swampy black clay, marl and tufa (Pincus, 1961). Stein (1962) reported a shallow, buried valley under most of the wetland. This valley contains layers of sand and gravel.

Soils

Jones (1974) provided generalized soil maps of Sandusky and Ottawa counties which showed soils of the Marsh Land Association in the vicinity of Muddy Creek Bay Wetland. This association is composed of level to depressional, very poorly drained soils adjacent to Sandusky Bay, which formed in glacial lake deposited sediment and are affected by water level fluctuations. The soil material of Marsh Land is similar to Toledo soils. On occasional sight rises, the material is light colored and resembles Fulton soils.

Hydrology

Muddy Creek Bay Wetland is adjacent to Sandusky Bay and the estuarine portion of several inflowing streams, so it is influenced by the level of Lake Erie (See Hydrology Section of Pickerel Creek Wetland, LE-043). Seven major streams flow through the wetland. The drainage areas of these streams are listed in Table 4-10.

Table 4-10. Streams Flowing Through Muddy Creek Bay Wetland[a]

Stream	Drainage Area (sq. mi.)
Pickerel Creek	46.3
Raccoon Creek	34.0
South Creek	21.6
Green Creek	80.8
Yellow Swale	10.0 (estimated)
Sandusky River	1,420
Muddy Creek	111

Cross (1967)

The average discharge for the Sandusky River is 1060 cubic feet per second (cfs) or 0.75 cfs per sq. mile of drainage area. The suspended sediment load at Fremont in 1952 was 269,000 tons. The composition of the load was 61% clay, 37% silt, and 2% sand (Pincus, 1961).

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

Climate

The closest weather station providing climatic data for Muddy Creek Bay Wetland is located in Sandusky, Ohio. The average annual temperature is 51.2°F based on the normal period from 1941-1970. The mean monthly low for January is 25.0°F and the mean monthly high for July is 84.0°F. The average annual precipitation is 34.08 inches, with a mean monthly precipitation of 2.27 inches in January and 4.14 inches in July. The growing season is approximately seven months long, with the last killing frost (28°F) in 1975 occurring on April 6 and the first killing frost on November 15 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Muddy Creek Bay Wetland (U.S.G.S. quadrangle map, Vickery, Ohio, 1969; Wightmans Grove, 1969).

Vegetation

Certain characteristics of Muddy Creek Bay Wetland may be inferred from the literature regarding Winous Point (Meeks, 1969; Lowden, 1969) which lies within Muddy Creek Bay Wetland.

Much of this wetland is divided by a network of dikes into a number of marsh units, which are managed for waterfowl habitat. While it is difficult to say with certainty which marsh units may be dominated by a given species from year to year, it is possible to identify those species which are likely to occur in the area as a dominant cover type. In open water areas, major species include coontail (Ceratophyllum demersum), duckweeds (Lemna minor, L. trisulca), water-milfoil (Myriophyllum exalbescens), water-smartweed (Polygonum coccineum), American lotus (Nelumbo lutea), white waterlily (Nymphaea tuberosa), spatterdock (Nuphar advena), bullhead lily (Nuphar variegatum), pond weed (Potamogeton nodosus), and water-stargrass (Heteranthera dubia).

The ability to regulate water levels in managed marsh units has proven to be a useful tool in altering species composition at Winous Point. By altering water levels at certain times of the year, marsh managers have successfully increased the available waterfowl food and nesting cover. Species of particular concern in this regard include Walter's millet (Echinochloa walteri), cut-grass (Leersia orzyoides), blue-joint grass (Calamoagrostis canadensis), and water-smartweed (Polygonum coccineum). In addition, cattail (Typha sp.) is an abundant component of the Winous Point marshes. Other wetland species commonly occurring in these wetlands include burreed (Sparganium eurycarpum), soft-stem bulrush (Scirpus validus), hard-stem bulrush (Scirpus acutus), river-bulrush (Scirpus fluviatilis), pickerel weed (Pontederia cordata), marsh-mallow (Hibiscus palustris), swamp-loosestrife (Decodon verticillatus), and arrowhead (Sagittaria latifolia).

Lowden (1969) analyzed the flora of Winous Point with regard to changes which have occurred since 1901. Several submersed or partially emersed rooted aquatic species have disappeared from this area since Pieter's (1901) report, including elodea (Elodea canadensis), naiad (Najas flexilis), arrowhead (Sagittaria graminea), wild cherry (Vallisneria americana), and some pondweeds (Potamogeton spp.). Wild rice (Zizania aquatica) was common at the turn of the century, but Lowden reported only eight plants in 1969. Reed grass (Phragmites communis) is now common only in small isolated patches, although Pieters reported this species forming "extensive associations". In 1901 both broad-leaved cattail (Typha latifolia) and the arrowhead (Sagittaria rigida) were abundant, while narrow-leaved cattail (Typha angustifolia) and (Sagittaria latifolia) were rare. Currently, these species abundance values are reversed, with narrow-leaved cattail and Sagittaria latifolia being abundant. Lowden attributes these changes to "construction of drainage ditches in the Black Swamp, marsh management techniques at Winous Point, and pronounced physiographic changes that have occurred over the past 150 years (based on maps) at the mouths of Muddy Creek and the Sandusky River".

The literature search yielded no site-specific data pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation of Muddy Creek Bay Wetland other than that cited for the Winous Point portion.

Fish

Meeks (1966) conducted a DDT cycling study on a four-acre section of marsh at Winous Point. Major fish species found in this study included central mudminnow (*Umbra limi*), carp (*Cyprinus carpio*), brown bullhead (*Ictalurus nebulosus*), white crappie (*Pomoxis annularis*), and green sunfish (*Lepomis cyanellus*). Plants, primarily algae, constituted up to 60% of carp diet, 40% of brown bullhead diet, and 12% of green sunfish diet. Bullheads and sunfish consumed mainly small arthropods, while white crappies preyed primarily on small fish, insects, mollusks, and crustaceans. Detritus was also a component in the diets of carp, central mudminnow, and brown bullhead.

General information regarding the fish fauna of Sandusky Bay and its relation to wetlands, discussed in connection with Bay View Wetland (LE-040) is probably applicable to Muddy Creek Bay Wetland. However, a search of the literature provided no site-specific information pertaining to spawning and hatching areas, seasonal locations and abundance, life histories or recreational and commercial use of the fish populations in Muddy Creek Bay Wetland.

Invertebrates

Information on the seasonal distribution, abundance, life histories, density and relationship to water levels for the Japanese snail (*Viviparus japonicus*), and the macroinvertebrate fauna of Sandusky Bay is available in Wolfert and Hiltunen (1968) and Herdendorf and Lindsay (1975). The invertebrates collected during these studies probably occur in Muddy Creek Bay Wetland owing to the proximity of this wetland to Sandusky Bay.

Three species of oligochaetes, *Branchiura sowerbyi*, *Limnodrelus hoffmeisteri*, *Peloscolex ferox*, and three species of dipterans, *Chironomus c. plumosus*, *Procladius bellus*, *Coelotanypus scapularis*, (Appendix B-1) were the dominant organisms collected by Herdendorf and Lindsay (1975). *Viviparus japonicus*, *Campeloma decisum*, and *Pleurocera acuta* were the dominant molluscs collected by Wolfert and Hiltunen (1968). Appendix B-2 lists, in order of abundance, the molluscs taken from the bay in 1963 by Wolfert and Hiltunen (1968). Appendix B-3 presents the other invertebrate taxa collected by Wolfert and Hiltunen (1968). No information was located in the literature regarding invertebrate productivity and major food sources in Muddy Creek Bay Wetland.

Reptiles and Amphibians

Conant (1951) reported the midland painted turtle (*Chrysemys picta marginata*) in the mouth of the Sandusky River. Meeks (1966) reported the following species from a marsh unit at Winous Point: Blanchard's cricket frog (*Acris crepitans blanchardi*), northern leopard frog (*Rana pipiens*), bullfrog (*Rana catesbeiana*), green frog (*Rana clamitans melanota*), snapping turtle

(Chelydra serpentina), midland painted turtle, Blanding's turtle (Emydoidea blandingi), northern water snake (Natrix sipedon sipedon), and eastern fox snake (Elaphe vulpina gloydi). Other reptiles recorded from wetland habitats in Sandusky and Ottawa Counties are listed in Appendix C-1. Although not specifically reported from Muddy Creek Bay Wetland, some of these species may occur there.

The literature search yielded no site-specific information pertaining to seasonal abundance and distribution, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in Muddy Creek Bay Wetland.

Avifauna

Historical information on seasonal occurrence, density, and productivity of the waterfowl of Winous Point Marsh, located on the northern shore of Sandusky Bay, is available in Andrews (1952). The breeding densities for three species of waterfowl for 1964 and 1965 at Winous Point Marsh and Ottawa Club Marsh, which are part of Muddy Creek Bay Wetland, are recorded in Bandy (1965). Urban (1970) found 78 waterfowl nests at Winous Point Marsh; 72% were mallards (Anas platyrhynchos), 16% were black ducks (A. rubripes), 9% were blue-winged teal (A. discors) and 2% were unknown species. The fall diet of four waterfowl species at Winous Point Marsh was determined by Farney (1975) for 1973 and 1974. Mallards fed mainly on corn while soybeans comprised the bulk of the diet for black ducks. Pigweeds (Amaranthus spp.) were the main food item for pintails (A. acuta) and green-winged teal (A. carolinensis) (Farney, 1975).

An intensive study of the breeding biology of great blue herons (Ardea herodias) at Winous Point Marsh was conducted by Edford (1976). The adult heron population was estimated to be between 2,400 and 2,600 birds at the Elm rookery, and 260 birds at the Lane rookery. Nest success was 2.27 fledged young per nest at the Elm rookery and 1.94 fledged young per nest at the Land rookery. The most frequently observed clutch size for both areas was 3-4 eggs per nest (Edford, 1976). Bald eagles (Haliaeetus leucocephalus), currently on the Federal and Ohio Endangered Species lists, nested in this wetland at the mouth of Pickerel Creek in 1969 and at Winous Point Marsh in 1970 and 1974 (VanCamp, 1974).

The literature search provided no site-specific information pertaining to recreational and commercial use, health, life histories or relationship to water levels of the birds utilizing Muddy Creek Bay Wetland.

Mammals

Information regarding Muddy Creek Bay Wetland is based on studies conducted in Winous Point Marsh, a portion of Muddy Creek Bay Wetland, but is applicable to the entire wetland. The mammalian species which can be found on Winous Point Marsh, with their relative abundance, are listed in Table 4-11. The eastern cottontail (Sylvilagus floridanus) and the woodchuck (Marmota monax) are found most commonly on the dikes (Andrews, 1952).

Table 4-11. Relative Abundance of Mammalian Species in Winous Point Marsh[a]

Common name	Relative abundance[b]
Virginia opossum	C
eastern cottontail	P
woodchuck	P
fox squirrel	C
white-footed mouse	P
deer mouse	P
meadow vole	P
muskrat	A
norway rat	C
red fox	R
raccoon	A
long-tailed weasel	U
mink	U
striped skunk	R

[a] Andrews, 1952; Urban, 1968
[b] A=abundant
C=common
R=rare
P=present

Several mammalian species found on Winous Point Marsh have commercial value. The muskrat (Ondatra zibethicus) is the most important furbearer and receives the greatest trapping pressure in all wetlands of southwestern Lake Erie (Andrews, 1952). The trapping season in the Lake Erie district typically runs from November until March. The number of muskrat harvested from Winous Point Marsh varies with the amount of trapping pressure and the size of the muskrat population (Table 4-12). A discussion of muskrat trapping techniques, factors which influence trapping success, pelt grading, and management practices utilized to increase muskrat populations is found in several publications (Bednarik, 1953, 1956; Donohoe, 1961). Other mammals receive much less trapping pressure than muskrats, but hunting and trapping pressure on raccoons and opossums (Didelphis virginiana) may increase if the market values of their pelts increase (Andrews, 1952). Since mink (Mustela vison) and red fox (Vulpes vulpes) are uncommon on Winous Point Marsh, few are trapped. During the 1950-1951 trapping season, only ten mink and one red fox were taken on Winous Point Marsh (Bednarik, 1953, 1956).

Information concerning the life history of the muskrat on Winous Point Marsh has been provided by several studies (Anderson, 1947; Bednarik, 1953, 1956; Donohoe, 1961, 1966). Typically males are heavier than females (Table 4-13). Muskrats trapped from cattail stands or bur weed stands are the heaviest animals. Muskrats taken in mixed stands of cane and smartweed and in bluejoint grass habitat are the smallest animals (Bednarik, 1953, 1956). The harvest

Table 4-12. Harvests of muskrats from Winous Point Marsh During Trapping Seasons of 1924 through 1961[a]

Season	Harvest	Number of trappers	Catch per trapper
1924-1925	1691	13	130
1925-1926	3900	12	325
1926-1927	135	6	22
1927-1928	3755	11	341
1928-1929	5299	11	481
1929-1930	2133	10	213
1930-1931	6700	8	837
1931-1932	7178	15	478
1932-1933	5700	14	407
1933-1934	1659	13	127
1934-1935	0	0	.
1935-1936	4162	6	693
1936-1937	3594	6	599
1937-1938	4730	10	473
1938-1939	7547	10	754
1939-1940	9335	10	933
1940-1941	8253	10	825
1941-1942	7996	10	799
1942-1943	6113	10	611
1943-1944	9536	9	1059
1944-1945	9308	10	930
1945-1946	10191	11	926
1946-1947	5580	10	558
1947-1948	2743	9	304
1948-1949	5433	8	679
1949-1950	6518	7	931
1950-1951	7362	7	1051
1951-1952	9801	8	1225
1952-1953	10502	6	1750
1953-1954	6440	6	1073
1954-1955	5232[b]	6	872
1955-1956	2014[b]	5	402
1956-1957	1788	4	447
1957-1958	1439	4	359
1958-1959	1854	6	309
1959-1960	3835	7	547
1960-1961	6604	6	1100
total	196060	314	624
average	5299	8.5	

[a]from Donohoe, 1961
[b]Total includes muskrat trapped at nearby marsh

usually yields a preponderance of males (Table 4-13), but this observation may be a result of behavior differences between males and females rather than a population/sex ratio that is different from 1 to 1.

Table 4-13. Mean Weight and Sex Ratios of Muskrats Harvested from Winous Point Marsh between 1945 and 1958

Season	Mean weight in kg (lbs) males	females	Percent males
1945-1946[a]	1.09 (2.40)	0.95 (2.09)	55.2
1950-1951[b]	1.04 (2.29)	1.09 (2.40)	58.2
1954-1955[c]	1.18 (2.60)	1.13 (2.49)	53.4
1955[c,d]	0.95 (2.09)	1.00 (2.20)	51.6
1955-1956[c]	1.18 (2.60)	1.13 (2.49)	54.5
1956-1957[c]	1.18 (2.60)	1.13 (2.49)	57.2
1957-1958[c]			58.8

[a] from Anderson, 1947
[b] adapted from Bednarik, 1953, 1956
[c] adapted from Donohoe, 1961, 1966
[d] data from muskrat trapped outside the trapping season

Several structures observed on Winous Point Marsh are associated with the activity of muskrats (Bednarik, 1953, 1956). The most noticable structure is the muskrat house, a dome-shaped pile of emergent vegetation. The average house varies in size from three to eight feet in diameter at the base and from two to six feet in height. Houses are located in stands of emergent vegetation or along the periphery of such stands. Houses are often constructed on protuberances in the marsh bottom, utilizing plants in the immediate area. The majority of houses are constructed during the fall, chiefly from October to November. Building activity occurs mainly during periods of darkness. Representative densities of active muskrat houses on a portion of Winous Point Marsh are given in Table 4-14. Smaller houses have one living chamber and larger houses have two or three living chambers above the water line. The living chamber is about 15 to 20 inches in height and is formed by the muskrat chewing out the vegetation. Most houses have two underwater exits or plunge holes. Other structures made by muskrats are associated with feeding activity. Rafts are constructed from stems of plants piled in a circular fasion to serve as a feeding platform. "Feeding bogs" are covered, floating platforms which are smaller in dimensions than the muskrat house and are no higher than 40.6 cm (16 in.), averaging 61.0 cm (24 in.) in diameter. These structures are usually located some distance from the larger muskrat house and serve as protected feeding sites. "Push-ups" are formed only in the winter and are small, hollow, dome-shaped shells of submergent vegetation over a plunge hole in the ice. These protected plunge holes allow the muskrat to extend the area over which it can forage since it can travel greater distances under the ice.

Table 4-14. Density of Active Muskrat Houses on a 29.2 ha (73 acre) Portion of Winous Point Marsh from 1949 to 1952[a]

Year	Number of active houses	Active houses per ha. (acre)
1949	310	10.6 (4.3)
1950	292	10.0 (4.0)
1951	206	7.1 (2.9)
1952	128	4.4 (1.8)

[a] adapted from Bednarik, 1953, 1956

A detailed study of muskrat feeding habitats (Bednarik, 1953, 1956) concluded that muskrats have a wide range of feeding behavior patterns. Muskrats consume a wide variety of food items (Table 4-15) and usually select plant species which are immediately available to them. Narrow-leaved cattail (Typha angustifolia) and bur weed (Sparganium eurycarpum) are the first and second most important food items, respectively, throughout the year. Other plant species are consumed more frequently when they are in active stages of growth.

The reproductive cycle of the muskrat on Winous Point Marsh has been documented by several researchers (Bednarik, 1953, 1956; Donohoe, 1961, 1966). Reproductive activity begins in January and ends in September, with the greatest activity occurring in February and March. The time of first mating is determined in part by the time of ice breakup. The gestation period varies from 20 to 28 days. Females usually have two litters of young per season although many may have three litters per season. Placental scar counts indicated that the mean number of young per litter is 10.9, but Bednarik (1953; 1956) concluded that at the time of birth, the average litter size is 8.3 with a range of three to nine young muskrat per litter. Donohoe (1961, 1966) found that the average litter size is 6.8 with a range of two to ten. Litters from April to August are smaller, with 5.8 young per litter, than earlier litters from February and March which had 7.1 young per litter. In 1950, 78.8% of female muskrats bore litters. In April and May 1950, 14.4% of the active houses examined contained a litter. In May and June 1950, 80.3% of the dike dens and burrows examined contained a litter. The sex ratio in the litters was 53.7% males to 46.3% females. Some female muskrats were observed to be sexually mature at 9 to 10 months of age.

Mortality factors of the muskrat population on Winous Point Marsh have been discussed by Bednarik (1953, 1956). Predation by mink would not have an important influence on the muskrat population unless the mink population should increase dramatically and buffer species decrease. Predation on juvenile muskrats by raccoons and Norway rats (Rattus norvegicus) occurs in early summer and is not an important mortality factor. The loss of one to two muskrat per week through July and August 1951 was attributed to hemorrhagic or "Errington's" disease. This disease often is considered the cause of fluctuations of muskrat populations in all southwestern Lake Erie wetlands.

Table 4-15. Food Items of Muskrat on Winous Point Marsh[a]

Common name	Scientific name
narrow-leaved cattail	Typha angustifolia
bur reed	Sparganium eurycarpum
bluejoint	Calamagrostis canadensis
needle grass[b]	
smartweed	Polygonum natans
cane	Phragmites maximus
rose mallow	Hibiscus palustris
swamp dock	Rumex verticillatus
white water lily	Nymphaea tuberosa
American lotus	Nelumbo lutea
swamp milkweed	Asclepias incarnata
common alfalfa	Medicago sativa
white sweet clover	Melilotus alba
spike rush	Eleocharis robbinsii
Walter's millet	Echinochloa walteri
blue grass	Poa pratensis
blue swamp iris	Iris versicolor
duck weed	Lemna sp.
button bush	Cephalanthus occidentalis
pickerel weed	Pontederia cordata
sago pondweed	Potamogeton pectinatus
coontail	Ceratophyllum demersum
water milfoil	Myriophyllum sp.
gizzard shad[c]	Dorosoma cepedianum
carp[c]	Cyprinus carpic
crayfish	Cambarus sp.

[a]adapted from Bednarik, 1953, 1956
[b]no scientific name given
[c]muskrat often use winter-killed individuals found under the ice as food sources

The water level stability of the marsh areas influences the density of muskrat on Winous Point Marsh. Those areas with more stable water levels have more muskrat houses per acre than areas with fluctuating water levels (Table 4-16). This difference is attributed to the absence of excessive wave action on areas with stable water levels and the relationship between good muskrat food plants and stable water levels (Bednarik, 1953, 1956). Also, marsh areas which are diked provide more suitable sites for bank dens (Donohoe, 1961; 1966).

Table 4-16. Number of Muskrat Houses per Hectare (Acre) on Areas with Different Water Level Stability on Winous Point Marsh

Water level stability	Year			
	1948[a]	1945[b]	1955[b]	1956[b]
stable[c]	7.7 (3.1)	4.9 (2.0)	2.8 (1.1)	2.6 (1.0)
fluctuating[d]	2.0 (0.8)	0.6 (0.2)	0.4 (0.2)	0.8 (0.3)
semi-stable	2.1 (0.8)			

[a] adapted from Bednarik, 1953, 1956
[b] adapted from Donohoe, 1961, 1966
[c] In Donohoe, 1961, 1966 referred to as controlled water level units
[d] In Donohoe, 1961, 1966 referred to as uncontrolled water level units

The stability of water levels also is related to the productivity of the muskrat population (Donohoe, 1961; 1966). The physiology of reproduction does not differ between areas of stable or controlled water levels and fluctuating or uncontrolled water levels, but higher productivity occurs on areas with stable water levels (Table 4-17). Juvenile muskrats are heavier in areas with stable water levels. Donohoe (1961, 1966) concluded that a higher density of muskrats occurs on areas with stable water levels because of a higher survival of juvenile muskrats on those areas.

Table 4-17. Juvenile to Adult Female Ratios for Muskrat Harvests from Controlled (C) and Uncontrolled (U) Water Level Areas at Winous Point Marsh[a]

Season	Juveniles per adult female	
	C	U
1954-1955	4.8	3.5
1955[b]	3.2	0.7
1955-1956	8.0	3.9
1956-1957	9.7	
1957-1958	10.1	
Mean	7.2	2.7

[a] from Donohoe, 1961, 1966
[b] based on data from muskrats collected outside the trapping season

Muskrat can use drained areas year round by utilizing bank dens (Meeks, 1963, 1969). After the area is reflooded, muskrat move in from other areas and construct houses in all types of emergent vegetation except bluejoint grass (Calamagrostis canadensis) and annual weeds. Removal of water from the marsh in mid-March dramatically decreases the number of young muskrat produced. Marsh management practices should allow for water depths great enough to prevent the marsh from freezing solid. When the marsh freezes solid, great mortality occurs in the muskrat population (Bednarik, 1953, 1956; Meeks 1963, 1969).

The density of the raccoon (Procyon lotor) population in North Winous Point Marsh has been estimated to be 17.4 raccoons per square km (45.3 per square mile). This density is higher than raccoon densities reported for other wetlands (Urban, 1968, 1970). The juvenile to adult female ratio in the years reported was 1.20 juveniles per adult female indicating a moderate productivity for the raccoon population.

Several aspects of the life history of the raccoon on Winous Point Marsh were investigated by a trapping and telemetry study (Urban, 1968, 1970). The mean weights of both adults and juveniles increased from spring till early winter and then decreased over the winter (Table 4-18). Male raccoons represented 60% of the trapped adults and 62.5% of the trapped juveniles. The higher frequency of males in the trapped sample may be a result of behavior differences between male and female raccoons.

Table 4-18. Mean Seasonal Weights of Adult and Juvenile Raccoons Trapped on Winous Point Marsh in 1967-1968[a]

Season	Adults mean weight in kg (lbs.)	Adults range (kg)	Adults sample size	Juveniles mean weight in kg (lbs.)	Juveniles range (kg)	Juveniles sample size
Summer	4.9 (10.8)	3.2-6.8	19	2.2 (4.8)	1.4-2.9	14
Fall	5.8 (12.8)	4.5-7.3	5	2.6 (5.7)	0.9-4.4	14
Winter	6.9 (15.2)	5.4-8.2	3	5.1 (11.2)	4.1-5.9	3
Spring	4.7 (10.3)	3.4-5.9	7	2.9 (6.4)	2.5-3.7	3

[a] Urban (1968)

The telemetry portion of the study provided information on raccoon movements, home range, and denning. The researcher noted that these results may not be directly characteristic of the entire population since the nine radio-tagged raccoons might not be a large enough sample to be representative of the entire population. Generally raccoons spend the daytime period in or near dens. The amount of nocturnal movement is related to the size of the home range. Raccoons with larger home ranges move greater distances. Raccoons move at a mean rate of 161.6 m per hour (530 ft/hr). Male juvenile raccoons disperse from the marsh in the fall. Marsh is the major habitat type encompassed in an average night of travel (Table 4-19) and the habitat type in which raccoons spend the most time (Table 4-20). Raccoons spend approximately 73% of the time in the vicinity of shallow water. Raccoons do not search out waterfowl nests, since little change occurs in their movement patterns when waterfowl nesting is initiated. Main and spoil dikes receive high usage in proportion to the amount of area they represent in the marsh. Movements of female raccoons encompass more wooded area per night than the movements of male raccoons. Also, female raccoons spend more time in wooded areas than male raccoons.

Table 4-19. Mean Hectares (Acres) of Habitat Encompassed in Average Night Travel by Raccoons on Winous Point Marsh[a]

Habitat	Mean hectares (Acres) per night	
marsh (emergent vegetation)	18.84	(46.6)
marsh (open water)	4.88	(12.1)
wood lots	1.56	(3.9)
wet meadows	0.80	(2.0)
farm land	0.12	(0.3)
Total	26.56	(65.6)
main dikes	1023.28[b]	(3356)
spoil dikes	417.24[b]	(1369)

[a] Urban (1968)
[b] mean meters (feet) per night

Table 4-20. Percent of Hourly Fixes[a] in Relation to Habitat Type for Radio-tagged Raccoons on Winous Point Marsh[b]

Habitat	Percent of hourly fixes		
	winter	spring	total
marsh (emergent vegetation)	54.8	49.2	50.6
woodlots	5.9	11.6	10.1
wet meadows	0.7	5.5	4.3
farm land	0.7	0	0.2
main dikes	15.6	16.6	16.3
spoil dikes	22.2	17.1	18.4

[a] an index to the amount of time an animal spends in a habitat type
[b] Urban (1968)

The average home range of a raccoon is 47.84 ha (118.2 acres) in size. This figure is smaller than home range sizes reported by other studies of marsh raccoons. The majority of the home range is in marsh habitat (Table 4-21). Adult males have the largest home ranges. Female home ranges contain more wooded areas than male home ranges.

Various structures are used as dens by raccoons (Table 4-22). Raccoons typically use more than one den. Muskrat houses are the most common type, but tree dens are heavily utilized in late fall and winter.

Table 4-21. Mean Hectares (Acres) of Habitat Types Found in Home Ranges of Radio-tagged Raccoons on Winous Point Marsh[a]

Habitat	Mean hectares (Acres)	Percent
marsh (emergent vegetation	29.92 (73.93)	62.0
marsh (open water)	11.92 (29.45)	24.7
wood lots	4.44 (10.97)	9.2
wet meadows	1.72 (4.25)	3.6
farm land	0.24 (0.59)	0.5
Total	47.84 (118.21)	

[a] Urban (1968)

Table 4-22. Types of Dens and Frequency of Use by Radio-tagged Raccoons on Winous Point Marsh[a]

Den type	Number	Percent	Number of times used	Percent of times used
muskrat houses	19	57.6	50	60.9
dead elm trees	5	15.1	21	25.9
willow trees	4	12.1	6	7.3
bank dens	2	6.1	2	2.4
wood duck boxes	1	3.0	1	1.2
hackberry trees	2	6.1	2	2.4
Total	33		82	

[a] Urban (1968)

Food items of raccoons on Winous Point Marsh include muskrat, crayfish, fish, duck eggs, plant material, seeds, and birds (Andrews 1952; Bednarik, 1953, 1956, Urban, 1968). Bednarik (1953, 1956) indicated that fish, crayfish, and plant material were the chief food items in all seasons. Muskrat fur was found in only 8% of 169 scats collected year round. Urban (1968) found muskrat fur in 47% of 30 scats collected in the spring. Andrews (1952) noted that chimney crayfish (*Cambarus limosum*) is a favorite food of raccoons in the summer. Raccoons were responsible for the termination of 39% of the 64 waterfowl nests found on dikes in 1967 and 1968 (Urban, 1968, 1970).

Red foxes, opossums, and striped skunks (*Mephitis mephitis*) are all predators of duck eggs. In 1967 and 1968, red fox, opossum and striped skunk terminated 20%, 11%, and 2%, respectively, of the 64 waterfowl nests found on dikes (Urban, 1968; 1970). Food items of the Norway rat on Winous Point Marsh include crayfish, fish, birds, juvenile muskrat, and duck eggs (Bednarik, 1953, 1956). Food items of the mink on Winous Point Marsh include fish, crayfish, muskrat and birds (Bednarik, 1953, 1956). Mink were responsible for termination of two percent of the 64 waterfowl nest found on dikes in 1967 and 1968 (Urban, 1968; 1970).

Endandgered Species

Bald eagles nested at the mouth of Pickerel Creek in 1969, and at Winous Point Marsh in 1970 and 1974 (Van Camp, 1974). No other plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Ohio Division of Wildlife, 1976) were documented in this wetland by the literature search.

Health

Site specific information indicates that the environmental quality of Muddy Creek Bay Wetland is good. Most of the wetland is managed for waterfowl breeding, propagating, and resting. A wide diversity of plant species, as well as great number of waterfowl and mammals, inhabit the wetland. However, three NPDES permit holders discharge waste into nearby waters and this may have some effect on the health of the wetland.

CULTURAL SETTING

LE 044

Population

Muddy Creek Bay Wetland is located in Bay Township of Ottawa County, Ohio, and in Riley and Rice Townships of Sandusky County, Ohio. Both counties are moderately populated, with Ottawa County having a density of 149 persons per square mile and Sandusky County having a density of 154 persons per square mile. Table 4-23 indicates that population growth was moderate in Ottawa County, Sandusky County, and Rice Township, rapid in Bay Township, and slow in Riley Township between 1970 and 1975. Projections for 1990 indicate that Ottawa and Sandusky County are expected to undergo slow population growth.

Table 4-23. Population Data for the Vicinity of Muddy Creek Bay Wetland

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Ottawa County	38,828	4.7	41,500
Bay Township	1,990	10.7	--
Sandusky County	63,019	3.3	68,700
Riley Township	1,419	2.8	--
Rice Township	881	3.5	--

[a] U.S. Bureau of the Census (1977)
[b] Northern Ohio Urban System, Series 11 Method of Population Projection (1977)

Land Use and Ownership

Land use within Muddy Creek Bay Wetland and most of the surrounding area is rural open space. Levees are present throughout Muddy Creek Wtland. Many unimproved dirt roads and some hard surface roads run a short way into the wetland, and State Route 53 passes close to the western edge. A few buildings are located within the wetland. The wetland is under private ownership, but its location suggests that it is subject to minimal development pressure (U.S.G.S. quadrangle map, Vickery, Ohio, 1969).

Recreation

No known state or federal recreational facilities are present in the vicinity of Muddy Creek Bay Wetland.

Mineral, Energy, and Forest Resources

Potential mineral resources in the vicinity of Muddy Creek Bay Wetland include limestone and dolomite (Great Lakes Basin Commission, 1974). No significant oil, gas, and forest resources are known to be present in the vicinity.

Public Utilities and Facilities

No public utilities or facilities are located within 0.5 mile of Muddy Creek Bay Wetland (U.S.G.S. quadrangle map, Vickery, Ohio, 1969; Wightmans Grove, Ohio, 1969).

Pollution Sources

Three NPDES permit holders discharge pollutants into waters which may affect Muddy Creek Bay Wetland: a water pollution control plant discharges treated effluents from meat processors, foundries, dairy operations, and vinyl plastic producers into Sandusky Bay; the Village of Lindsey Sewage Treatment

Plant discharges process waters into Muddy Creek; and the J.E. Baker Co. Lime Division releases an unknown discharge into Muddy Creek. 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 ft. of Muddy Creek Bay Wetland (Ohio Historical Preservation Office).

No known archaeological resources exist in the Muddy Creek Bay Wetland vicinity, but this area has not yet been systematically surveyed by a professional archaeologist (Ohio Historical Preservation Office).

RESEARCH PROJECTS

LE 044

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

PORT CLINTON WETLAND

PHYSIOGRAPHIC SETTING

LE 045

Setting

Port Clinton Wetland is located on the north shore of Sandusky Bay, immediately south of the southern boundary of the city of Port Clinton, in Bay and Portage Townships of Ottawa County. The wetland is adjacent to Sandusky Bay and extends inland for 1.3 miles. This largely non-wooded, Palustrine System is protected by earthen and rip-rap dikes which failed during the high water storms of the early 1970's (U.S.G.S. quadrangle map, Vickery, Ohio, 1969).

Topography

Port Clinton Wetland lies at or near the mean elevation of Sandusky Bay and Lake Erie (571 feet above mean sea level). The wetland has very little relief; it is completely enclosed within the 575-foot contour line. The shore north of the bay rises to an elevation of 585 feet between the wetland and Lake Erie at Port Clinton (U.S.G.S. quadrangle maps, Port Clinton, Ohio, 1969; Vickery, Ohio, 1969).

Surficial Geology

Surficial material of Port Clinton Wetland consists of lacustrine sediments and glacial till overlying Silurian dolomite (Bass Island Formation) bedrock. An auger boring at Fulton Street, at the east edge of the wetland, indicated 12 feet of laminated lake clay underlain by 11 feet of glacial till (Pincus, 1961). A test boring a few miles east of the wetland showed the bedrock surface to be at an elevation of 559 feet (12 feet below lake level).

Soils

Jones (1974) provided a generalized soils map of Ottawa County which showed soils of the Marsh Land Association in the vicinity of the wetland. This association is composed of level to depressional, very poorly drained soils adjacent to Sandusky Bay, which formed in glacial lake deposited sediment and are affected by water level fluctuations. The soil material of Marsh Land is similar to Toledo soils, but on occasional slight rises the material is light colored and resembles Fulton soils.

Hydrology

The wetland is adjacent to Sandusky Bay, so it is influenced by the level of Lake Erie. No streams flow through the wetland, with the exception of a drainage ditch which enters the wetland from the northeast.

Walker (1962) reported that the limestone/dolomite bedrock, covered with an average of 25 feet of glacial till, may supply 300 or more gallons of water per minute at depths of around 200 feet. Water level fluctuations and water quality data for Sandusky Bay are discussed by Hartley (1975). However, the literature search provided no site-specific data pertaining to water level fluctuations, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Port Clinton Wetland.

Climate

The closest weather station providing climatic data for Port Clinton Wetland is located in Sandusky, Ohio. The average annual temperature is 51.2°F based on the normal period from 1941-1970. The mean monthly low for January is 25.0°F and the mean monthly high for July is 84.0°F. The average annual precipitation is 34.08 inches, with a mean monthly precipitation of 2.27 inches in January and 4.14 inches in July. The growing season is approximately seven months long, with the last killing frost (28°F) in 1975 occurring on April 6 and the first killing frost on November 15 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Port Clinton Wetland (U.S.G.S. quadrangle map, Vickery, Ohio, 1969).

BIOTIC SETTING LE 045

Vegetation

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

Fish

General information regarding the fish populations of Sandusky Bay as related to wetlands is discussed in connection with Bay View Wetland (LE-040) and is probably applicable to Port Clinton Wetland. However, a search of the literature provided no site-specific information pertaining to 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

Information on the seasonal distribution, abundance, life histories, density and relationship to water levels for the Japanese snail (*Viviparus japonicus*), and the macroinvertebrate fauna of Sandusky Bay is available in Wolfert and Hiltunen (1968) and Herdendorf and Lindsay (1975). The invertebrates collected during these studies may occur in Port Clinton Wetland owing to the proximity of this wetland to Sandusky Bay. A list of the benthic macroinvertebrates collected by Herdendorf and Lindsay (1975) in Sandusky Bay, 1972 to 1974, appears in Appendix B-1. The molluscs taken from the bay in 1963 by Wolfert and Hiltunen (1968) are listed in order of abundance in Appendix B-2. Appendix B-3 includes the other invertebrate taxa collected by Wolfert and Hiltunen (1968).

The literature review yielded no site-specific information regarding invertebrate productivity or food sources in Port Clinton Wetland.

Reptiles and Amphibians

Species of reptiles and amphibans recorded from wetland habitats in Ottawa County are listed in Appendix C-1. Although not specifically reported from Port Clinton Wetland, some of these species may occur there. The literature search yielded no site-specific information pertaining to major species, seasonal abundance and distribution, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in Port Clinton Wetland.

Avifauna

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 Port Clinton Wetland.

Mammals

General information concerning the wetlands of southwestern Lake Erie (Bednarik 1953, 1956; Donohoe, 1961) may apply to Port Clinton Wetland. Also, information discussed concerning Muddy Creek Bay Wetland (LE-044) and Magee Marsh (LE-062) may apply to this wetland. However, 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 Clinton 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; Ohio Division of Wildlife, 1976) were documented in Port Clinton Wetland by the literature search.

Health

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

Population

Port Clinton Wetland is located in Portage and Bay Townships of Ottawa County, Ohio. The county is moderately populated, having a density of 149 persons per square mile. Table 4-24 indicates that population growth was moderate in Ottawa County, slow in Portage Township, and rapid in Bay Township between 1970 and 1975. Projections for 1990 indicate that Ottawa County is expected to undergo slow population growth in the future.

Table 4-24. Population Data for the Vicinity of Port Clinton Wetland

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Ottawa County	38,828	4.7	41,500
Portage Township	8,129	2.3	--
Bay Township	1,990	10.7	--

[a] U.S. Bureau of the Census (1977)
[b] Northern Ohio Urban System, Series 11 Method of Population Projection (1977)

Land Use and Ownership

Land use within Port Clinton Wetland is rural open space. The surrounding area is predominantly residential. Levees are present throughout Port Clinton Wetland. Power transmission lines run across the northern part of the wtland. A few buildings are located in the southwest corner of this wetland, and a dual highway passes to the north. The wetland is under private ownership, and its location suggests that it is subject to moderate development pressure (U.S.G.S. quadrangle map, Vickery, Ohio, 1969).

Recreation

No known state or federal recreational facilities are present in the vicinity of Port Clinton Wetland.

Mineral, Energy, and Forest Resources

Potential mineral resources in Port Clinton Wetland include gypsum, limestone, and dolomite (Great Lakes Basin Commission, 1974). No significant oil, gas, and forest resources are known to be present in the vicinity.

Public Utilities and Facilities

No public utilities or facilities are located within 0.5 mile of Port Clinton Wetland (U.S.G.S. quadrangle map, Vickery, Ohio, 1969).

Pollution Sources

There are no NPDES permit holders adjacent to Port Clinton 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 ft. of Port Clinton Wetland (Ohio Historical Preservation Office).

No known archaeological resources exist in the Port Clinton Wetland vicinity, but this area has not yet been systematically surveyed by a professional archaeologist (Ohio Historical Preservation Office).

RESEARCH PROJECTS

LE 045

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

LOCKWOOD ROAD WETLAND

PHYSIOGRAPHIC SETTING

LE 046

Setting

Lockwood Road Wetland is located on the north shore of western Sandusky Bay in Portage Township of Ottawa County, Ohio, two miles southeast of the city of Port Clinton. This non-wooded, Palustrine wetland is protected by earthen and rip-rap dikes (U.S.G.S. quadrangle map, Vickery, Ohio, 1969).

Topography

Lockwood Road Wetland lies at or near the mean level of Lake Erie (571 feet above mean sea level) at its juncture with Sandusky Bay. Inland the wetland rises above the 575-foot contour line and is bounded by the 580-foot contour to yield a total relief of nearly 10 feet. Immediately north of the wetland the land surface rises to 610 feet above sea level at a gypsum quarry. Elsewhere in the vicinity of the wetland the slope of the land surface is very gentle (U.S.G.S. quadrangle map, Vickery, Ohio, 1969).

Surficial Geology

Surficial material in the vicinity of Lockwood Road Wetland consists of lacustrine sediments and glacial till overlying Silurian dolomite (Bass Island Formation) bedrock. An auger boring near the intersection of Fulton Street and Lockwood Road (2 miles west of the wetland) indicated 12 feet of laminated lake clay underlain by 11 feet of glacial till (Pincus, 1961). A test boring near Hickory Grove (1 mile west of the wetland) showed an elevation of the bedrock surface at 559 feet (12 feet below lake level).

Soils

Jones (1974) provided a generalized soils map of Ottawa County which showed soils of the Marsh Land Association in the vicinity of Lockwood Road Wetland. This association is composed of level to depressional, very poorly drained soils adjacent to Sandusky Bay, which formed in glacial lake deposited sediment and are affected by water level fluctuations. The soil material of Marsh Land is similar to Toledo soils, but on occasional slight rises, the material is light colored and resembles Fulton soils.

Hydrology

Lockwood Road Wetland is adjacent to Sandusky Bay, so it is influenced by the level of Lake Erie. No streams flow through the wetland with the exception of a drainage ditch which enters the wetland from the northeast.

Walker (1962) reported that the limestone/dolomite bedrock, covered with an average of 25 feet of glacial till, may supply 300 or more gallons of water per minute at depths of around 200 feet. Water level fluctuations and water quality data for Sandusky Bay are discussed by Hartley (1975). The literature search provided no site-specific data pertaining to water level fluctuations, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in this wetland.

Climate

The closest weather station providing climatic data for Lockwood Road Wetland is located in Sandusky, Ohio. The average annual temperature is 51.2^{o}F based on the normal period from 1941-1970. The mean monthly low for January is 25.0^{o}F and the mean monthly high for July is 84.0^{o}F. The average annual precipitation is 34.08 inches, with a mean monthly precipitation of 2.27 inches in January and 4.14 inches in July. The growing season is approximately seven months long, with the last killing frost (28^{o}F) in 1975 occurring on April 6 and the first killing frost on November 15 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Lockwood Road Wetland (U.S.G.S. quadrangle map, Vickery, Ohio, 1969).

BIOTIC SETTING

LE 046

Vegetation

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

Fish

General information regarding the fishes of Sandusky Bay as related to wetlands is discussed in connection with Bay View Wetland (LE-040) and is probably applicable to Lockwood Road Wetland. However, a search of the literature provided no site-specific information pertaining to 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

Information on the seasonal distribution, abundance, life histories, density and relationship to water levels for the Japanese snail (*Viviparus japonicus*), and the macroinvertebrate fauna of Sandusky Bay is available in Wolfert and Hiltunen (1968) and Herdendorf and Lindsay (1975). The invertebrates collected during these studies may occur in Lockwood Road Wetland owing to the proximity of this wetland to Sandusky Bay. A list of the benthic macroinvertebrates collected by Herdendorf and Lindsay (1975) in Sandusky Bay, 1972 to 1974, appears in Appendix B-1. The molluscs taken from the bay in 1963 by Wolfert and Hiltunen (1968) are listed in order of abundance in Appendix B-2. Appendix B-3 includes the other invertebrate taxa collected by Wolfert and Hiltunen (1968).

The literature review yielded no site-specific information regarding invertebrate productivity or food sources in Lockwood Road Wetland.

Reptiles and Amphibians

Species of reptiles and amphibans recorded from wetland habitats in Ottawa County are listed in Appendix C-1. Although not specifically reported from Lockwood Road Wetland, some of these species may occur there. The literature search yielded no site-specific information pertaining to major species, seasonal abundance and distribution, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in Lockwood Road Wetland.

Avifauna

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 Lockwood Road Wetland.

Mammals

General information concerning the wetlands of southwestern Lake Erie (Bednarik 1953, 1956; Donohoe, 1961) may apply to Lockwood Road Wetland. Also, information discussed concerning Muddy Creek Bay Wetland (LE-044) and Magee Marsh (LE-062) may apply to this wetland. However, 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 Lockwood Road 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; Ohio Division of Wildlife, 1976) were documented in Lockwood Road Wetland by the literature search.

Health

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

Population

Lockwood Road Wetland is located in Portage Township of Ottawa County, Ohio. The county is moderately populated, having a density of 149 persons per square mile. Table 4-25 indicates that Ottawa County experienced moderate population growth, while Portage Township experienced slow population growth, between 1970 and 1975. Projections for 1990 indicate that Ottawa County is expected to undergo slow population growth in the future.

Table 4-25. Population Data for the Vicinity of Lockwood Road Wetland

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Ottawa County	38,828	4.7	41,500
Portage Township	8,129	2.3	--

[a] U.S. Bureau of the Census (1977)
[b] Northern Ohio Urban System, Series 11 Method of Population Projection (1977)

Land Use and Ownership

Land use within Lockwood Road Wetland is rural open space. The surrounding area is predominantly residential. A few hard surface roads pass through the northern part of Lockwood Road Wetland, and an unimproved dirt road crosses the southwestern area. Levees are present throughout the wetland and a highway barrow pit is located in the northern portion. The wetland is under private ownership, and its location suggests that it is subject to moderate development pressure (U.S.G.S. quadrangle map, Vickery, Ohio, 1969).

Recreation

No known state or federal recreational facilities are present in the vicinity of Lockwood Road Wetland.

Mineral, Energy, and Forest Resources

Potential mineral resources in Lockwood Road Wetland include gypsum, limestone, and dolomite (Great Lakes Basin Commission, 1974). No significant oil, gas, and forest resources are known to be present in the vicinity.

Public Utilities and Facilities

No public utilities or facilities are located within 0.5 mile of Lockwood Road Wetland (U.S.G.S. quadrangle map, Vickery, Ohio, 1969).

Pollution Sources

There are no NPDES permit holders adjacent to Lockwood Road 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 ft. of Lockwood Road Wetland (Ohio Historical Preservation Office).

No known archaeological resources exist in the Lockwood Road Wetland vicinity, but this area has not yet been systematically surveyed by a professional archaeologist (Ohio Historical Preservation Office).

RESEARCH PROJECTS

LE 046

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

PORTAGE WETLAND

PHYSIOGRAPHIC SETTING

LE 047

Setting

Portage Wetland is located on the north shore of western Sandusky Bay in Portage Township of Ottawa County, Ohio, 8 miles northwest of Sandusky, 4 miles southeast of Port Clinton and 0.2 mile from Horseshoe Island. This non-wooded, Palustrine wetland is protected by earthen dikes from the open water of Sandusky Bay (U.S.G.S. quadrangle map, Castalia, Ohio, 1969).

Topography

Portage Wetland lies at or near the mean level of Lake Erie (571 feet above mean sea level). The wetland has very little relief; it is completely enclosed by the 575-foot contour line. North of the bay shore the land surface gently rises to 600 feet about 2 miles from the wetland (U.S.G.S. quadrangle maps, Castalia, Ohio, 1969; Gypsum, Ohio, 1969).

Surficial Geology

Surficial material in the vicinity of Portage Wetland consists of lacustrine sediments and glacial till overlying Silurian dolomite (Bass Island Formation) bedrock. A water well within one mile of the wetland indicated 59 feet of unconsolidated material, including gravel, over the rock (Walker, 1962).

Soils

Jones (1974) provided a generalized soils map of Ottawa County which showed soils of the Marsh Land Association in the vicinity of Portage Wetland. This association is composed of level to depressional, very poorly drained soils adjacent to Sandusky Bay, which formed in glacial lake deposited sediment and are affected by water level fluctuations. The soil material of Marsh Land is similar to Toledo soils, but on occasional slight rises, the material is light colored and resembles Fulton soils.

Hydrology

Portage Wetland is adjacent to Sandusky Bay, so it is influenced by the level of Lake Erie (See Hydrology Section of Pickerel Creek Wetland, LE 043). No surface streams flow through the wetland, with the exception of a drainage ditch that enters from the north.

Walker (1962) reported that the limestone/dolomite bedrock, covered with an average of 25 feet of glacial till, may supply 300 or more gallons of water per minute at depths of around 200 feet. Water level fluctuations and water quality data for Sandusky Bay are discussed by Hartley (1975). The literature search provided no site-specific data pertaining to water level fluctuations, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in this wetland.

Climate

The closest weather station providing climatic data for Portage Wetland is located in Sandusky, Ohio. The average annual temperature is 51.2°F based on the normal period from 1941-1970. The mean monthly low for January is 25.0°F and the mean monthly high for July is 84.0°F. The average annual precipitation is 34.08 inches, with a mean monthly precipitation of 2.27 inches in January and 4.14 inches in July. The growing season is approximately seven months long, with the last killing frost (28°F) in 1975 occurring on April 6 and the first killing frost on November 15 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Portage Wetland (U.S.G.S. quadrangle map, Castalia, Ohio, 1969).

BIOTIC SETTING LE 047

Vegetation

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

Fish

General information regarding the fishes of Sandusky Bay as related to wetlands is discussed in connection with Bay View Wetland (LE-040) and is probably applicable to Portage Wetland. However, a search of the literature provided no site-specific information pertaining to 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

Information on the seasonal distribution, abundance, life histories, density and relationship to water levels for the Japanese snail (Viviparus japonicus), and the macroinvertebrate fauna of Sandusky Bay is available in Wolfert and Hiltunen (1968) and Herdendorf and Lindsay (1975). The invertebrates collected during these studies may occur in Portage Wetland owing to the proximity of this wetland to Sandusky Bay. A list of the benthic macroinvertebrates collected by Herdendorf and Lindsay (1975) in Sandusky Bay, 1972 to 1974, appears in Appendix B-1. The molluscs taken from the bay in 1963 by Wolfert and Hiltunen (1968) are listed in order of abundance in Appendix B-2. Appendix B-3 includes the other invertebrate taxa collected by Wolfert and Hiltunen (1968).

The literature review yielded no site-specific information regarding invertebrate productivity or food sources in Portage Wetland.

Reptiles and Amphibians

Species of reptiles and amphibans recorded from wetland habitats in Ottawa County are listed in Appendix C-1. Although not specifically reported from Portage Wetland, some of these species may occur there. The literature search yielded no site-specific information pertaining to major species, seasonal abundance and distribution, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in Portage Wetland.

Avifauna

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 Portage Wetland.

Mammals

General information concerning the wetlands of southwestern Lake Erie (Bednarik 1953, 1956; Donohoe, 1961) may apply to Portage Wetland. Also, information discussed concerning Muddy Creek Bay Wetland (LE-044) and Magee Marsh (LE-062) may apply to this wetland. However, 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 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; Ohio Division of Wildlife, 1976) were documented in Portage 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

LE 047

Population

Portage Wetland is located in Portage Township of Ottawa County, Ohio. The county is moderately populated, having a density of 149 persons per square mile.

Table 4-26 indicates that Ottawa County experienced moderate population growth, while Portage Township experienced slow population growth, between 1970 and 1975. Projections for 1990 indicate that Ottawa County is expected to undergo slow population growth in the future.

Table 4-26. Population Data for the Vicinity of Portage Wetland

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Ottawa County	38,828	4.7	41,500
Portage Township	8,129	2.3	--

[a] U.S. Bureau of the Census (1977)
[b] Northern Ohio Urban System, Series 11 Method of Population Projection (1977)

Land Use and Ownership

Land use within Portage Wetland and most of the surrounding area is rural open space. Drainage canals are present in the area. An unimproved dirt road is located in the northeast corner of Portage Wetland. The wetland is under private ownership, but its location suggests that it is subject to minimal development pressure (U.S.G.S. quadrangle map, Castalia, Ohio, 1969).

Recreation

No known state or federal recreational facilities are present in the vicinity of Portage Wetland.

Mineral, Energy, and Forest Resources

Potential mineral resources in Portage Wetland include gypsum, limestone, and dolomite (Great Lakes Basin Commission, 1974). No significant oil, gas, and forest resources are known to be present in the vicinity.

Public Utilities and Facilities

No public utilities or facilities are located within 0.5 mile of Portage Wetland (U.S.G.S. quadrangle map, Castalia, Ohio, 1969).

Pollution Sources

There are no NPDES permit holders adjacent to Portage 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 ft. of Portage Wetland (Ohio Historical Preservation Office).

No known archaeological resources exist in the Portage Wetland vicinity, but this area has not yet been systematically surveyed by a professional archaeologist (Ohio Historical Preservation Office).

RESEARCH PROJECTS LE 047

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

DANBURY WETLAND

PHYSIOGRAPHIC SETTING

LE 048

Setting

Danbury Wetland is located on the north shore of Sandusky Bay in Danbury Township of Ottawa County, Ohio, 2.5 miles west of Meadow Brook, 5 miles east-southeast of Port Clinton, and 6 miles northwest of Sandusky. This non-wooded, Palustrine wetland is protected by earthen dikes (U.S.G.S. quadrangle maps, Castalia, Ohio 1969; Gypsum, Ohio, 1969).

Topography

Danbury Wetland lies at or near the mean level of Lake Erie (571 feet above mean sea level). The wetland has very little relief; it is completely enclosed by the 575-foot contour line. North of the bay shore the land surface gently rises to 600 feet about 2 miles from the wetland (U.S.G.S. quadrangle maps, Castalia, Ohio, 1969; Gypsum, Ohio, 1969).

Surficial Geology

Surficial material in the vicinity of Danbury Wetland consists of lacustrine sediments and glacial till overlying Silurian dolomite (Bass Island Formation) bedrock. A water well within one mile of the wetland indicated 59 feet of unconsolidated material, including gravel, over the rock (Walker, 1962).

Soils

Jones (1974) provided a generalized soils map of Ottawa County which showed soils of the Marsh Land Association in the vicinity of Danbury Wetland. This association is composed of level to depressional, very poorly drained soils adjacent to Sandusky Bay, which formed in glacial lake deposited sediment and are affected by water level fluctuations. The soil material of Marsh Land is similar to Toledo soils, but on occasional slight rises, the material is light colored and resembles Fulton soils.

Hydrology

The wetland is adjacent to Sandusky Bay, so it is influenced by water levels in Lake Erie (see Hydrology Section of Pickerel Creek Wetland, LE-043). No surface streams flow through the wetland, with the exception of a drainage ditch that enters from the north.

Walker (1962) reported that the limestone/dolomite bedrock, covered with an average of 25 feet of glacial till, may supply 300 or more gallons of water per minute at depths of around 200 feet. Water level fluctuations and water quality data for Sandusky Bay are discussed by Hartley (1975). However, the literature search provided no site-specific data pertaining to water level fluctuations, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in this wetland.

Climate

The closest weather station providing climatic data for Danbury Wetland is located in Sandusky, Ohio. The average annual temperature is 51.2°F based on the normal period from 1941-1970. The mean monthly low for January is 25.0°F and the mean monthly high for July is 84.0°F. The average annual precipitation is 34.08 inches, with a mean monthly precipitation of 2.27 inches in January and 4.14 inches in July. The growing season is approximately seven months long, with the last killing frost (28°F) in 1975 occurring on April 6 and the first killing frost on November 15 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Danbury Wetland (U.S.G.S. quadrangle map, Castalia, Ohio, 1969).

BIOTIC SETTING

LE 048

Vegetation

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

Fish

General information regarding the fishes of Sandusky Bay as related to wetlands is discussed in connection with Bay View Wetland (LE-040) and is probably applicable to Danbury Wetland. However, a search of the literature provided no site-specific information pertaining to 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

Information on the seasonal distribution, abundance, life histories, density and relationship to water levels for the Japanese snail (*Viviparus japonicus*), and the macroinvertebrate fauna of Sandusky Bay is available in Wolfert and Hiltunen (1968) and Herdendorf and Lindsay (1975). The invertebrates collected during these studies may occur in Danbury Wetland owing to the proximity of this wetland to Sandusky Bay. A list of the benthic macroinvertebrates collected by Herdendorf and Lindsay (1975) in Sandusky Bay, 1972 to 1974, appears in Appendix B-1. The molluscs taken from the bay in 1963 by Wolfert and Hiltunen (1968) are listed in order of abundance in Appendix B-2. Appendix B-3 includes the other invertebrate taxa collected by Wolfert and Hiltunen (1968).

The literature review yielded no site-specific information regarding invertebrate productivity or food sources in Danbury Wetland.

Reptiles and Amphibians

Species of reptiles and amphibans recorded from wetland habitats in Ottawa County are listed in Appendix C-1. Although not specifically reported from Danbury Wetland, some of these species may occur there. The literature search yielded no site-specific information pertaining to major species, seasonal abundance and distribution, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in Danbury Wetland.

Avifauna

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 Danbury Wetland.

Mammals

General information concerning the wetlands of southwestern Lake Erie (Bednarik 1953, 1956; Donohoe, 1961) may apply to Danbury Wetland. Also, information discussed concerning Muddy Creek Bay Wetland (LE-044) and Magee Marsh (LE-062) may apply to this wetland. However, 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 Danbury 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; Ohio Division of Wildlife, 1976) were documented in Danbury 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 LE 048

Population

Danbury Wetland is located in Danbury Township of Ottawa County, Ohio. The county is moderately populated, having a density of 149 persons per square mile.

Table 4-26 indicates that Ottawa County experienced moderate population growth, while Danbury Township experienced rapid population growth, between 1970 and 1975. Ottawa County is expected to undergo slow population growth in the future.

Table 4-26. Population Data for the Vicinity Danbury Wetland

	Estimated Population 1975[a]	Estimated % Δ 1970-1975[a]	Projected Population 1990[b]
Ottawa County	38,828	4.7	41,500
Danbury Township	4,395	16.9	--

[a] U.S. Bureau of the Census (1977)
[b] Northern Ohio Urban System, Series 11 Method of Population Projections (1977)

Land Use and Ownership

Land use within Danbury Wetland and most of the surrounding area is rural open space. An unimproved dirt road runs adjacent to the northeast corner of Danbury Wetland. Drainage canals lie adjacent to the south and west sides of the wetland. The wetland is under private ownership, but its location suggests that it is subject to moderate development pressure (U.S.G.S. quadrangle map, Castalia, Ohio, 1969).

Recreation

No known state or federal recreational facilities are present in the vicinity of Danbury Wetland.

Mineral, Energy, and Forest Resources

Potential mineral resources in Danbury Wetland include gypsum, limestone, and dolomite (Great Lakes Basin Commission, 1974). No significant oil, gas, and forest resources are known to be present in the vicinity.

Public Utilities and Facilities

No public utilities or facilities are located within 0.5 mile of Danbury Wetland (U.S.G.S. quadrangle map, Castalia, Ohio, 1969).

Pollution Sources

There are no NPDES permit holders adjacent to Danbury Wetland. No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

The Ohio Archaeological Inventory indicates that two archaeological features are present in the vicinity of Danbury Wetland, the Danbury Site 0.3 mile south of the wetland and the Bay Side Site 0.3 mile southwest. Further information regarding field research and exact location can be obtained from the Ohio History Center (Ohio Historical Preservation Office).

RESEARCH PROJECTS

LE 048

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

BAY POINT WETLAND

PHYSIOGRAPHIC SETTING

LE 049

Setting

Bay Point Wetland is located on a sandy spit at the mouth of Sandusky Bay in Danbury Township of Ottawa County, Ohio, approximately 3.5 miles north of the city of Sandusky. This non-wooded, Palustrine wetland has formed at the distal end of the spit, which extends southward from the rockbound headlands of Marblehead Peninsula; the spit projects over 7500 feet into the bay and is nearly 2000 feet across at its widest point. Bay Point is classified as compound spit because of the series of beach ridges and depressions at its southern end (Herdendorf, 1975). Wetlands and open ponds occupy these depressions. The ridges represent the crests of beaches formed by waves along successive positions as the spit built southward into Moseley Channel. This channel, connecting Sandusky Bay and Lake Erie, separates Bay Point from Cedar Point to the southeast (U.S.G.S. quadrangle maps, Kelleys Island, Ohio, 1969; Sandusky, Ohio 1969).

Topography

Bay Point Wetland lies at or near the mean elevation of Lake Erie (571 feet above mean sea level). The wetland has very little relief; it is bounded by the 575-foot contour line. The largest depressional pond lies at an elevation of 573 feet. The relief of the spit is approximately 10 feet from lake level to the crest of the highest ridge. Marblehead Peninsula reaches a maximum elevation of slightly over 680 feet (109 feet above mean lake level) about 3 miles north of the wetland.

Surficial Geology

The sand spit at Bay Point Wetland is underlain by lacustrine sediments and glacial till. Sparling (1965) showed that the bedrock under the wetland was Devonian dolomite (Lucas Formation) with a top elevation ranging from 535 to 555 feet above sea level. This indicates a thickness of unconsolidated material under the wetlands ranging from approximately 35 to 15 feet.

Soils

Jones (1974) provided a generalized soil map of Ottawa County, but he did not indicate marsh soils for Bay Point probably because of size limitations of the map. The descriptions of Marsh soils for Cedar Point Wetland by Redmond, et al. (1970) may be appropriate for Bay Point Wetland.

Hydrology

Bay Point Wetland is adjacent to Sandusky Bay and Lake Erie, so it is influenced by the water level of the lake. No surface streams flow through the wetland.

The mouth of Sandusky Bay is an area of converging littoral currents. One set of currents are building Bay Point in a southeasterly direction and another set is building Cedar Point in a northwesterly direction. These two spits are now separated by the 40-feet deep Moseley Channel. The dominant current along the east side of Bay Point, generated by northeast winds and refracted waves of northwest wind, flows in a southerly direction around the tip into Sandusky Bay. It then flows northward between Bay Point and Johnson Island or southward along the bay side of Cedar Point. Water quality surveys by the Ohio Geological Survey in 1964 revealed that during rising water levels, masses of lake water with low specific conductance moved southward along Bay Point and then into the bay (Herdendorf, 1975). The tip of Bay Point is accreting at a rate of about 10 feet per year.

Walker (1962) reported that limestone/dolomite bedrock, covered with an average of 25 feet of glacial till, may supply 300 or more gallons of water per minute at depths of around 200 feet. However, the literature search provided no site-specific data pertaining to water level fluctuations, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Bay Point Wetland.

Climate

The closest weather station providing climatic data for Bay Point Wetland is located in Sandusky, Ohio. The average annual temperature is 51.2°F based on the normal period from 1941-1970. The mean monthly low for January is 25.0°F and the mean monthly high for July is 84.0°F. The average annual precipitation is 34.08 inches, with a mean monthly precipitation of 2.27 inches in January and 4.14 inches in July. The growing season is approximately seven months long, with the last killing frost (28°F) in 1975 occurring on April 6 and the first killing frost on November 15 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are located in the vicinity of Bay Point Wetland (U.S.G.S. quadrangle maps, Kelleys Island, Ohio, 1969; Sandusky, Ohio, 1969).

BIOTIC SETTING LE 049

Vegetation

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

Fish

General information regarding the fishes of Sandusky Bay as related to wetlands is discussed in connection with Bay View Wetland (LE 040) and is probably applicable to Bay Point Wetland. However, a search of the literature provided no site-specific information pertaining to 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

Information on the seasonal distribution, abundance, life histories, density and relationship to water levels for the Japanese snail (Viviparus japonicus), and the macroinvertebrate fauna of Sandusky Bay is available in Wolfert and Hiltunen (1968) and Herdendorf and Lindsay (1975). The invertebrates collected during these studies may occur in Bay Point Wetland owing to the proximity of this wetland to Sandusky Bay. A list of the benthic macroinvertebrates collected by Herdendorf and Lindsay (1975) in Sandusky Bay, 1972 to 1974, appears in Appendix B-1. The molluscs taken from the bay in 1963 by Wolfert and Hiltunen (1968) are listed in order of abundance in Appendix B-2. Appendix B-3 includes the other invertebrate taxa collected by Wolfert and Hiltunen (1968).

The literature review yielded no site-specific information regarding invertebrate productivity or food sources in Bay Point Wetland.

Reptiles and Amphibians

Conant (1951) reported the following reptiles from Bay Point: eastern fox snake (Elaphe vulpina gloydi), northern water snake (Natrix sipedon sipedon), northern brown snake (Storeria dekayi dekayi), eastern garter snake (Thamnophis sirtalis sirtalis), and Blanding's turtle (Emydoidea blandingi). These species probably occur in Bay Point Wetland. Other species of reptiles and amphibans recorded from wetland habitats in Ottawa County are listed in Appendix C-1. Although not specifically reported from Bay Point Wetland, some of these species may occur there.

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

Avifauna

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 Bay Point Wetland.

Mammals

The short-tailed shrew (Blarina brevicauda), least shrew (Cryptotis parva), white-footed mouse (Peromyscus leucopus), deer mouse (P. maniculatus), meadow vole (Microtus pennsylvanicus), and house mouse (Mus musculus) have been reported to occur on Bay Point (Bole and Moulthrop, 1942). The short-tailed shrew, white-footed mouse, and deer mouse were the only species of small mammals trapped in 1965 from habitat associated with Bay Point Wetland and its borders (Fall et al., 1968).

General information concerning the wetlands of southwestern Lake Erie (Bednarik 1953, 1956; Donohoe, 1961) may apply to Bay Point Wetland. Also, information discussed concerning Muddy Creek Bay Wetland (LE-044) and Magee Marsh (LE-062) may apply to this wetland. However, 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 Bay 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; Ohio Division of Wildlife, 1976) were documented in Bay Point 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 LE 049

Population

Bay Point Wetland is located in Danbury Township of Ottawa County, Ohio. The county is moderately populated, having a density of 149 persons per square mile. Table 4-27 indicates that Ottawa County experienced moderate population growth, while Danbury Township experienced rapid population growth, between 1970 and 1975. Ottawa County is expected to undergo slow population growth in the future.

Table 4-27. Population Data for the Vicinity of Bay Point Wetland

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Ottawa County	38,828	4.7	41,500
Danbury Township	4,395	16.9	--

[a] U.S. Bureau of the Census (1977)
[b] Northern Ohio Urban System, Series 11 Method of Population Projection (1977)

Land Use and Ownership

Land use within Bay Point Wetland and most of the surrounding area is rural open space. The wetland is under private ownership, and its location suggests that it is subject to moderate development pressure (U.S.G.S. quadrangle map, Kelleys Island, Ohio, 1969).

Recreation

Bay Point Wetland is adjacent to Bay Point Beach, a privately maintained beach open to public use for a fee.

Mineral, Energy, and Forest Resources

Potential mineral resources in Bay Point Wetland include gypsum, limestone, and dolomite (Great Lakes Basin Commission, 1974). No significant oil, gas, or forest resources are known to be present in the vicinity.

Public Utilities and Facilities

No public utilities or facilities are located within 0.5 mile of Bay Point Wetland (U.S.G.S. quadrangle maps, Sandusky, Ohio, 1969; Kelleys Island, Ohio, 1969).

Pollution Sources

There are no NPDES permit holders adjacent to Bay Point 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 ft. of Bay Point Wetland (Ohio Historical Preservation Office).

No known archaeological resources exist in the Bay Point Wetland vicinity, but this area has not yet been systematically surveyed by a professional archaeologist (Ohio Historic Preservation Office).

RESEARCH PROJECTS

LE 049

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

KELLEYS ISLAND WETLAND

PHYSIOGRAPHIC SETTING

LE 050

Setting

Kelleys Island Wetland is located on the north shore (North Bay) of this island in Kelleys Island Township of Erie County, Ohio, 1.3 miles northeast of the island ferry dock and 11 miles north of Sandusky. This Palustrine wetland has wooded margins with an open-water area in the center. Kelleys Island is the largest island within the American waters of Lake Erie (U.S.G.S. quadrangle map, Kelleys Island, Ohio, 1969). Kelleys Island Wetland is known locally as North Pond and Carp Pond.

Topography

Kelleys Island Wetland lies at or near the mean elevation of Lake Erie (571 feet above sea level). The wetland has very little relief; it is entirely enclosed by the 575-foot contour line. The maximum elevation on the island is 620 feet at a point 0.2 mile south of the wetland, yielding a total relief of nearly 50 feet (U.S.G.S. quadrangle map, Kelleys Island, 1969).

Surficial Geology

Approximately 18 feet of glacial till and lacustrine sediments overlie the Devonian limestone (Columbus Formation) in the vicinity of the wetland. The till is a heterogeneous mixture of clay, sand, and gravel with a predominance of clay. The lacustrine sediments consist of clay, silt, and fine sand deposited in glacial lakes (Pincus, 1961).

A sand beach 5,000 feet long extends along the southwest shore of North Bay. The central part of the beach forms a barrier separating North Pond from Lake Erie (Herdendorf, 1963). The beach varies in width from 100 to 50 feet, the widest part being at the western end. The shore shows signs of recent and continuing erosion. Except for North Pond the beach is backed by low bluffs of glacial till which are slowly receding. At the pond, high-water storms have washed sand into the wetland.

Soils

Redmond, et al. (1971) mapped the soils of this wetland as Marsh. Marsh soils are submerged part of the year, but they are dry long enough to permit the growth of cattails, sedges, and other water-tolerant plants. The material underlying the marsh is similar to the material in the lower part of the profile of Lenawee and Colwood soils.

Hydrology

Kelleys Island Wetland lies adjacent to Lake Erie and is therefore influenced by water levels of the lake. No surface streams flow through the wetland.

Walker (1962) reported that the limestone/dolomite bedrock, covered with an average of 25 feet of glacial till, may supply 300 or more gallons of water per minute at depths of around 200 feet. However, the literature search provided no site-specific data pertaining to water level fluctuations, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in this wetland.

Climate

The closest weather station providing climatic data for Kelleys Island Wetland is located in Sandusky, Ohio. The average annual temperature is 51.2^{o}F based on the normal period from 1941-1970. The mean monthly low for January is 25.0^{o}F and the mean monthly high for July is 84.0^{o}F. The average annual precipitation is 34.08 inches, with a mean monthly precipitation of 2.27 inches in January and 4.14 inches in July. The growing season is approximately seven months long, with the last killing frost (28^{o}F) in 1975 occurring on April 6 and the first killing frost on November 15 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are located in the vicinity of Kelleys Island Wetland (U.S.G.S. quadrangle map, Kelleys Island, Ohio, 1969).

BIOTIC SETTING

LE 050

Vegetation

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

Fish

An annotated list of fish species associated with wetland habitats or aquatic vegetation in the Lake Erie area of Ohio appears in Appendix A-3. Some of thesse species may utilize Kelleys Island Wetland, but the small size of the wetland, and its operation from Lake Erie by a barrier beach makes it doubtful that an extensive fish community is present.

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 Kelleys Island Wetland.

Reptiles and Amphibians

Langlois (1964) reported western chorus frog (*Pseudacris triseriata triseriata*), northern leopard frog (*Rana pipiens*), northern water snake (*Natrix sipedon sipedon*), and eastern garter snake (*Thamnophis sirtalis sirtalis*) from Kelleys Island. These species may occur in Kelleys Island Wetland.

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

Avifauna

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 Kelleys Island Wetland.

Mammals

General information concerning the mammalian species of the Lake Erie islands (Fall, 1966; Fall et al., 1968; Cooper and Herdendorf, 1977) may apply to Kelleys Island Wetland. The number of mammalian species found on the islands is lower than on the adjacent mainland, owing to the isolation and small size of the islands. The white-footed mouse (*Peromyscus leucopus*), Norway rat (*Rattus norvegicus*), and meadow vole (*Microtus pennsylvanicus*) were the only small mammals trapped in various habitats on Kelleys Island in 1964 and 1967. The raccoon (*Procyon lotor*), red fox (*Vulpes vulpes*), and muskrat (*Ondatra zibethicus*) occur only in small numbers on the Lake Erie islands because suitable habitat is limited.

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 Kelleys 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; Ohio Division of Wildlife, 1976) were documented in Kelleys Island 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

Population

Kelleys Island Wetland is located in Kelleys Island Township of Erie County, Ohio. The county is moderately populated, having a density of 293 persons per square mile. Table 4-28 indicates that Erie County experienced slow population growth, while Kelleys Island Township experienced a slow decline in population, between 1970 and 1975. Erie County is expected to undergo moderate population growth in the future.

Table 4-28. Population Data for the Vicinity of Kelleys Island Wetland

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Erie County	77,300	1.8	85,200
Kelleys Island Township	173	-1.1	--

[a] U.S. Bureau of the Census (1977)
[b] Northern Ohio Urban System, Series 11 Method of Population Projection (1977)

Land Use and Ownership

Land use within Kelleys Island Wetland and most of the surrounding area is rural open space. The wetland is under state ownership, and its location suggests that it is subject to minimal development pressure (U.S.G.S. quadrangle map, Kelleys Island, Ohio, 1969).

Recreation

No known state or federal recreational facilities are present in the vicinity of Kelleys Island Wetland.

Mineral, Energy, and Forest Resources

Potential mineral resources in Kelleys Island Wetland include limestone and dolomite (Great Lakes Basin Commission, 1974). No significant oil, gas, or forest resources are known to be present in the vicinity.

Public Utilities and Facilities

No public utilities or facilities are located within 0.5 mile of Kelleys Island Wetland (U.S.G.S. quadrangle map, Kelleys Island, Ohio, 1969).

Pollution Sources

There are no NPDES permit holders adjacent to Kelleys Island 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 ft. of Kelleys Island Wetland (Ohio Historical Preservation Office).

No known archaeological resources exist in the Kelleys Island Wetland vicinity, but this area has not yet been systematically surveyed by a professional archaeologist (Ohio Historic Preservation Office).

RESEARCH PROJECTS LE 050

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

Table 4-29. Data Gaps-Lake Section 4

Data Gap*		Wetland Number	031	032–034	035–036	037	038–039	040	041–042	043	044	045	046	047	048	049	050
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	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		Food Sources	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	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	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		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	*	*	*	*	*	*	*	*		*	*	*	*	*	*
		Endangered Species															
		Health	*	*	*	*	*	*	*	*		*	*	*	*	*	*
Cultural Setting		Population															
		Land Use and Ownership															
		Recreation															
		Mineral, Energy, Forest Resourc															
		Public Utilities/Facilities															
		Point Pollution Sources															
		Non-Point Pollution Sources	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		Historic Features															
		Archeologic Features															

LAKE SECTION 5

INTRODUCTION

Lake Section 5 extends along the southern shoreline of Lake Erie from Marblehead to Port Clinton in Ottawa County, Ohio and includes the Lake Erie Islands. The region features relatively flat topography in the vicinity of the wetlands. The predominant shore type along this 50 mile stretch of shoreline is low plain.

Figures 5-1 and 5-2 show the approximate location of the six coastal wetlands in Lake Section 5. Data concerning latitude, longitude, acreage, and classification for each of these wetlands are presented in Table 5-1. The wetlands of Lake Section 5 are located at elevations between 577 and 642 feet above sea level (six to 72 feet above the approximate mean elevation of Lake Erie). These wetlands are all classified as Palustrine.

Available information related to physiographic and cultural features of the six coastal wetlands is summarized in the individual wetland narratives presented in this chapter. Published sources lack site-specific information related to the biotic characteristics of these wetlands in many instances.

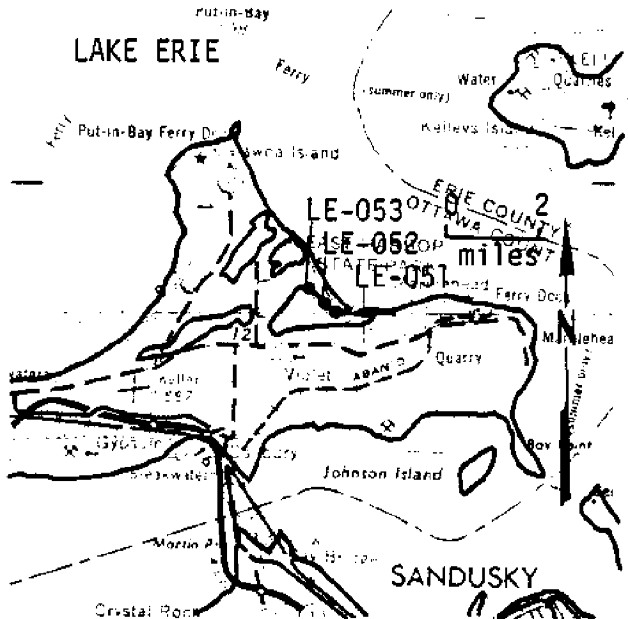

Figure 5-1. Lake Section 5
East Harbor Area

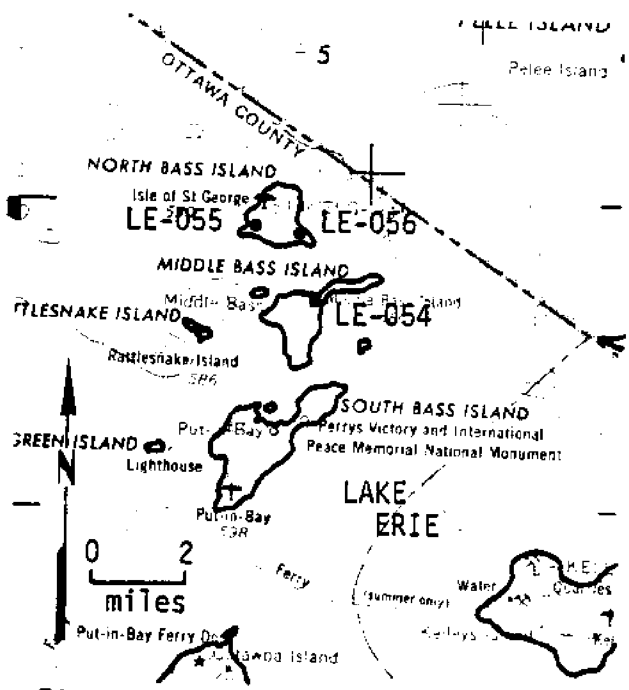

Figure 5-2. Lake Section 5 -
Island Area

Table 5-1. Location, Acreage, and Classification of Wetlands in Lake Section 5

Wetland Number	Wetland	Latitude	Longitude	Acreage	Classification[a]
	EAST HARBOR WETLAND COMPLEX				
051	East Harbor Wetland #1	41°32'25"	82°47'12"	1.5	P
052	East Harbor Wetland #2	41°32'30"	81°47'30"	12.5	P
053	East Harbor Wetland #3	41°33'10"	81°48'04"	1.5	P
054	Middle Bass Island Wetland	41°41'26"	82°48'14"	17	P
	NORTH BASS ISLAND WETLAND COMPLEX				
055	North Bass Island Wetland #1	41°42'44"	82°49'37"	34	P
056	North Bass Island Wetland #2	41°42'33"	82°48'31"	5	P

[a]P=palustrine
L=lacustrine
R=riverine

EAST HARBOR WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LE 051-053

Setting

The East Harbor Wetland Complex is located within East Harbor State Park in Danbury Township of Ottawa County, Ohio, 7.5 miles northwest of the city of Sandusky and 6.8 miles east-northeast of Port Clinton. This largely non-wooded, Palustrine System occupies the inshore reach of a barrier beach that fronts the state park. The complex consists of East Harbor Wetlands #1, #2, and #3. Wetland #1 lies adjacent to the entrance channel to the harbor; #2 lies 0.3 miles northwest of the channel; and #3 is 1.2 miles northwest of the channel, adjacent to the beach access roadway (U.S.G.S. quadrangle map, Gypsum, Ohio, 1969).

Topography

The East Harbor Wetland Complex lies at or near the mean level of Lake Erie (571 feet above mean sea level). The wetlands have very little relief; #1 and #3 are completely enclosed by the 575-foot depression contour line. Wetland #2 lies slightly above the 575-foot contour line. The shore of East Harbor south of the wetland rises to an elevation of 600 feet about 1000 feet from the water line (U.S.G.S. quadrangle map, Gupsum, Ohio, 1969).

Surficial Geology

From West Harbor, through Middle Harbor and East Harbor, to Lakeside, Ohio (3.5 miles), the shore of Lake Erie is low and bordered by sand beaches. The beaches lie on marsh deposits which accumulated in the shallow bay between Catawba Island and Marblehead Peninsula. The underlying material is lacustrine clay over glacial till. An extensive sand deposit has accumulated in the East Harbor area and low sand dunes and marshes have formed behind the beach (Herdendorf and Braidech, 1972). Bedrock lies at an elevation of 480 feet at wetland #1 and rises to an elevation of 540 at wetland #3 (Sparling, 1965). The bedrock underlying the wetlands consists of Devonian (Detroit River Group) and Silurian (Bass Island Formation) shales and dolomites which are less resistant to erosion than the flanking limestones and dolomites which form Marblehead Peninsula and Catawba Island (Herdendorf and Braidech, 1972).

Soils

Jones (1974) provided a generalized map of the soils of Ottawa County. The area in the vicinity of East Harbor is mapped as Marsh Land Association, composed of level or depressional areas that are periodically flooded by the lake. Cattails, willows, arrow-weed and other kinds of water tolerant vegetation are indicators of this association. The soil material of Marsh Land is similar to Toledo soils, but on occasional slight rises, the material is light colored and resembles Fulton soils.

Hydrology

The East Harbor Wetland Complex is adjacent to Lake Erie, so water levels in the wetlands are influenced by the lake. No surface streams flow through the wetlands; however, the depression which forms East Harbor may be part of an abandoned valley of the Portage River which now flows into Lake Erie at Port Clinton (Herdendorf and Braidech, 1972).

Walker (1962) reported that the limestone/dolomite bedrock, covered with an average of 25 feet of glacial till, may supply 300 or more gallons of water per minute at depths of around 200 feet. The literature search provided no site-specific data pertaining to water level fluctuations, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in these wetlands.

Climate

The closest weather station providing climatic data for the East Harbor Wetland Complex is located in Sandusky, Ohio. The average annual temperature is 51.2^{o}F based on the normal period from 1941-1970. The mean monthly low for January is 25.0^{o}F and the mean monthly high for July is 84.0^{o}F. The average annual precipitation is 34.08 inches, with a mean monthly precipitation of 2.27 inches in January and 4.14 inches in July. The growing season is approximately seven months long, with the last killing frost (28^{o}F) in 1975 occurring on April 6 and the first killing frost on November 15 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are located in the vicinity of the East Harbor Wetland Complex (U.S.G.S. quadrangle map, Gypsum, Ohio, 1969).

BIOTIC SETTING   LE 051-053

Vegetation

Moore (1972, 1976) provides a description of major species composition and distribution in East Harbor Wetlands #1-#3; however, in 1972 these wetlands were far more than they now appear on U.S.G.S. topographic sheets. The area between East Harbor Wetlands #1 and #3 was essentially a single extensive wetland which extended well into both East and Middle Harbors. Moore reported five major plant associations occurring in the area occupied by the East Harbor Wetland Complex:

1.	reed grass	*Phragmites communis*
2.	narrow-leaved cattail	*Typha angustifolia*
3.	burreed	*Sparganium eurycarpum*
	bulrush	*Scirpus* spp.
	willow	*Salix* spp.
4.	cottonwood	*Populus deltoides*
	willow	*Salix* spp.
5.	sandbar-willow	*Salix interior*

Since the plants of these associations were major species in the area, it is likely that they have persisted, but it is difficult to determine the current location of these plant zones.

The floristic composition of the East Harbor Wetland Complex is largely dependent upon the degree to which water levels fluctuate in Lake Erie. Hence, during periods of high water levels, one might expect a dramatic increase in the numbers of wetland plants, as well as a major change in the general aspect of the vegetative cover in the area.

The literature search located no site-specific information concerning density and productivity of the vegetation in this 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 East Harbor Wetlands #1, #2, and #3.

Invertebrates

Historical information on the occurrence of certain invertebrates in East Harbor is available in Krecker (1939) and Brown et al. (1938). Krecker (1939) provided a general discussion of the invertebrate animal community associated with submergent plants in East Harbor. A list of fresh-water mussels collected by Brown et al. (1938) in East Harbor appears in Table 5-2.

Table 5-2. List of Fresh-water Mussels in Order of Abundance, Randomly Sampled in East Harbor[a]

Lampsilis siliquoidea	Ligumia recta
Proptera alata	Amblema costata
Leptodea fragilis	Fusconaia flava
Ligumia nasuta	Pleurobema cordatum coccineum
Lampsilis ventricosa	Strophitus rugosus
Anodonta grandis	Obovaria subrotunda

[a] Brown et al. (1938)

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

Reptiles and Amphibians

Conant (1951) reported the eastern spiny softshell (Trionyx spiniferus spiniferus) from East Harbor, and the species probably utilized the three harbor wetlands. Other reptiles and amphibans recorded from wetland habitats in Ottawa County are listed in Appendix C-1. Although not specifically reported from East Harbor Wetlands #1, #2, or #3, some of these species may occur there. The literature search yielded no site-specific information pertaining to seasonal abundance and distribution, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in East Harbor Wetlands #1, #2, or #3.

Avifauna

The king rail (Rallus elegans), which is on the Ohio Endangered Species List, breeds in the vicinity of West Harbor and may be found in the wetlands of this complex. Common terns (Sterna hirundo) and bald eagles (Haliaeetus leucocephalus) occasionally visit the area from nearby Lake Erie marshes (U.S. Army Corps of Engineers, 1977). The bald eagle is currently on the Federal and Ohio Endangered Species Lists and the common tern is on the Ohio Endangered Species List.

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 the three wetlands of the East Harbor Wetland Complex.

Mammals

The large, narrow-leaved cattail (Typha angustifolia) stands in the three wetlands of the East Harbor Wetland Complex support sizable muskrat (Ondatra zibethicus) populations (Moore, 1973). In East Harbor Wetland #2 and #3, over 60 muskrat houses were counted in 1973. Muskrat feeding almost eliminates stiff wapato (Sagittaria rigida) before any seeds mature.

Raccoons (Procyon lotor) are found in East Harbor State Park (Sagar, 1956). Juvenile raccoons are difficult to trap on this area in late summer. Some raccoons in East Harbor State Park use red oak trees (Quercus rubrum) and small limestone caves as den sites.

General information concerning the Catawba Peninsula (Fall et al., 1968; Browne, 1977) and the wetlands of southwestern Lake Erie (Bednarik, 1953, 1956; Donohoe, 1961) may apply to the three wetlands of the East Harbor Wetland Complex. The short-tailed shrew (Blarina brevicauda) has been trapped in marsh areas on Catawba Peninsula. Also, the Norway rat (Rattus norvegicus) utilizes muskrat runs in the marsh areas on the peninsula. Information discussed concerning Muddy Creek Bay Wetland (LE 044) and Magee Marsh (LE 062) may also apply to these wetlands. However, the literature search yielded no site-specific information pertaining to seasonal distribution, density and productivity, recreational and commercial use, life histories, or relationship to water levels of the mammals inhabiting the three wetlands of the East Harbor Wetland Complex.

Endangered Species

The king rail (*Rallus elegans*), a species endangered in Ohio, breeds in the vicinity of West Harbor and may be found in the wetlands of this complex. Common terns (*Sterna hirundo*) and bald eagles, also endangered in Ohio, occasionally visit the area from nearby marshes.

No other plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Ohio Division of Wildlife, 1976) were documented in the East Harbor 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 LE 051-053

Population

The East Harbor Wetland Complex is located in Danbury Township of Ottawa County, Ohio. The county is moderately populated, having a density of 149 persons per square mile. Table 5-3 indicates that Ottawa County experienced moderate population growth, while Danbury Township experienced rapid population growth, between 1970 and 1975. Ottawa County is expected to undergo slow population growth in the future.

Table 5-3. Population Data for the Vicinity of the East Harbor Wetland Complex

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Ottawa County	38,800	4.7	41,500
Danbury Township	4,395	16.9	--

[a] U.S. Bureau of the Census (1977)
[b] Northern Ohio Urban System, Series 11 Method of Population Projection (1977)

Land Use and Ownership

Land use within the East Harbor Wetland Complex and most of the surrounding area is rural open space. The wetland is under state ownership, and its location suggests that it is subject to minimal development pressure (U.S.G.S. quadrangle map, Gypsum, Ohio, 1969).

Recreation

The East Harbor Wetland Complex lies within East Harbor State Park. The park offers recreational facilities for hunting, fishing, sailing, skiing, swimming, camping, and picnicking.

Mineral, Energy, and Forest Resources

Potential mineral resources in the East Harbor Wetland Complex include limestone and dolomite (Great Lakes Basin Commission, 1974). No oil, gas, or forest resources are known to be present in the vicinity. Development is unlikely because the wetland complex is within East Harbor State Park.

Public Utilities and Facilities

A sewage disposal facility is located approximately 0.4 mile west of East Harbor Wetland #3 (U.S.G.S. quadrangle map, Gypsum, Ohio, 1969).

Pollution Sources

There are no NPDES permit holders are located adjacent to the East Harbor Wetland Complex. 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 ft. of the East Harbor Wetland Complex (Ohio Historical Preservation Office).

No known archaeological resources exist in the East Harbor Wetland Complex vicinity, but this area has not yet been systematically surveyed by a professional archaeologist (Ohio Historic Preservation Office).

RESEARCH PROJECTS LE 051-053

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

MIDDLE BASS ISLAND WETLAND

PHYSIOGRAPHIC SETTING

LE 054

Setting

Middle Bass Island Wetland is located within Haunk's Pond at the base of the northeast projection of Middle Bass Island. This island lies in the western basin of Lake Erie, within Put-in-Bay Township of Ottawa County, Ohio, approximately 14 miles northeast of Port Clinton and 17 miles northwest of Sandusky, Ohio. The non-wooded, Palustrine wetland is separated from Lake Erie by narrow gravel bars on the northwest and southeast margins of the wetland (U.S.G.S. quadrangle map, Put-in-Bay, Ohio, 1969).

Topography

The wetlands of the Bass Islands lie at or near the mean elevation of Lake Erie (571 feet above mean sea level). They have very little relief, lying below (or within depressions outlined by) the 575-foot contour line. The relief of the Bass Islands is approximately 70 feet. The maximum elevations of the islands in this group are given below:

Island	Area (acres)	Highest Elevation (feet)
South Bass Island	1570	642
Middle Bass Island	813	592
North Bass Island	704	596
Rattlesnake Island	60	606
Sugar Island	40	584
Green Island	17	592
Ballast Island	12	591
Gibraltar Island	6	613
Starve Island	1	577

Data Source: U.S.G.S. quadrangle map, Put-in-Bay, Ohio 1969

Surficial Geology

The unconsolidated sediments on the Bass Islands originated from glacial and lacustrine deposition. During the Pleistocene Epoch the islands were covered by at least two continental ice sheets and later by a series of glacial lakes resulting in the deposition of glacial till followed by lake sediments. The surface over which the glaciers advanced was rugged stream-cut terrain with the present islands standing as hilltops as high as 200 feet above preglacial streams (Herdendorf, 1970). Silurian dolomite bedrock (Raisin River Member of the Bass Island Formation) underlies the sediments of the islands' wetlands at depths of less than 10 feet (Sparling, 1965).

Soils

Paschall, et al. (1928) mapped the soils of Ottawa County, including the Bass Islands. The wetland soils of the islands were originally mapped as Catawba silt loam, but the modern terminology of this group of soils is Mermill (Hamilton and Forsyth, 1972). This group has developed in thin lacustrine silt or fine sand lying on till, the soil profile locally extending downward into the underlying till. Mermill soil has a gray-brown topsoil that is thickest in the swampy flats around the edges of the ponds on Middle Bass and North Bass Islands.

Hydrology

The wetlands of the Bass Islands are adjacent to Lake Erie and often separated only by narrow gravel bars. Therefore, these wetlands are influenced by the level of Lake Erie; during high water storms these bars are often breached, allowing a fresh influx of lake water. Nutrient overenrichment is the single greatest water quality problem in this part of western Lake Erie (Cooper and Herdendorf, 1977).

Walker (1962) reported that the dolomite underlying the glacial till may supply 300 or more gallons of water per minute from a well drilled to a depth of around 200 feet. However, the literature search provided no site-specific data pertaining to water level fluctuations, water quality, groundwater drainage patterns and runoff, depth, or seasonal changes in Middle Bass Island Wetland.

Climate

The closest weather station providing climatic data for Middle Bass Island Wetland is located in Sandusky, Ohio. The average annual temperature is 51.2^{o}F based on the normal period from 1941-1970. The mean monthly low for January is 25.0^{o}F and the mean monthly high for July is 84.0^{o}F. The average annual precipitation is 34.08 inches, with a mean monthly precipitation of 2.27 inches in January and 4.14 inches in July. The growing season is approximately seven months long, with the last killing frost (28^{o}F) in 1975 occurring on April 6 and the first killing frost on November 15 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Middle Bass Island Wetland (U.S.G.S. quadrangle map, Put-in-Bay, Ohio, 1969).

BIOTIC SETTING

LE 054

Vegetation

Wood (1966) provides a characterization of the major species composition and distribution of vegetation in Middle Bass Island Wetland as it appeared in 1966, as well as an analysis of the relationship of vegetation to water level fluctuation.

Wood divided this wetland into eight zones based on aspect dominance as follows:

zone		zone	
1	open water	5	cutgrass
2	waterlily	6	jewelweed
3	dock	7	tall grass
4	cattail	8	shrub

None of these zones were clearly delimited and in no zone did one species dominate to the exclusion of all other species.

Major species occuring in the open water zone were unattached floating plants such as duckweeds (Lemna minor, L. trisulca), water-flaxseed (Spirodela polyrhiza), and water-meal (Wolffia columbiana), and submersed aquatic plants such as pondweed (Potamogeton pectinatus), water-milfoil (Myriophyllum exalbescens), elodea (Elodea canadensis), and coontail (Ceratophyllum demersum). July water depth in this zone ranged to 36 inches.

Major species composing the waterlily zone were spatterdock (Nuphar advena) and white waterlily (Nymphaea tuberosa). Species associated with this zone included water-plantain (Alisma subcordatum), arrowhead (Sagittaria latifolia), and pickerel weed (Pontederia cordata). The waterlily zone was actually several disjunct zones, together occupying a major portion of the wetland. July water depth in this zone ranged up to 36 inches.

Two species of dock (Rumex crispus, R. verticillatus) comprised the major cover of the dock zone. Plants thriving under the dock cover included spatterdock, white-waterlily, sedges (Carex comosa, Cyperus strigosus, Eleocharis intermedia, and E. obtusa), and in some areas cutgrass (Leersia oryzoides). Occasional hummocks supported swamp-loosestrife (Decondon verticillatus) and buttonbush (Cephalanthus occidentalis). July water depth in this zone ranged up to 18 inches.

Narrow-leaved cattail (Typha angustifolia) and broad-leaved cattail (Typha latifolia) were co-dominant species of the cattail zone. Thriving as associates in this zone were sedges (Carex cristatella, Scirpus atrovirens, S. validus), soft-rush (Juncus effusus), burreed (Sparganium eurycarpum), cutgrass, and river bulrush (Scirpus fluviatilis). Early summer water depth in this zone ranged up six inches. However, this zone was predominantly a mudflat.

In early summer, two to six inches of water covered the cutgrass zone. At this time water-plantain (Alisma subcordatum) and spatterdock were common associates of cutgrass. As water levels fell, associated species were limited to sedges (Carex cristatella, C. comosa, Cyperus strigosus, Scirpus atrovirens, S. validus), spike-rushes (Eleocharis intermedia, E. obtusa), and ditch stonecrop (Penthorum sedoides).

The jewelweeds, Impatiens capensis, and I. pallida occurred in the jewelweed zone nearly to the exclusion of other species. However, in wetter areas cutgrass, spatterdock and dock occurred. Additional associates of this zone included cattail, sedges, rushes, monkey-flower (Mimulus ringens), skullcap (Scutellaria epilobiifolia), and Iris sp.

The tallgrass zone was primarily composed of reed-canary grass (Phalaris arundinacea) and blue-joint grass (Calamagrostis canadensis), which in some areas attained a height of two meters. Jewelweed and cattail were the only herbaceous associates. Small hummocks in this zone supported white ash (Fraxinus americana), hackberry (Celtis occidentalis), and choke-cherry (Prunus virginiana).

The shrub zone was composed primarily of saplings of species found in the nearby swamp forest such as bur-oak (Quercus macrocarpa), hackberry, slippery elm (Ulmus rubra), white ash, and white mulberry (Morus alba). Low growing plants occurring in this site included choke cherry, prairie rose (Rosa setigera) and common elderberry (Sambucus canadensis).

The location and surficial geology of Middle Bass Island Wetland accounts for water level fluctuations in the wetland which are directly related to water level fluctuations of Lake Erie. In years of increased water depth, previously established terrestrial plants may be drowned while wetland and aquatic species may be favored. In years of decreased water depth, it is likely that aquatic species would quickly become succeeded by terrestrial species.

The literature search provided no site-specific data concerning density and productivity of the vegetation in this wetland.

Fish

An annotated list of fish species associated with wetland habitats or aquatic vegetation in the Lake Erie area of Ohio appears in Appendix A-3. Some of these species probably utilize Middle Bass Island Wetland. However, a search of the literature provided no site-specific information pertaining to 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

Early studies of the caddisflies, (Trichoptera) and the dragonflies (Odonata) in western Lake Erie were done by Marshall (1939) and Kennedy (1922) respectively. The wetland-inhabiting species of dragonflies of the Bass Islands of Lake Erie are discussed in Kennedy (1922). The species presented in this discussion may or may not occur now in Middle Bass Island Wetland.

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

Reptiles and Amphibians

Langlois (1964) reported red-spotted newt (Notophthalmus viridescens viridescens), small-mouthed salamander (Ambystoma texanum), eastern tiger salamander (Ambystoma tigrinum tigrinum), American toad (Bufo americanus americanus), Blanchard's cricket frog (Acris crepitans blanchardi), bullfrog (Rana catesbeiana), northern leopard frog (Rana pipiens), Blanding's turtle (Emydoidea blandingi), midland painted turtle (Chrysemys picta marginata), northern water snake (Natrix sipedon sipedon), eastern garter snake (Thamnophis sirtalis sirtalis), and eastern fox snake (Elaphe vulpina gloydi) from Middle Bass Island, and these species may occur in Middle Bass Island Wetland. Other reptiles and amphibans recorded from wetland habitats in Ottawa County are listed in Appendix C-1. Although not specifically reported from Middle Bass Island Wetland, some of these species may occur there.

The literature search yielded no site-specific information pertaining to seasonal abundance and distribution, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in Middle Bass Island Wetland.

Avifauna

Historical information on the avifauna of the Lake Erie Islands, which may be pertinent to this wetland, is available in Jones (1912). However, 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 Middle Bass Island Wetland.

Mammals

General information concerning the mammalian species of the Lake Erie islands (Fall, 1966; Fall et al., 1968; Cooper and Herdendorf, 1977; Browne, 1977) may apply to Middle Bass Island Wetland. The number of mammalian species found on the islands is lower than on the adjacent mainland owing to the isolation and small size of the islands. The white-footed mouse (Peromyscus leucopus) and Norway rat (Rattus norvegicus) were the only small mammals trapped in various habitats on Middle Bass Island in 1964 and 1966. The raccoon (Procyon lotor), red fox (Vulpes vulpes), and muskrat (Ondatra zibethicus) occur in only small numbers on the Lake Erie islands because suitable habitat is limited.

The literature search yielded no site-specific information pertaining to species composition, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, major food sources, or relationship to water levels of the mammals inhabiting Middle Bass 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; Ohio Division of Wildlife, 1976) were documented in Middle Bass Island 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

Population

Middle Bass Island Wetland is located in Put-in-Bay Township of Ottawa County, Ohio. The county is moderately populated, having a density of 149 persons per square mile. Table 5-4 indicates that Ottawa County experienced moderate population growth, while Put-in-Bay Township underwent a rapid decline in population, between 1970 and 1975. Projections for 1990 indicate that Ottawa County is expected to undergo slow population growth in the future.

Table 5-4. Population Data for the Vicinity of Middle Bass Island Wetland

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Ottawa County	38,800	4.7	41,500
Put-in-Bay Township	473	-6.7	--

[a] U.S. Bureau of the Census (1977)
[b] Northern Ohio Urban System, Series 11 Method of Population Projections (1977)

Land Use and Ownership

Land use within Middle Bass Island Wetland and most of the surrounding area is rural open space. A hard surface road runs adjacent to the southern and eastern sides of Middle Bass Island Wetland. The wetland is under private ownership, but its location suggests that it is subject to minimal development pressure (U.S.G.S. quadrangle map, Put-in-Bay, Ohio, 1969).

Recreation

No known state or federal recreational facilities are present in the vicinity of Middle Bass Island Wetland.

Mineral, Energy, and Forest Resources

Potential mineral resources in Middle Bass Island Wetland include limestone and dolomite (Great Lakes Basin Commission, 1974). No significant oil, gas, or forest resources are known to be present in the vicinity.

Public Utilities and Facilities

No public utilities or facilities are located within 0.5 mile of Middle Bass Island Wetland (U.S.G.S. quadrangle map, Put-in-Bay, Ohio, 1969).

Pollution Sources

There are no NPDES permit holders are located adjacent to Middle Bass Island 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 ft. of Middle Bass Island Wetland (Ohio Historical Preservation Office).

No known archaeological resources exist in the Middle Bass Island Wetland vicinity, but this area has not yet been systematically surveyed by a professional archaeologist (Ohio Historic Preservation Office).

RESEARCH PROJECTS

LE 054

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

NORTH BASS ISLAND WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LE 055-056

Setting

The North Bass Island Wetland Complex is located near the southern shore of North Bass Island in the western basin of Lake Erie, within Put-in-Bay Township of Ottawa County, Ohio, 15 miles northwest of the city of Sandusky. The complex is comprised of North Bass Island Wetland #1 (locally known as Smith's Pond) and North Bass Island Wetland #2 (locally known as Fox's Marsh). These largely non-wooded, Palustrine wetlands are separated from Lake Erie by narrow gravel bars. Wetland #1 is situated on a point at the southeast end of the island and wetland #2 is an interior projection of Manila Bay at the southwest part of the island (U.S.G.S. quadrangle map, Put-in-Bay, Ohio, 1969).

Topography

The wetlands of the Bass Islands lie at or near the mean elevation of Lake Erie (571 feet above mean sea level). They have very little relief, lying below (or within depressions outline by) the 575-foot contour line. The relief of the Bass Islands is approximately 70 feet. The maximum elevation of the islands in this group are given below:

Island	Area (acres)	Highest Elevation (feet)
South Bass Island	1570	642
Middle Bass Island	813	592
North Bass Island	704	596
Rattlesnake Island	60	606
Sugar Island	40	584
Green Island	17	592
Ballast Island	12	591
Gibraltar Island	6	613
Starve Island	1	577

Data Source: U.S.G.S. quadrangle map, Put-in-Bay, Ohio 1969

Surficial Geology

The unconsolidated sediments on the Bass Islands originated from glacial and lacustrine deposition. During the Pleistocene Epoch the islands were covered by at least two continental ice sheets and later by a series of glacial lakes resulting in the deposition of glacial till followed by lake sediments. The surface over which the glaciers advanced was rugged stream-cut terrain with the present islands standing as hilltops as high as 200 feet above preglacial streams (Herdendorf, 1970). Silurian dolomite bedrock (Raisin River Member of the Bass Island Formation) underlies the sediments of the islands' wetlands at depths of less than 10 feet (Sparling, 1965).

Soils

Paschall, et al. (1928) mapped the soils of Ottawa County, including the Bass Islands. The wetland soils of the islands were originally mapped as Catawba silt loam, but the modern terminology of this group of soils is Mermill (Hamilton and Forsyth, 1972). This group has developed in thin lacustrine silt or fine sand lying on till, the soil profile locally extending downward into the underlying till. Mermill soil has a gray-brown topsoil that is thickest in the swampy flats around the edges of the ponds on Middle Bass and North Bass Islands.

Hydrology

The wetlands of the Bass Islands are adjacent to Lake Erie and often separated only by narrow gravel bars. Therefore, these wetlands are influenced by the level of Lake Erie; during high water storms these bars are often breached, allowing a fresh influx of lake water. Nutrient overenrichment is the single greatest water quality problem in this part of western Lake Erie (Cooper and Herdendorf, 1977).

Walker (1962) reported that the dolomite underlying the glacial till may supply 300 or more gallons of water per minute from a well drilled to a depth of around 200 feet. However, the literature search provided no site-specific data pertaining to water level fluctuations, water quality, groundwater drainage patterns and runoff, depth, or seasonal changes in these wetlands.

Climate

The closest weather station providing climatic data for the North Bass Island Wetland Complex is located in Sandusky, Ohio. The average annual temperature is 51.2^{o}F based on the normal period from 1941-1970. The mean monthly low for January is 25.0^{o}F and the mean monthly high for July is 84.0^{o}F. The average annual precipitation is 34.08 inches, with a mean monthly precipitation of 2.27 inches in January and 4.14 inches in July. The growing season is approximately seven months long, with the last killing frost (28^{o}F) in 1975 occurring on April 6 and the first killing frost on November 15 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are located in the vicinity of the North Bass Wetland Complex (U.S.G.S. quadrangle map, Put-in-Bay, Ohio, 1969).

BIOTIC SETTING

LE 055-056

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 North Bass Island Wetland Complex.

Fish

An annotated list of fish species associated with wetland habitats or aquatic vegetation in the Lake Erie area of Ohio appears in Appendix A-3. Some of these species probably utilize North Bass Island Wetlands #1 and #2. 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 these wetlands.

Invertebrates

Early studies of the caddisflies, (*Trichoptera*) and the dragonflies (*Odonata*) in western Lake Erie were done by Marshall (1939) and Kennedy (1922) respectively. The wetland-inhabiting species of dragonflies of the Bass Islands of Lake Erie are discussed in Kennedy (1922). The species presented in this discussion may or may not occur now in the North Bass Island Wetland Complex.

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

Reptiles and Amphibians

Langlois (1964) reported the following species from North Bass Island: small-mouthed salamander (*Ambystoma texanum*), red-spotted newt (*Notophthalmus viridescens viridescens*), northern leopard frog (*Rana pipiens*), Blanding's turtle (*Emydoidea blandingi*), midland painted turtle (*Chrysemys picta marginata*), and eastern garter snake (*Thamnophis sirtalis sirtalis*). These species may be present in North Bass Island Wetlands #1 and #2. Other reptiles and amphibans recorded from wetland habitats in Ottawa County are listed in Appendix C-1. Although not specifically reported from North Bass Island Wetlands #1 and #2, some of these species may occur there.

The literature search yielded no site-specific information pertaining to seasonal abundance and distribution, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in North Bass Island Wetlands #1 or #2.

Avifauna

Historical information on the avifauna of the Lake Erie islands, which may be pertinent to the wetlands in this complex, is available in Jones (1912). However, 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 the two wetlands comprising the North Bass Island Wetland Complex.

Mammals

General information concerning the mammalian species of the Lake Erie islands (Fall, 1966; Fall et al., 1968; Cooper and Herdendorf, 1977; Browne, 1977) may apply to the two wetlands of the North Bass Island Wetland Complex. The number of small mammalian species found on the islands is lower than on the adjacent mainland, owing to the isolation and small size of the islands. The white-footed mouse (*Peromyscus leucopus*) and Norway rat (*Rattus norvegicus*) were the only small mammals trapped in various habitats on North Bass Island in 1964. The raccoon (*Procyon lotor*), red fox (*Vulpes vulpes*), and muskrat (*Ondatra zibethicus*) occur in only small numbers on the Lake Erie islands because suitable habitat is limited.

The literature search yielded no site-specific information pertaining to species composition, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, major food sources, or relationship to water levels of the mammals inhabiting the two wetlands of North Bass Island 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; Ohio Division of Wildlife, 1976) were documented in the North Bass Island 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

LE 055-056

Population

The North Bass Island Wetland Complex is located in Put-in-Bay Township of Ottawa County, Ohio. The county is moderately populated, having a density of 149 persons per square mile. Table 5-5 indicates that Ottawa County experienced moderate population growth, while Put-in-Bay Township underwent a rapid decline in population, between 1970 and 1975. Projections for 1990 indicate that Ottawa County is expected to undergo slow population growth in the future.

Table 5-5. Population Data for the Vicinity of the North Bass Island Wetland Complex

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Ottawa County	38,800	4.7	41,500
Put-in-Bay Township	473	-6.7	--

[a] U.S. Bureau of the Census (1977)
[b] Northern Ohio Urban System, Series 11 Method of Population Projections (1977)

Land Use and Ownership

Land use within the North Bass Island Wetland Complex and most of the surrounding area is rural open space. The wetland is under private ownership, but its location suggests that it is subject to minimal development pressure (U.S.G.S. quadrangle map, Put-in-Bay, Ohio, 1969).

Recreation

No known state or federal recreational facilities are present in the vicinity of the North Bass Island Wetland Complex.

Mineral, Energy, and Forest Resources

Potential mineral resources in the North Bass Island Wetland Complex include limestone and dolomite (Great Lakes Basin Commission, 1974). No significant oil, gas, or forest resources are known to be present in the vicinity.

Public Utilities and Facilities

No public utilities or facilities are located within 0.5 mile of the two wetlands comprising the North Bass Island Wetland Complex (U.S.G.S. quadrangle map, Put-in-Bay, Ohio, 1969).

Pollution Sources

There are no NPDES permit holders adjacent to the North Bass Island Wetland Complex. 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 ft. of the North Bass Island Wetland Complex (Ohio Historical Preservation Office).

No known archaeological resources exist in the North Bass Island Wetland Complex vicinity, but this area has not yet been systematically surveyed by a professional archaeologist (Ohio Historic Preservation Office).

RESEARCH PROJECTS

LE 055-056

The literature search identified no on-going or impending research projects pertaining to the North Bass Island Wetland Complex.

Table 5-6. Data Gaps-Lake Section 5

Data Gap*		Wetland Number	051-053	054	055-056
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	*	*	*
		Food Sources	*	*	*
	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	*	*	*
		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	*	*	*
		Endangered Species			
		Health	*	*	*
Cultural Setting		Population			
		Land Use and Ownership			
		Recreation			
		Mineral, Energy, Forest Resourc			
		Public Utilities/Facilities			
		Point Pollution Sources			
		Non-Point Pollution Sources	*	*	*
		Historic Features			
		Archeologic Features	*	*	*

LAKE SECTION 6

INTRODUCTION

Lake Section 6 extends along the southern shoreline of Lake Erie from Port Clinton to the Ohio-Michigan border in Ottawa and Lucas Counties, Ohio, and includes Maumee Bay. The region features relatively flat topography in the vicinity of the wetlands. The predominant shore type along this 40 mile stretch of shoreline is low plain.

Figure 6-1 and 6-2 show the approximate location of the 12 coastal wetlands in Lake Section 6. Data concerning latitude, longitude, acreage, and classification for each of these wetlands are presented in Table 6-1. The wetlands of Lake Section 6 all lie at an elevation of 571 feet above sea level, which is the approximate mean elevation of Lake Erie. These wetlands are classified as Palustrine and Lacustrine.

Available information related to physiographic and cultural features of the 12 coastal wetlands is summarized in the individual wetland narratives presented in this chapter. Published sources lack site-specific information related to the biotic characteristics of these wetlands in many instances.

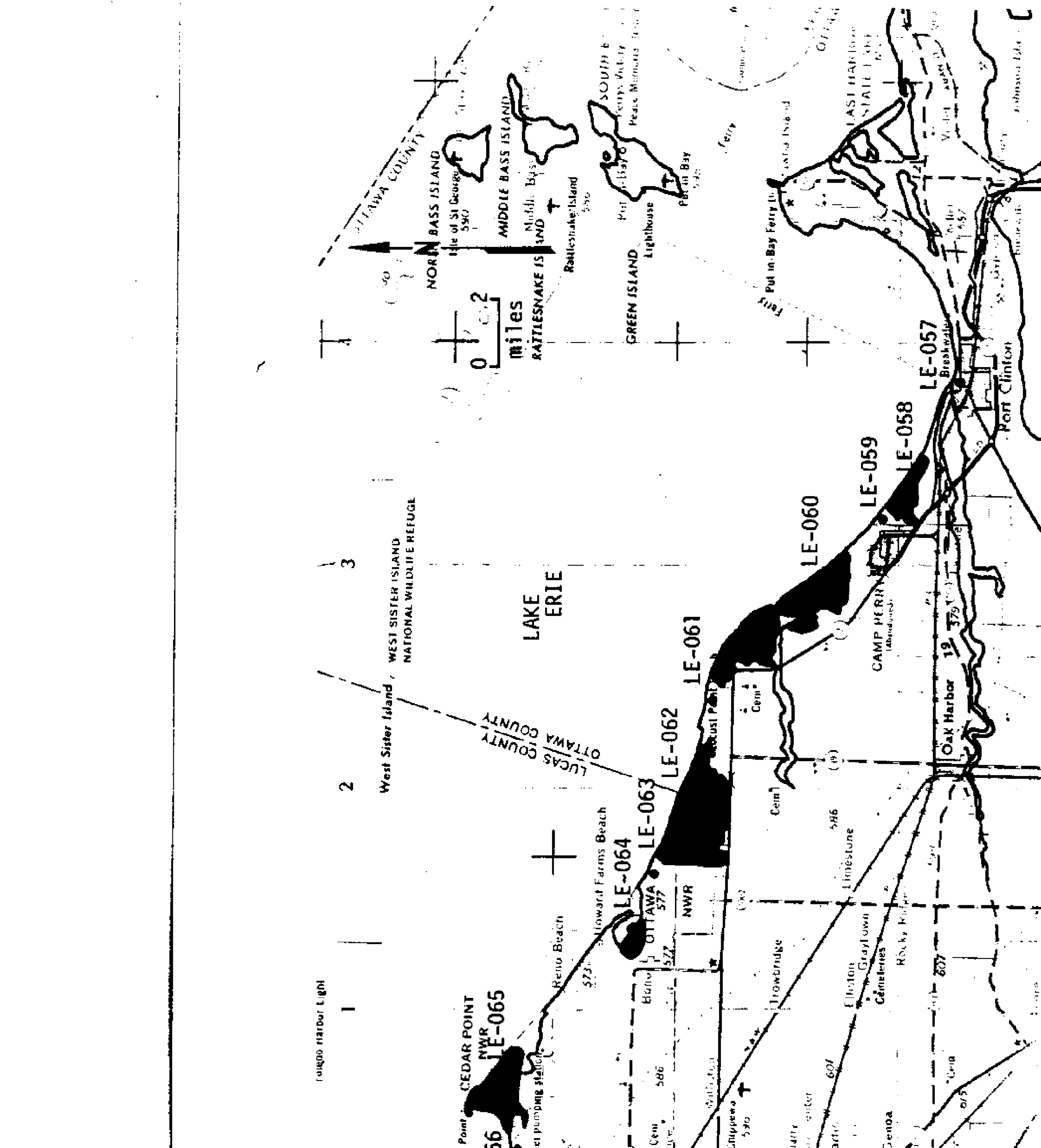

Figure 6-1. Lake Section 6 - Ottawa Area

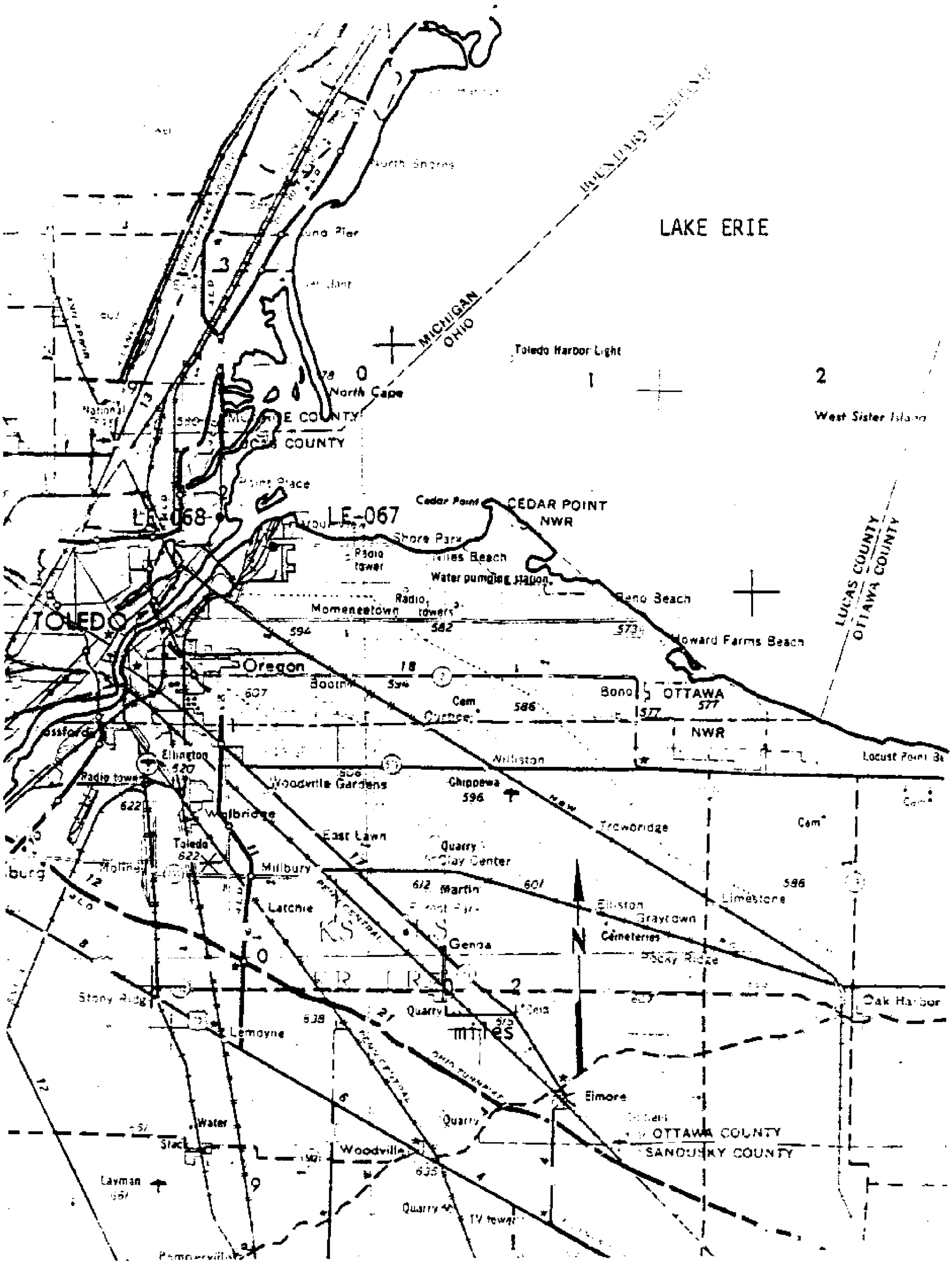

Figure 6-2. Lake Section 6 - South Maumee Bay Area

Table 6-1. Location, Acreage, and Classification of Wetlands in Lake Section 6

Wetland Number	Wetland	Latitude	Longitude	Acreage	Classification[a]
057	Perry Street Wetland	41°30'51"	82°56'04"	33	P,L
	OTTAWA WILDLIFE REFUGE WETLAND COMPLEX				
058	Ottawa Wildlife Refuge Wetland	41°31'54"	82°59'28"	554	P
059	Camp Perry Area Wetland	41°32'37"	83°00'43"	5	P
	TOUSSAINT RIVER WETLAND COMPLEX				
060	Toussaint River Wetland	41°35'10"	83°04'43"	2600	P
061	Long Beach Wetland	41°36'38"	83°06'43"	60	P
	OTTAWA WETLAND COMPLEX				
062	Magee Marsh	41°37'00"	83°09'24"	1916	P
063	Ottawa National Wildlife Refuge Wetland	41°37'18"	83°12'56"	1814	P
064	Metzger Marsh	41°38'32"	83°14'25"	128	P
065	Cedar Point National Wildlife Regue Wetland	41°40'48"	83°19'14"	1591	P
066	Niles Beach Area Wetland	41°41'05"	83°21'30"	48	P
067	Otter Creek Wetland	41°41'06"	83°27'30"	70	P
068	Detwiler Area Wetland	41°41'59"	83°28'40"	20	P,L

[a]P=palustrine
L=lacustrine
R=riverine

PERRY STREET WETLAND

PHYSIOGRAPHIC SETTING

LE 057

Setting

Perry Street Wetland is located within the city of Port Clinton in Ottawa County, Ohio. It lies adjacent to Lake Erie on the east and west sides of the Portage River mouth. The wetland is non-wooded and largely Palustrine, with some Lacustrine components at the lake shore (U.S.G.S. quadrangle map, Port Clinton, Ohio, 1969). Most of the wetland lies within a city beach park.

Topography

The lakeward portions of Perry Street Wetland lie at or near the mean elevation of Lake Erie (571 feet above mean sea level). The interior portions of the wetland rise to an approximate elevation of 578 feet. This yields a wetland relief of about 7 feet. South of the wetland the land surface is nearly flat, having an elevation of only 580 feet about 1 mile inland.

Surficial Geology

The surface material along the lake shore near Perry Street Wetland is mainly glacial till, locally covered to a shallow depth by marsh deposits. The glacial till was deposited directly by the Pleistocene ice sheets, and although the old glacial lakes modified the surface of the till, only a thin veneer of lacustrine clay was deposited upon it. Marshes formed along the low shore of the present lake, developing marsh deposits on the till surface. The marsh deposits consist of decayed organic matter mixed with varying amounts of sand, silt, and clay; in color these deposits vary from grayish brown to brownish black. In thickness the marsh materials vary from a thin veneer to a maximum of several feet, and in places such deposits occur beneath the present sandy beach deposits. The bedrock, composed of dolomites of the Silurian Age, is buried by 10 to 50 feet of glacial material (U.S. Army Corps of Engineers, 1945).

Soils

Jones (1974) provided a generalized soils map of Ottawa County, which placed the soils of Perry Street Wetland within the Toledo-Fulton association. Soils of this association are mostly level and very poorly drained; they were formed in clayey glacial till on broad flats.

Hydrology

The lakeward portion of Perry Street Wetland merges into the open lake and therefore is influenced by the water level of Lake Erie. The Portage River flows through the wetland and divides it into an east and west section. The Portage River has a drainage area of 587 sq. miles and an average discharge rate of 392 cfs. The estimated suspended sediment load of this stream is 120,000 tons; the annual dissolved solids load is 91,200 tons (Herdendorf, 1975).

Walker (1962) reported that the dolomite underlying the glacial till in this area may supply 300 or more gallons of water per minute from a well drilled to a depth of around 200 feet. However, the literature search provided no site-specific data pertaining to water level fluctuations, water quality, groundwater drainage patterns and runoff, or seasonal changes in this wetland.

Climate

The closest weather station providing climatic data for Perry Street Wetland is located in Sandusky, Ohio. The average annual temperature is 51.2°F based on the normal period from 1941-1970. The mean monthly low for January is 25.0°F and the mean monthly high for July is 84.0°F. The average annual precipitation is 34.08 inches, with a mean monthly precipitation of 2.27 inches in January and 4.14 inches in July. The growing season is approximately seven months long, with the last killing frost (28°F) in 1975 occurring on April 6 and the first killing frost on November 15 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of Perry Street Wetland (U.S.G.S. quadrangle map, Port Clinton, Ohio, 1969).

BIOTIC SETTING

LE 057

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 Perry Street Wetland.

Fish

Perry Street Wetland encompasses a part of Port Clinton Harbor, in which biological surveys have been conducted to assess the impact of harbor maintenance operations. A list of fish species present was compiled by the U.S. Army Corps of Engineers (1977) and is reproduced in Table 6-2. However, the literature search yielded no site-specific data pertaining to spawning and hatching areas, seasonal distribution and abundance, life histories, recreational and commercial use, food sources, or recreational and commercial use of the fish populations of 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 Perry Street Wetland.

Table 6-2. Fish Species Recorded from Port Clinton Harbor, Ohio[a]

Family and common name	Family and common name
Petromyzontidae	Cyprinidae (continued)
silver lamprey	mimic shiner
Lepisosteidae	fathead minnow*
longnose gar*	bluntnose minnow
Amiidae	Ictalurus
bowfin*	channel catfish
Clupeidae	black bullhead*
alewife	brown bullhead*
gizzard shad*	yellow bullhead*
Hiodontidae	stonecat
mooneye	tadpole madtom*
Salmonidae	Percopsidae
coho salmon	trout-perch
rainbow trout	Cyprinodontidae
Osmeridae	blackstripe topminnow
rainbow smelt	Percichthyidae
Esocidae	white bass
northern pike*	Centrarchidae
Catostomidae	smallmouth bass
white sucker*	largemouth bass*
northern hogsucker	rock bass
quillback	black crappie*
bigmouth buffalo	white crappie*
golden redhorse	bluegill*
spotted sucker*	green sunfish*
Cyprinidae	longear sunfish
carp*	orangespotted sunfish
goldfish*	Percidae
emerald shiner	yellow perch*
spottail shiner	walleye
goldenshiner*	logperch*
common shiner	johnny darter*
spotfin shiner	Sciaenidae
sand shiner	freshwater drum

[a]U.S. Army Corps of Engineers (1977)
*Species generally associated with wetland habitats according to Trautman (1957)

Reptiles and Amphibians

Conant (1951) reported the following species from the vicinity of Port Clinton: eastern fox snake (Elaphe vulpina gloydi), queen snake (Natrix septemvittata), northern water snake (Natrix sipedon sipedon), northern brown snake (Storeri dekayi dekayi), Butler's garter snake (Thamnophis butleri), eastern garter snake (Thamnophis sirtalis sirtalis), stinkpot (Sternotherus odoratus), Blanding's turtle (Emydoidea blandingi), and map turtle (Graptemys geographica). Some of these species may occur in Perry Road Wetland. Other reptiles and amphibans recorded from wetland habitats in Ottawa County are listed in Appendix C-1. Although not specifically reported from Perry Street Wetland, some of these species may occur there.

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

Avifauna

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 Perry Street Wetland.

Mammals

General information concerning mammals in the wetlands of southwestern Lake Erie (Bednarik, 1953, 1956; Donohoe, 1961) may apply to Perry Street Wetland. Information discussed concerning Muddy Creek Bay Wetland (LE 044) and Magee Marsh (LE 062) may also apply to this wetland. However, the literature search yielded no site-specific information pertaining to species composition, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, major food sources, or relationship to water levels of the mammals inhabiting Perry Street 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; Ohio Division of Wildlife, 1976) were documented in Perry Street 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 sanitary waste into the Portage River, which may have some effect on the health of the wetland.

Population

Perry Street Wetland is located within the city limits of Port Clinton in Ottawa County, Ohio. The county is moderately populated, having a density of 149 persons per square mile. Table 6-3 indicates that Ottawa County and Port Clinton (city) both experienced moderate population growth between 1970 and 1975. Projections for 1990 indicate that Ottawa County is expected to undergo slow population growth in the future.

Table 6-3. Population Data for the Vicinity of Perry Street Wetland

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Ottawa County	38,800	4.7	41,500
City of Port Clinton	7,503	4.2	--

[a] U.S. Bureau of the Census (1977)
[b] Northern Ohio Urban System, Series 11 Method of Population Projections (1977)

Land Use and Ownership

Land use within Perry Street Wetland is urban open space. The surrounding area is predominantly residential. State Route 163 runs adjacent to the southern side of Perry Street Wetland; there are highway barrow pits in the southeast part of the wetland. The Portage River runs into Lake Erie from a dredged channel through the wetland, and breakwalls have been constructed on the northern part of the dredged channel. An unimproved dirt road runs part way into the middle of the wetland. The wetland is under private ownership, and its location suggests that it is subject to severe development pressure (U.S.G.S. quadrangle map, Port Clinton, Ohio, 1969).

Recreation

No known state or federal recreational facilities are present in the vicinity of Perry Street Wetland.

Mineral, Energy, and Forest Resources

Potential mineral resources in Perry Street Wetland include sand, gravel, limestone, and dolomite (Great Lakes Basin Commission, 1974). No significant oil, gas, or forest resources are known to be present in the vicinity. Development is unlikely since the wetland is within Port Clinton harbor.

Public Utilities and Facilities

A radio tower is located approximately 300 feet west of Perry Street Wetland. Armory Park lies 0.3 mile west, and Lakeview Park lies 0.4 mile east, of the wetland (U.S.G.S. quadrangle map, Port Clinton, Ohio, 1969).

Pollution Sources

The Oak Harbor Sanitary Treatment Plant holds an NPDES permit to discharge sanitary waste into the Portage River. This discharge may have an impact on Perry Street Wetland.

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

Historical and Archaeological Features

The Ohio Historical Inventory indicates that two historical sites are located in the vicinity of the Perry Street Wetland, the Island House Motor Inn 250 feet south of the wetland and the Portage River Bridge at Port Clinton, 0.2 mile west. Further information regarding field research and exact location can be obtained from the Ohio History Center (Ohio Historical Preservation Office).

RESEARCH PROJECTS

LE 057

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

OTTAWA WILDLIFE REFUGE WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LE 058-059

Setting

The Ottawa Wildlife Refuge Wetland Complex is located along the south shore of western Lake Erie in Erie Township of Ottawa County, Ohio. The complex is comprised of Ottawa Wildlife Refuge Wetland (Darby Marsh) and Camp Perry Area Wetland; both are largely non-wooded, Palustrine, and protected by earthen and rip-rap dikes. Darby Marsh is part of the Ottawa National Wildlife Refuge administered by the U.S. Fish and Wildlife Service. This wetland is located 2 miles west of downtown Port Clinton. Camp Perry Area Wetland is immediately east of the Ohio National Guard camp and 4.5 miles west of Port Clinton (U.S.G.S. quadrangle maps, Port Clinton, Ohio 1969; Lacarne, Ohio, 1967).

Topography

The wetlands of this complex lie at or near the mean elevation of Lake Erie (571 feet above mean sea level). The complex has very little relief, lying below (or within depressions outlined by) the 575-foot contour line. Inland from the wetland the land surface is relatively flat, rising to only 10 feet above mean lake level within 2 miles south of the lake shore (U.S.G.S. quadrangle maps, Port Clinton, Ohio, 1969; Lacarne, Ohio, 1967).

Surficial Geology

The surface material along the lake shore near these wetlands is mainly glacial till, locally covered to a shallow depth by marsh deposits. The glacial till was deposited directly by the Pleistocene ice sheets, and although the old glacial lakes modified the surface of the till, only a thin veneer of lacustrine clay was deposited upon it. Marshes formed along the low shore of the present lake, developing marsh deposits on the till surface. The marsh deposits consist of decayed organic matter mixed with varying amounts of sand, silt, and clay; in color thesee deposits vary from grayish brown to brownish black. In thickness the marsh materials vary from a thin veneer to a maximum of several feet, and in places such deposits occur beneath the present sandy beach deposits. The bedrock, composed of dolomites of the Silurian Age, is buried by 10 to 50 feet of glacial material (U.S. Army Corps of Engineers, 1945).

Soils

Jones (1974) provided a generalized soils map of Ottawa County, which characterized the soils of these wetlands as Marsh Land Association. Soils of this association are composed of level to depressional, very poorly drained material adjacent to the shore of Lake Erie; they were formed in clayey glacial lake deposited sediments and are affected by lake level fluctuations. The soil material of Marsh Land is similar to Toledo soils, but on occasional slight rises the material is light colored and resembles Fulton soils of glacial till clay origin.

Hydrology

The wetland complex lies adjacent to Lake Erie and is strongly influenced by the water level of the lake. Lacarpe Creek flows through Darby Marsh, but no surface streams enter the Camp Perry Area Wetland.

Stein (1962) reported that a shallow buried valley lies between the mouths of the Portage River and Lacarpe Creek. Sand and gravel lenses in the fill may yield as much as 20 gallons of water per minute. Larger yields (100-300 gpm) are available from the underlying dolomite bedrock. The literature search provided no site-specific data pertaining to water level fluctuations, water quality, groundwater drainage patterns and runoff, or seasonal changes in these wetlands.

Climate

The closest weather station providing climatic data for the Ottawa Wildlife Refuge Wetland Complex is located in the Ottawa National Wildlife Refuge. The average annual temperature is 49.8°F based on the normal period from 1941-1970. The mean monthly low for January is 22.5°F and the mean monthly high for July is 83.7°F. The average annual precipitation is 32.97 inches, with a mean monthly precipitation of 2.35 inches in January and 3.35 inches in July. The growing season is approximately six months long, with the last killing frost (28°F) in 1975 occurring on April 16 and the first killing frost on October 3 (National Oceanic and Atmospheric Administration, 1975).

Special Features

No natural special features are found in the vicinity of the Ottawa Wildlife Refuge Wetland Complex (U.S.G.S. quadrangle maps, Lacarne, Ohio, 1967; Port Clinton, Ohio, 1969).

BIOTIC SETTING LE 058-059

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 two wetlands comprising the Ottawa Wildlife Refuge Wetland Complex.

Fish

An annotated list of fish species associated with wetland habitats or aquatic vegetation in the Lake Erie area of Ohio appears in Appendix A-3. Some of these species probably utilize Ottawa Wildlife Refuge Wetland and Camp Perry Area Wetland. 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 of 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 the Ottawa Wildlife Refugee Wetland Complex.

Reptiles and Amphibians

Conant (1951) found the eastern fox snake (Elaphe vulpina gloydi) at Camp Perry, and this species may occur in Camp Perry Wetland and Ottawa Wildlife Refuge Wetland. Species of reptiles and amphibans recorded from wetland habitats in Ottawa County are listed in Appendix C-1. Although not specifically reported from the two wetlands of this complex, some of these species may occur there.

The literature search yielded no site-specific information pertaining to major species, seasonal abundance and distribution, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in Ottawa Wildlife Refuge Wetland or Camp Perry Wetland.

Avifauna

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 the Ottawa Wildlife Refuge Wetland Complex.

Mammals

General information concerning the mammals of the wetlands of southwestern Lake Erie (Bednarik, 1953, 1956; Donohoe, 1961) may apply to the Ottawa Wildlife Refuge Wetland Complex. Information discussed concerning Muddy Creek Bay Wetland (LE 044) and Magee Marsh (LE 062) may also apply to these wetlands. However, the literature search yielded no site-specific information pertaining to species composition, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, major food sources, or relationship to water levels of the mammals inhabiting the two wetlands of the Ottawa Wildlife Refuge 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; Ohio Division of Wildlife, 1976) were documented in the Ottawa Wildlife Refuge 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, an NPDES permit holder discharges process waste into Lacarpe Creek, which may effect the health of the wetlands.

Population

The Ottawa Wildlife Refuge Wetland Complex is located in Erie Township of Ottawa County, Ohio. The county is moderately populated, having a density of 149 persons per square mile. Table 6-4 indicates that Ottawa County experienced moderate population growth and Erie Twonship experienced slow population growth between 1970 and 1975. Projections for 1990 indicate that Ottawa County is expected to undergo slow population growth in the future.

Table 6-4. Population Data for the Vicinity of the Ottawa Wildlife Refuge Wetland Complex

	Estimated Population 1975[a]	Estimated % Δ 1970-1975[a]	Projected Population 1990[b]
Ottawa County	38,800	4.7	41,500
Erie Township	1,512	2.9	--

[a] U.S. Bureau of the Census (1977)
[b] Northern Ohio Urban System, Series 11 Method of Population Projections (1977)

Land Use and Ownership

Land use within the Ottawa Wildlife Refuge Wetland Complex and most of the surrounding area is rural open space. There are drainage canals and levees throughout the Ottawa Wildlife Refuge Wetland Complex. A heliport is located to the west. A roadside park adjacent to State Route 2, and a few buildings, are located in the southwest corner of Ottawa Wildlife Refuge. The wetland complex is primarily under federal ownership. The federal portion is subject to minimal development pressure. The privately owned portion has been subject to considerable past development and continues to be subject to such pressure (U.S.G.S. quadrangle map, Port Clinton, Ohio, 1969; Lacarne, Ohio, 1967).

Recreation

The Ottawa Wildlife Refuge Complex lies within the Ottawa National Wildlife Refuge, but no state or federal recreational facilities are located in the vicinity of the wetlands.

Mineral, Energy, and Forest Resources

Potential mineral resources in the Ottawa Wildlife Refuge Wetland Complex include sand, gravel, limestone, and dolomite (Great Lakes Basin Commission, 1974). Other resources are unknown. Any development of resources is unlikely because the wetland complex is within the Ottawa Wildlife Refuge.

Public Utilities and Facilities

A roadside park lies within the Ottawa Wildlife Wetland Complex (U.S.G.S. quadrangle map, Lacarne, Ohio, 1967).

Pollution Sources

Camp Perry Military Reservation Waste Water Treatment Plant holds an NPDES permit to discharge process water into Lacarpe Creek, which may affect the Ottawa National Wildlife Refuge Wetlands.

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

Historical and Archaeological Features

The Ohio Archaeological Inventory indicates that one archaeological feature, the Refuge Site, is located within Ottawa Wildlife Refuge Wetland. Further information regarding field research and exact location can be obtained from the Ohio History Center (Ohio Historical Preservation Office).

RESEARCH PROJECTS LE 058-059

The literature search identified no on-going or impending research projects pertaining to the Ottawa Wildlife Refuge Wetland Complex.

TOUSSAINT RIVER WETLAND COMPLEX

PHYSIOGRAPHIC SETTING LE 060-061

Setting

The Toussaint River Wetland Complex is located in the vicinity of Locust Point on western Lake Erie, in Erie and Carroll Townships of Ottawa County, Ohio. This extensive wetland complex is largely non-wooded and Palustrine, and is protected from Lake Erie flooding by earthen and rip-rap dikes. The complex consists of Toussaint River Wetland (known locally as Navarre Marsh), lying on the east and west sides of the Toussaint River mouth, and Long Beach Wetland, a smaller marsh area inshore from the community of Long Beach. The complex is located 25 miles northwest of Sandusky and 26 miles east of Toledo, Ohio (U.S.G.S. quadrangle map, Lacarne, Ohio, 1967).

Topography

The Toussaint River Wetland Complex lies at or near the mean elevation of Lake Erie (571 feet above mean sea level). The wetlands have very little relief, lying below the 575-foot contour line or within depressions enclosed by this contour. The land surface inland from the wetlands is relatively flat, reaching an elevation of only 585 feet one mile southwest of the complex (U.S.G.S. quadrangle map, Lacarne, Ohio, 1967).

Surficial Geology

The surface material along the lake shore is mainly glacial till, locally covered to a shallow depth by marsh deposits. The glacial till was deposited directly by the Pleistocene ice sheets, and although the old glacial lakes modified the surface of the till, only a thin veneer of lacustrine clay was deposited upon it. Marshes formed along the low shore of the present lake, developing marsh deposits on the till surface. The marsh deposits consist of decayed organic matter mixed with varying amounts of sand, silt, and clay; in color these deposits vary from grayish brown to brownish black. In thickness the marsh materials vary from a thin veneer to a maximum of several feet, and in places, such deposits occur beneath the present sandy beach deposits. The bedrock, composed of dolomites of the Silurian Age, is buried by 10 to 50 feet of glacial material (U.S. Army Corps of Engineers, 1945).

The shoreline at nearby Locust Point is very stable and is classified as a non-critical erosion area, protected by rock dikes. The beach consists of sand and shell mixed. Immediately offshore, the underwater bottom consists of a shallow layer of sand with shell and clay intermixed, which overlies stiff lake-clay. This sandy bottom varies from 0.2 to 0.1 mile wide, and beyond is a strip of stiff lake-clay exposed by wave action, which is 0.4 to 0.2 mile wide. About 0.5 mile offshore of the point, the bottom becomes sand again with increasing amounts of gravel as one goes further offshore. Eastward, the bottom becomes muddy sand (U.S. Atomic Energy Commission, 1973).

Jones (1974) provided a generalized soils map of Ottawa County, which characterized the soils of these wetlands as Marsh Land Association. Soils of this association are composed of level to depressional, very poorly drained material adjacent to the shore of Lake Erie; they were formed in clayey glacial lake deposited sediments and are affected by lake level fluctuations. The soil material of Marsh Land is similar to Toledo soils, but on occasional slight rises the material is light colored and resembles Fulton soils of glacial till clay origin.

Hydrology

The wetlands of this complex lie adjacent to Lake Erie and the estuarine portion of the Toussaint River and Rusho Creek, so the water level in the wetlands is influenced by Lake Erie. The Toussaint River drains 143 square miles and has a slope of about one foot per mile. Near its mouth, water levels are controlled mainly by the levels in the lake (U.S. Atomic Energy Commission, 1973).

Within the wetland complex, the groundwater table elevation follows the lake levels. It is usually a few feet higher than the lake, and when the lake rises several feet during storms, the groundwater table will rise commensurately. The groundwater table is relatively horizontal with a gradient of only 1 to 3 feet/mile (average of 2 feet/mile) toward the lake. During infrequent dry periods or when the lake is high, the groundwater flows away from the lake; the rate of flow is similar to that in the local rivers and creeks. The bugs and joints in the Silurian bedrock formations are the groundwater aquifers, but the impervious clayey soils and glacial deposits are not water-yielding sediments. Since the bedrock is at least 10 feet below the surface and overlaid by impervious deposits, the bedrock aquifer is under an artesian head of 10 feet above bedrock. These waters are sulfurous (containing more than 5 ppm H_2S), hard and non-potable. However, they are used for farm and sanitary purposes. Bedrock wells are usually less than 100 feet deep and yield up to tens of gallons per minute. Some municipal wells in the Toussaint River Basin can, on the other hand, yield 100 gpm. No information is available about the precise chemistry of the groundwater. Some cottagers along the lake obtain their drinking water from shallow beach wells in the lake sands, and some south of the complex truck in water from central cisterns (U.S. Atomic Energy Commission, 1973). Data concerning the water quality of Lake Erie, as measured 50 to 100 feet offshore from the wetland complex, are presented in Table 6-5. Measurements taken at a station in the lake 2700 feet offshore are given in Table 6-6. The results of the analyses are typical of an eutrophic lake (U.S. Nuclear Regulatory Commission, 1975).

The Toussaint River Wetland Complex is located near Locust Point on the southern shore of the western basin of Lake Erie; the basin is very shallow with a maximum depth of about 35 feet. A shallow epilimnion develops early during the season of natural heating in the spring, but since the basin is so shallow, wind action causes efficient vertical mixing and by June the water becomes vertically isothermal. During August the deeper waters occasionally have a thermocline for short periods. The entire Western Basin freezes over early in the winter and stays frozen even during relatively mild winters. Lake levels fluctuate both annually and over a period of many years. Yearly high levels

Table 6-5. Water Quality Measurements at Locust Point - 50 to 100 feet Offshore

Parameter	Average values (ppm)
Calcium (Ca)	45
Magnesium (Mg)	11
Sodium (Na)	12
Chloride (Cl)	22
Nitrate (NO_3)	12
Sulphate (SO_4)	37
Phosphate (PO_4)	1.5
Silica (SiO_2)	2
Alkalinity (as $CaCo_3$)	101
Turbidity (as SiO_2)	-
Suspended Solids	131
Total Dissolved Solids	225
Dissolved Oxygen	10
pH	8.1
Chlorine Demand	1.4
Arsenic	0.016
Barium	0.1
Boron	0.0
Phosphorus	0.22
Iron	0.31
Manganese	0.07
Mercury	0.001
Nitrogen (N)	4
Potassium	3
Selenium	0.00
Silicon	0.28
Sulfur	14
Zinc	0.03

Data Period: November 1968 - October 1970
Data Source: U.S. Atomic Energy Commission (1973)

Table 6-6 . Water Quality Measurements at Locust Point - 2700 feet Offshore

Parameter	Average values (ppm)	Extremes High	Extremes Low
Calcium (Ca)	42	65	29
Magnesium (Mg)	9	15	3
Sodium (Na)	15	22	7.9
Chloride (Cl)	22	40	14
Nitrate (NO_3)	6	18.1	0
Sulfate (SO_4)	41	58	28
Phosphate (PO_4)	0.3	1.38	0
Silica (SiO_2)	1.0	7.5	0.1
Alkalinity (as $CaCO_3$)	98	128	80
Suspended solids	28	178	4
Dissolved solids	234	488	102
Dissolved oxygen	10	14	7
BOD	2	7.6	0.1
pH	8.1	8.95	7.35
Ammonia nitrogen	0.6	1.6	0.03
Chlorine demand	1.4	2.5	0.4

Data Period: November 1968 - February 1974
Data Source: U.S. Nuclear Regulatory Commission (1975)

occur in summer and lows in winter, with a total average fluctuation of 1.2 feet. Local changes due to storm action, however, may be as great as 6 feet. The Detroit River, which empties into Lake Erie about 40 miles northwest of the complex, provides 90% of the total inflow into the lake (188,000 cfs). At Locust Point the Detroit River current, which crosses the Western Basin, diverges into eastern and western branches. This provides a southeast drift of littoral sand from Locust Point to Toledo. The presence of three or four sand bars parallel to the shore and close to the beach indicates a predominance of currents parallel to the beach. Surface current velocities at Locust Point are about 2% of the wind velocity and vary with wind direction (U.S. Atomic Energy Commission, 1973).

Climate

The closest weather station providing climatic data for the Toussaint River Wetland Complex is located in the Ottawa National Wildlife Refuge. The average annual temperature is 49.8^{o}F based on the normal period from 1941-1970. The mean monthly low for January is 22.5^{o}F and the mean monthly high for July is 83.7^{o}F. The average annual precipitation is 32.97 inches, with a mean monthly precipitation of 2.35 inches in January and 3.35 inches in July. The growing season is approximately six months long, with the last killing frost (28^{o}F) in 1975 occurring on April 16 and the first killing frost on October 3 (National Oceanic and Atmospheric Administration).

Special Features

No natural special features are found in the vicinity of the Toussaint River Wetland Complex (U.S.G.S. quadrangle map, Lacarne, Ohio, 1967).

BIOTIC SETTING LE 060-061

Vegetation

Adams (1976) provides the following species list for the general area in which the Toussaint River Wetland Complex is located:

Algae (*Spirogyra* sp.)
American lotus (*Nelumbo lutea*)
Arrowhead (*Sagittaria latifolia*)
Bladderwort (*Utricularia* sp.)
Burreed (*Sparganium eurycarpum*)
Cattail (*Typha latifolia*)
Chara (*Chara vulgaris*)
Coontail (*Ceratophyllum demersum*)
Curly-leaf pondweed (*Potamogeton crispus*)
Duckweed (*Lemna minor*)
Oedogonium (*Oedogonium* sp.)
Pickerel weed (*Pontederia cordata*)
Nodding smartweed (*Polygonum lapathifolium*)
Cut grass (*Leersia oryzoides*)
Sago pondweed (*Potamogeton pectinatus*)

Sedge (Carex sp.)
Slender pondweed (Potamogeton berchtoldi)
Soft-stem bulrush (Scirpus validus)
Spike rush (Eleocharis sp.)
Swamp loosestrife (Decodon verticillatus)
Walter's millet (Echinochloa walteri)
Water milfoil (Myriophyllum exalbescens)
White waterlily (Nymphaea odorata)
Wild rice (Zizania aquatica)
Spatterdock (Nuphar advena)

The literature search provided no site-specific information pertaining to major species composition and distribution, density and productivity, or relationship to water levels of the vegetation in the two wetlands comprising this complex.

Fish

A fishery survey in connection with an environmental evaluation of the Davis-Besse Nuclear Power Station near Locust Point revealed 47 fish species and one hybrid form in the vicinity of Locust Point (Table 6-7). Of these 47 only a small number of bowfin (Amia calva), gizzard shad (Dorosoma cepedianum), goldfish (Carassius auratus), carp (Cyprinus carpio), largemouth bass (Micropterus salmoides), black crappie (Pomoxis nigromaculatus), and white crappie (Pomoxis annularis), were collected in hoop nets set in Navarre Marsh, a unit of Toussaint River Wetland which surrounds the power station (CLEAR 1974, 1975; Reutter and Herdendorf, 1977). Trawl surveys were conducted in the Toussaint River and adjacent wetlands during 1973, 1974, and 1975 in connection with a study of the channel catfish in western Lake Erie by the Ohio Cooperative Fishery Research Unit, Ohio State University, Columbus, Ohio. The results of these surveys in the form of a M.S. thesis have not yet been published.

An annotated list of fish species associated with wetland habitats or aquatic vegetation in the Lake Erie area of Ohio appears in Appendix A-3. Some of these species, in addition to those mentioned above, probably utilize Toussaint River Wetland. However, the literature search provided no site-specific information pertaining to spawning and hatching areas, seasonal distribution and abundance, life histories, food sources, or recreational and commercial use of the fish populations in the two wetlands of this complex, nor to species composition in Long Beach Wetland.

Invertebrates

An incomplete list of invertebrates found in Toussaint River Wetland is available in Adams (1976) and is presented in Table 6-8. These species are likely to occur also in Long Beach Wetland owing to its proximity. However, the literature search provided no site-specific information pertinent to seasonal distribution, density and productivity, major food sources, or relationship to water levels of the invertebrates present in the two wetlands comprising the Toussaint River Wetland Complex.

Table 6-7 . Fish Species Collected in the Vicinity of Locust Point, Ottawa County, Ohio, 1963-1976[a]

Family and common name
Petromyzontidae
sea lamprey
Lepisosteidae
longnose gar**
Amiidae
bowfin*
Clupeidae
alewife
gizzard shad*
Esocidae
northern pike**
muskellunge**
Osmeridae
rainbow smelt
Salmonidae
coho salmon
Cyprinidae
goldfish*
carp*
carp x goldfish hybrid **
silver chub
emerald shiner
spottail shiner
spotfin shiner
mimic shiner
fathead minnow**
Catostomidae
quillback
white sucker**
spotted sucker**
golden redhorse
bigmouth buffalo
northern hogsucker
Ictaluridae
black bullhead**
yellow bullhead**
brown bullhead**
channel catfish
stonecat
Atherinidae
brook silverside
Percopsidae
trout-perch
Percichthyidae
white bass
Centrarchidae
rock bass
green sunfish**
pumpkinseed**
orangespotted sunfish
bluegill**
redear sunfish
smallmouth bass
largemouth bass*
black crappie*
white crappie*
Percidae
johnny darter**
logperch**
yellow perch**
sauger
walleye
Sciaenidae
freshwater drum

[a]Reutter and Herdendorf (1974, 1975, 1977)
*Species caught in hoopnets in the Navarre Marsh unit of Toussaint River Wetland, which surrounds the Davis Besse Nuclear Power Station
**Species which are generally associated with wetland habitats or aquatic vegetation in the Lake Erie area of Ohio according to Trautman (1957) but not collected in Navarre Marsh.

Table 6-8. Invertebrates found in Toussaint River Wetland

Annelida
  Hirudinea
    Placobdella parasitica
	Hemiptera
	    Belostomatidae
	    Corixidae
	    Gerridae
	    Nepidae
	    Notonectidae

Arthropoda
  Crustacea
    Decapoda
      Palaemonetes sp.
      Orconectes immunis
      Procambarus blandingi
	Coleoptera
	    Dineutus americanus
	    Hydrophilidae

Insecta
  Odonata
    Anisoptera
    Zygoptera
	Mollusca
	  Gastropoda
	    Pulmonata
	      Lymnaea sp.
	      Viviparus malleatus

* Adams (1976)

Reptiles and Amphibians

The snapping turtle (*Chelydra serpentina*), midland painted turtle (*Chrysemys picta marginata*), and Blanding's turtle (*Emydoidea blandingi*) have been recently collected from the Navarre Marsh unit of Toussaint River Wetland near the Davis-Besse Nuclear Power Station at Locust Point (Center for Lake Erie Area Research, 1975). Conant (1951) found the map turtle (*Graptemys geographica*) in the Toussaint River and the midland painted turtle in Toussaint Creek. Reptiles and amphibans recorded from wetland habitats in Ottawa County are listed in Appendix C-1. Although not specifically reported from Toussaint River Wetland, some of these species may occur there.

The literature search yielded no site-specific information pertaining to seasonal abundance and distribution, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in the Toussaint River Wetland Complex, or to major species in Long Beach Wetland.

Avifauna

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 the Toussaint River Wetland Complex.

Mammals

The woodchuck (Marmota monax), muskrat (Ondatra zibethicus), and raccoon (Procyon lotor) can be found on the two wetlands of the Toussaint River Wetland Complex (Lehman, 1973; Adams, 1976).

A survey of the gastrointestinal parasites of the muskrat in the two wetlands of the Toussaint River Wetland Complex (Rice and Heck, 1975) revealed that 96% of the muskrat are infected with at least one of the following four helminths: Echinostoma revolutum, Quinqueserialis quinqueserialis, Wardis zibethicus, and Trichuris opaca. Echinostoma revolutum occurred most frequently in muskrat, but Quinqueserialis quinqueserialis represented the highest mean number of parasites per infected muskrat.

General information concerning the mammals of the wetlands of southwestern Lake Erie (Bednarik, 1953, 1956; Donohoe, 1961) may apply to the two wetlands of the Toussaint River Wetland Complex. Information discussed concerning Muddy Creek Bay Wetland (LE 044) and Magee Marsh (LE 062) may also apply to these wetlands. However, the literature search yielded no site-specific information pertaining to seasonal distribution and abundance, density and productivity, recreational and commercial use, major food sources, or relationship to water levels of the mammals inhabiting the two wetlands of the Toussaint River 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; Ohio Division of Wildlife, 1976) were documented in these wetlands by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of these wetlands. However, two NPDES permit holders discharge waste into Rusha Creek and this may have some effect the health of the wetlands.

CULTURAL SETTING

LE 060-061

Population

The Toussaint River Wetland Complex is located in Erie and Carroll Townships of Ottawa County, Ohio. The county is moderately populated, having a density of 149 persons per square mile. Table 6-9 indicates that Ottawa County and Carroll Township both experienced moderate population growth and Erie Township experienced slow population growth between 1970 and 1975. Projections for 1990 indicate that Ottawa County is expected to undergo slow population growth in the future.

Table 6-9. Population Data for the Vicinity of the Toussaint River Wetland Complex

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Ottawa County	38,800	4.7	41,500
Erie Township	1,512	2.9	--
Carroll Township	1,410	4.1	--

[a] U.S. Bureau of the Census (1977)
[b] Northern Ohio Urban System, Series 11 Method of Population Projections (1977)

Land Use and Ownership

Land use within the Toussaint River Wetland Complex is rural open space. The surrounding area is predominantly open space except for residential development along portions of the shore. Levees are located throughout both of the wetlands of this complex, and there are drainage canals throughout Long Beach Wetland. A few hard surface roads and some unimproved dirt roads run through and adjacent to the wetlands of this complex. A few buildings are located within Long Beach Wetland. The wetland complex is under private ownership, and its location suggests that it is subject to moderate development pressure (U.S.G.S. quadrangle map, Lacarne, Ohio, 1967).

Recreation

No known state or federal recreational facilities are present in the vicinity of the Toussaint River Wetland Complex.

Mineral, Energy, and Forest Resources

Potential mineral resources in the Toussaint River Wetland Complex include limestone, and dolomite (Great Lakes Basin Commission, 1974). Other resources are unknown.

Public Utilities and Facilities

A sewage disposal facility is located approximately 0.4 mile south of the easternmost portion of Toussaint River Wetland and the Davis-Besse Nuclear Power Station is within the wetland's central portion (U.S.G.S. quadrangle map, Lacarne, Ohio, 1967).

Pollution Sources

Uniroyal USCO Services, Inc. holds a NPDES permit to discharge sanitary and process waters from a sewage treatment plant into an unnamed marsh which leads to Rusha Creek. The Port Clinton Water Treatment Facility holds a NPDES permit to discharge treated water from Erie Industrial Park into Rusha Creek. Both discharges probably have an impact on the Toussaint River Wetland Complex. Thermal discharges from the Davis-Besse Nuclear plant are released 2500 feet offshore in the lake.

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 ft. of the Toussaint River Wetland Complex (Ohio Historic Preservation Office).

No known archaeological resources exist in the Toussaint River Wetland Complex vicinity, but this area has not yet been systematically surveyed by a professional archaeologist (Ohio Historical Preservation Office).

RESEARCH PROJECTS LE 060-061

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

OTTAWA WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LE 062-064

Setting

The Ottawa Wetland Complex lies along the south shore of western Lake Erie between Locust Point and Howard Farms, in Carroll and Benton Townships of Lucas County, Ohio, approximately 21 miles east of Toledo. The complex is comprised of three wetlands: Magee Marsh (State Wildlife Area), Ottawa National Wildlife Refuge Wetland (Ottawa Marsh) and Metzger marsh (State Wildlife Area). Crane Creek State Park lies between Magee and Ottawa Marshes. The wetlands of this complex are extensive, largely non-wooded, and Palustrine, and are protected from lake flooding by earthen and rip-rap dikes (U.S.G.S. quadrangle maps, Lacarne, Ohio, 1967; Oak Harbor, Ohio 1967; Metzer Marsh, Ohio, 1964; and Reno Beach, Ohio, 1967).

Topography

The Ottawa Wetland Complex lies at or near the mean level of Lake Erie (571 feet above mean sea level). The wetlands have very little relief; they are all below the 575-foot contour line. The land surface south of the complex is also relatively flat, reaching an elevation of only 585 feet approximately 3 miles southwest of the wetlands (U.S.G.S. quadrangle maps, Lacarne, Ohio, 1967; Oak Harbor, Ohio, 1967; Metzer Marsh, Ohio, 1964; and Reno Beach, Ohio 1967).

Surficial Geology

The surface material along the lake shore is mainly glacial till, locally covered to a shallow depth by marsh deposits. The glacial till was deposited directly by the Pleistocene ice sheets, and although the old glacial lakes modified the surface of the till, only a thin veneer of lacustrine clay was deposited upon it. Marshes formed along the low shore of the present lake, developing marsh deposits on the till surface. The marsh deposits consist of decayed organic matter mixed with varying amounts of sand, silt, and clay; in color these deposits vary from grayish brown to brownish black. In thickness the marsh materials vary from a thin veneer to a maximum of several feet, and in places such deposits occur beneath the present sandy beach deposits. The bedrock, composed of dolomites of the Silurian age, is buried by 10 to 50 feet of glacial material (U.S. Army Corps of Engineers, 1945).

According to Savoy (1956), the land from little Cedar Point at Maumee Bay to Marblehead is a low, level plain extending for several miles to the southwest, which represents the bottom of an ancient glacial lake higher than the present Lake Erie. As this higher lake (Lake Maumee) receded, extensive wetlands developed on the flat plain. These wetlands, known as the "Black Swamp", have been largely drained for agricultural purposes, but the Ottawa Wetland Complex is a prominent remnant (Forsyth, 1968). Over the nearly 11,000 years since the time of the glacial lakes, waves breaking offshore in the shallow water of the lake plain have been churning at the bottom sediments, sorting out the meager sand fractions. This material, together with the sand brought by shore currents from the washed bluffs of glacial till to the southeast, has been piled up lakeward in the form of an offshore bar. In the Magee Marsh area, this sand bar separates the marshes from the lake itself. The waves are continually cutting deeper on the lakeward side of the bar; the annual inundations of the bar by wind-driven waves in spring storms from the northeast wash sand farther into the marsh. The west and southeast winds which persist during the greater part of the year, particularly in the fall, do blow sand lakeward, but apparently not nearly to the extent that it is washed into the marsh during the spring. Thus, the bar is migrating landward and the marshland is slowly being destroyed, the net effect being that the lake is encroaching upon the land. The movement of the bar is too rapid for the development of soil profiles, even in the areas of dense vegetation.

Soils

Jones (1974) presented a generalized soils map of Ottawa County, which characterized the soils of this wetland complex as Marsh Land Association. Soils of this association are composed of level to depressional, very poorly drained material adjacent to the shore of Lake Erie; they were formed in clayey glacial lake deposited sediments and are affected by lake level fluctuations. The soil material of Marsh Land is similar to Toledo soils, but on occasional slight rises the material is light colored and resembles Fulton soils of glacial till clay origin.

Hydrology

The wetlands of this complex are adjacent to Lake Erie, so they are influenced by the level of the lake. Several streams flow through or adjacent to the wetlands; from east to west they include Turtle Creek, Crane Creek, and Wards Canal. All of these streams possess estuary-type mouths within the complex (Brant and Herdendorf, 1972).

Basically, the shorelines of the wetlands all show evidence of submergence, i.e. they are being slowly inundated by rising lake waters where not protected by dikes. Barrier beaches with embayments front much of the complex. They consist of a low series of beaches and sandbars, at times with low dune ridges. Behind the beach area, shallow water is often impounded and supports marsh vegetation. Such areas are temporary features geologically, since they are highly susceptible to shore erosion activity, especially that of storms and longshore currents (Finkbeiner, et al., 1971). According to Stein (1962), the Silurian limestone and dolomite, covered with an average of 50 feet of till along the shore between Locust Point and little Cedar Point, may yield from 100 to 250 gallons of water per minute from wells drilled to depths of up to 500 feet. The literature search provided no site-specific data pertaining to water level fluctuations, water quality, groundwater drainage patterns and runoff, depth, or seasonal changes in the Ottawa Wetland Complex.

Climate

The closest weather station providing climatic data for the Ottawa Wetland Complex is located in the Ottawa National Wildlife Refuge. The average annual temperature is 49.8^{o}F based on the normal period from 1941-1970. The mean monthly low for January is 22.5^{o}F and the mean monthly high for July is 83.7^{o}F. The average annual precipitation is 32.97 inches, with a mean monthly precipitation of 2.35 inches in January and 3.35 inches in July. The growing season is approximately six months long, with the last killing frost (28^{o}F) in 1975 occurring on April 16 and the first killing frost on October 3 (National Oceanic and Atmospheric Administration).

Special Features

No natural special features are found in the vicinity of the Ottawa Wetland Complex (U.S.G.S. quadrangle maps, Oak Harbor, Ohio, 1967; Reno Beach, Ohio, 1967; Metzger Marsh, Ohio, 1964; Lacarne, Ohio, 1967).

BIOTIC SETTING

LE 062-064

Vegetation

Bednarik (1960) provides a characterization of the major species composition and distribution of vegetation in Magee Marsh. Since many of the species reported are excellent duck food and are common to the area, it is likely that the following species are still thriving in Magee Marsh. Walter's millet (*Echinochloa walteri*) was the dominant grass in the west and mid-marsh units of the marsh. Species associated with water's millet included soft-stem bulrush (*Scirpus validus*), hard-stem bulrush (*Scirpus acutus*), rice cut-grass (*Leersis lenticularis*), mild water-pepper (*Polygonum hydropiperoides*), and stands of smart weed (*Polygonum pennsylvanicum*). A particularly difficult problem in this site was encroachment of woody species such as peach-leaved willow (*Salix amygdaloides*) and cottonwood (*Populus deltoides*). To eradicate woody species, marsh managers flooded the site. The flooding did little to correct the problem, but did produce a large growth of cattail (*Typha* sp.) in the lower elevations.

Major species composition of the eastern portion of the marsh was variable, as a result of water level manipulation. This area was alternately dominated by smart weed, Walter's millet, rice cut-grass, and cattail. In 1960, an almost solid stand of cattail dominated the 100 acre marsh south of Big Sandy Bay, known as the Perry Unit.

The literature search yielded no site-specific data pertaining to density and productivity of vegetation in the Ottawa Wetland Complex, nor to major species composition and distribution or relationship to water levels in Ottawa National Wildlife Refuge Wetland and Metzger Marsh.

Fish

Recreational fishing is available in Magee Marsh, and a boat ramp provides access on Turtle Creek (Ohio Department of Natural Resources, undated). In Metzger Marsh, a deep fishing channel was created during improvement of the dike access road running east of Wards Canal, which provides good recreational fishing for crappies (*Pomoxis annularis* and *P. nigromaculatus*), bullheads

(*Ictalurus* spp.) and channel catfish (*Ictalurus punctatus*) (Ohio Department of Natural Resources, undated).

A list of fish species associated with wetland habitats or aquatic vegetation in the Lake Erie area of Ohio is presented, with annotations, in Appendix A-3. Some of these species probably utilize the three wetlands of the Ottawa Complex. However, the literature search provided no site-specific information pertaining to species composition, spawning and hatching areas, life histories, food sources, or commercial use 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 the Ottawa Wetland Complex.

Reptiles and Amphibians

The midland painted turtle (*Chrysemys picta marginata*) was reported from Crane Creek (Conant, 1951) and probably occurs in all three wetlands of this complex. Other reptiles and amphibians recorded from wetland habitats in Ottawa and Lucas Counties are listed in Appendix C-1. Although not specifically reported from the three wetlands of this complex, some of these species may occur there.

The literature search yielded no site-specific information pertaining to seasonal abundance and distribution, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in Magee Marsh, Ottawa National Wildlife Refuge Wetland or Metzger Marsh.

Avifauna

The wetlands in this complex provide important nesting and feeding habitat for bald eagles (*Haliaeetus leucocephalus*), which are currently on the Federal and Ohio Endangered Species Lists. A pair of bald eagles nested in Crane Creek State Park , which is part of Magee Marsh, in 1962 and 1963 (Van Camp, 1974). Ospreys (*Pandion haliaetus*) and other migratory birds use the area for feeding and resting during migration. Mallards (*Anas platyrhynchos*), black ducks (*A. rubripes*) and Canada geese (*Branta canadensis*) are the major waterfowl species reported in Magee Marsh (Bednarik, 1975).

According to Bednarik (1975), a substantial increase in waterfowl production was reported in Magee Marsh during years of water level management (Bednarik, 1975). Tables 6-10 and 6-11 indicate the number of waterfowl nests found in Magee Marsh during 1967 and 1968. The number of species and the age and sex ratios of the waterfowl harvested in the marsh between 1973 and 1975 appear in Tables 6-12, 6-13, and 6-14, respectively. Data were also available for 1975 and 1976 and are presented in Tables 6-15 and 6-16.

Table 6-10 Number of Breeding Pairs of Ground-nesting Waterfowl, Magee Marsh, 1967[a]

Species	Number of breeding pairs	Percentage of total
blue-winged teal	129	59
mallard	64	30
black duck	11	5
green-winged teal	4	6
pintail	3	6
American wigeon	3	6
northern shoveler	2	6
redhead	2	6
TOTAL	218	100

[a]Taken from Bednarik, 1967

Table 6-11 Number of Waterfowl Nests Found on Magee Marsh, 1967-1968[a]

	1967 Nests		1968 Nests		Total Nests	
Species	No.	Percentage of total	No.	Percentage of total	No.	Percentage of total
blue-winged teal	38	66.6	23	63.9	61	65.5
mallard	17	29.8	13	36.1	30	32.3
black duck	1	1.8	--	--	1	1.1
green-winged teal	1	1.8	--	--	1	1.1
TOTAL	57	100.0	36	100.0	93	100.0

[a]Taken from Bailey, 1968

Table 6-12 Sex Ratios of Major Waterfowl Species Harvested at Magee Marsh, 1973-1975

Species	1973 No. ducks	1973 M:F	1974 No. ducks	1974 M:F	1975 No. ducks	1975 M:F
mallard	191	1.41	767	1.43	1,088	1.37
black duck	55	0.45	155	0.91	161	1.32
green-winged teal	18	0.28	92	1.24	121	1.57
American wigeon	17	2.40	38	1.38	55	1.29
gadwall	16	1.00	31	0.82	61	0.60
pintail	12	1.00	30	0.67	37	0.68
northern shoveler	22	1.44	16	0.23	15	0.88

[a]Taken from Bednarik et al, 1976.

Table 6-13. Age Ratios of Major Waterfowl Species Harvested at Magee Marsh, 1973-1975[a]

Species	1973 No. ducks	1973 I:A	1974 No. ducks	1974 I:A	1975 No. ducks	1975 I:A
mallard	191	0.51	767	1.60	1,088	1.30
black duck	55	14.29	155	1.43	161	0.80
green-winged teal	18	0.50	92	2.41	121	1.47
American wigeon	17	1.43	38	0.31	55	0.77
gadwall	16	1.66	31	0.41	61	0.65
pintail	12	2.00	30	1.00	37	0.85
northern shoveler	22	1.20	16	0.45	15	0.25

[a]Taken from Bednarik et al., 1976

Table 6-14. Species Composition of Magee Marsh Waterfowl Harvest, 1973-1975[a]

Species	1973 No. ducks	1973 Percent	1974 No. ducks	1974 Percent	1975 No. ducks	1975 percent
mallard	191	52	767	64	1,088	64
black duck	55	15	155	13	161	9
green-winged teal	18	5	92	8	121	7
American wigeon	17	5	38	3	55	3
gadwall	16	4	31	3	61	4
northern shoveler	22	6	16	1	15	*
pintail	12	3	30	3	37	2
wood duck	4	1	9	*	42	2
lesser scaup	1	*	8	*	12	*
greater scaup	0	-	0	-	3	*
hooded merganser	3	*	4	*	16	*
redhead	0	-	2	*	2	*
blue-winged teal	2	*	2	*	5	*
bufflehead	0	-	1	*	3	*
mallard x black	1	*	2	*	5	*
canvasback	0	-	0	-	1	*
ring-necked duck	1	*	3	*	12	*
ruddy duck	2	*	0	-	4	*
common merganser	1	*	3	*	20	1
oldsquaw	0	-	1	*	0	-
goldeneye	0	-	1	*	1	*
American coot	23	6	33	3	46	3

[a]Taken from Bednarik et al., 1976
*Less than 1%

Table6-15. Comparison of 1975 and 1976 Waterfowl Harvests, by Species Composition, in Magee Marsh

Species	1975 No.	1975 % of '75 Harvest	1976 No.	1976 % of '76 Harvest	% Change of composition	1976 Point value
						70
mallard	1,088	64	485	39	-30	25
black duck	161	9	60	5	-44	70
green-winged teal	121	7	201	16	+129	10
American wigeon	55	3	126	10	+233	25
gadwall	61	4	49	4	No change	10
northern shoveler	15	*	29	2	Increase	10
pintail	37	2	144	12	+500	10
wood duck	42	2	3	*	Decrease	70
lesser scaup	12	*	7	*	No change	10
greater scaup	3	*	0	0	Not killed('76)	10
hooded merganser	16	*	1	*	No change	70
redhead	2	*	7	*	No change	70
blue-winged teal	5	*	23	2	Increase	10
bufflehead	3	*	0	0	Not killed('76)	25
mallard x black	5	*	7	*	No change	25
canvasback	1	*	0	0	Not killed('76)	100
ring-necked duck	12	*	35	3	Increase	10
ruddy duck	4	*	29	2	Increase	10
common merganser	20	1	3	*	Decrease	10
oldsquaw	0	0	0	0	No change	10
goldeneye	1	*	0	0	Not killed('76)	25
American coot	46	3	40	3	No change	--
TOTAL	1,710		1,249			

[a]Taken from Bednarik, 1977a
*Less than 1%

Table 6-16. Sex and Age Ratios in 1976 Magee Marsh Waterfowl Harvest[a]

Species	Number	Age Ratio (I:A)	Sex Ratio (M:F)
mallard	485	1.02	2.37
pintail	144	2.51	1.53
black duck	60	1.00	1.50
blue-wing teal	23	4.75	0.64
green-wing teal	201	1.64	2.19
ring-necked duck	35	2.89	0.94
northern shoveler	29	3.14	1.42
ruddy duck	29	4.80	0.81
American wigeon	126	5.00	0.85
gadwall	49	7.17	1.13
redhead	7	6.00	0
common merganser	3	3.00	0.50
black x mallard	7	6.00	2.50
wood duck	3	0	0.50
lesser scaup	7	1.33	0.75
hooded merganser	1	0	0

[a]Taken from Bednarik, 1977a

Fall movements of Canada geese in Crane Creek State Park and Ottawa National Wildlife Refuge Wetland are available in Koerner (1971). Major waterfowl species recorded in Ottawa National Wildlife Refuge Wetland are mallards, black ducks, American wigeon (Anas americana), wood ducks (Aix sponsa), pintails (Anas acuta), and blue-winged teal (A. discors) (Hesselbart, 1969). A harvest rate of 0.38 goose per hunter was calculated for this wetland in 1976 and 1977. The age and sex ratios of the harvested geese for those seasons were 0.72 immatures per adult and 1.15 males per female, respectively (Bednarik, 1977). Bald eagles nested in this wetland in 1968 and 1974 (Van Camp, 1974).

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 Metzger Marsh, or to commercial use, health, life histories, or major food sources of the birds utilizing Magee Marsh and Ottawa National Wildlife Refuge Wetland.

Mammals

Mammalian species found on Magee Marsh, with their relative abundance, are listed in Table 6-17. Eastern cottontail (Sylvilagus floridanus) and fox squirrel (Sciurus niger) are found chiefly along the marsh perimeter and along dikes and ditch banks. Striped skunks (Mephitis mephitis) are especially common along dikes and ditch banks (U.S. Congress, 1961) but are most abundant on the southcentral portion of Magee Marsh and least common on the northern and eastern portions (Bailey, 1968, 1971). Raccoons (Procyon lotor) and Virginia opossums (Didelphis virginiana) visit most areas of Magee Marsh.

Table 6-17. Relative Abundance of Mammalian Species on Magee Marsh[a]

Common name	Relative abundance[b]
Virginiana opossum	P
eastern cottontail	P
woodchuck	P
fox squirrel	LN
meadow vole	P
muskrat	A
Norway rat	P
red fox	U
raccoon	P
long-tailed weasel	P
mink	U
striped skunk	P
white-tailed deer	O

[a] from U.S. Congress, 1961; Bailey, 1968; Bednarik, 1975; and Ohio Department of Natural Resources undated (a), undated (b).

[b] P=present
LN=limited number
A=abundant
U=uncommon
O-occasional

The late summer population size and density of several mammalian species on Magee Marsh was estimated in 1967 and 1968 (Table 6-17). The raccoon density on Magee Marsh is much lower than the raccoon density at Winous Point Marsh. Although a ratio of 1.0 juveniles per adult indicates a relatively low productivity for the striped skunk population on Magee Marsh, the population turnover rate is high (Bailey, 1968, 1971). Nearly 71% of all skunks examined were under one year old; few were over two years old. The productivity of the eastern cottontail population was relatively low in 1960. The juvenile to adult ratio based on data from the opening day harvest was 1.4 juveniles per adult (Edwards, 1950).

Table 6-18. Late Summer Population Size and Density of Several Mammalian Species on Magee Marsh[a]

Common name	Estimated population size	Number per km^2 (sq. mile)
Virginia opossum	39	4.63 (11.99)
red fox	14	1.66 (4.30)
raccoon	52	6.18 (16.01)
long-tailed weasel	5	0.58 (1.50)
mink	24	2.70 (6.99)
striped skunk	39	4.63 (11.99)

[a] Bailey, 1968, 1971

The muskrat (Ondatra zibethicus) is the most important furbearer on Magee Marsh (U.S. Congress, 1961). The trapping season in the Lake Erie district typically runs from November to March. The Magee Marsh muskrat harvest of the 1919-1920 season brought in $40,000 at a price of 4.10 per pelt (Bednarik, 1952). The muskrat harvest declined from 1939 to 1951 (Table 6-19). Few muskrats were harvested from Magee Marsh during the late 1950's when high water resulted in the deterioration of the marsh (U.S. Congress, 1961). In recent years, trapping success has been good. A discussion of muskrat trapping techniques, factors which influence trapping success, and pelt grading is found in several publications (Bednarik, 1953, 1954, 1956). The number and value of other furbearers harvested on Magee Marsh is considered negligible (U.S. Congress, 1961). No red fox (Vulpes vulpes) were trapped during the four trapping seasons from 1948 to 1952 (Bednarik, 1953, 1956). Raccoons, striped skunks, and mink (Mustela vison) are not extensively sought by trappers (U.S. Congress, 1961). Eastern cottontails are sometimes hunted on Magee Marsh. In 1960, 155 eastern cottontails were harvested on opening day (Edwards, 1950).

Table 6-19. Muskrat Harvests at Magee Marsh for Trapping Seasons from 1939 to 1951[a]

Season	Harvest
1939-1940	12235
1940-1941	10719
1941-1942	11805
1942-1943	19324
1943-1944	17169
1944-1945	4334

-continued-

Table 6-19. (concluded)

1945-1946	4889
1946-1947	2965
1947-1948	2620
1948-1949	1660
1949-1950	803
1950-1951	900
1951-1952	932

[a] Bednarik, 1953

Aspects of the life history of the muskrat on Magee Marsh have been studied (Bednarik, 1953, 1956). Breeding begins in January and ends in September, with the greatest period of activity in February and March. In 1951, 79.2% of the females bore at least one litter. The mean litter size based on placental scar counts was 9.6 young per litter.

An important mortality factor of muskrat in all wetlands of southwestern Lake Erie is hemorrhagic or "Errington's" disease (Bednarik, 1953, 1954, 1956). The loss of three muskrat per day on Magee Marsh through the summer of 1945 was attributed to this disease, and several hundred muskrat had perished in this way by December 1945. The greatest decline in the muskrat population occurred from November through December.

A survey of the gastrointestinal parasites of the muskrat in Magee Marsh (Rice and Heck, 1975) revealed that 96% of the muskrat are infected with at least one of the following four helminths: Echinostoma revolutum, Quinqueserialis quinqueserialis, Wardis zibethicus, and Trichuris opaca. Echinostoma revolutum occurred most frequently in muskrat, but Quinqueserialis quinqueserialis resulted in the highest mean number of parasites per infected muskrat.

The feeding habits of muskrat on Magee Marsh are versatile (Bednarik, 1953, 1956). Freshwater mussels (Anodontinidae) are caught on the barrier beach by muskrat and are an important food item. Staghorn sumac (Rhus typhina) is heavily utilized. The roots of alfalfa (Medicago sativa), burdock (Arctium minus) and bull thistle (Cirsium vulgare) are dug up from the dikes and consumed. The bark of cottonwood trees (Populus deltoides), duck carrion, and horsetail (Equisetum arvense) are minor food items. Little loosestrife (Decodon verticillatus) is consumed by muskrat although at the time of the study, loosestrife comprised 90% of the cover on Magee Marsh.

Increases in water levels have a detrimental effect on the muskrat population of Magee Marsh (Bednarik, 1953, 1956). Sudden rises in water level caused by spring storms result in the destruction of many muskrat houses in open water areas of Magee Marsh. In April 1951, 354 muskrat houses were counted on the west units of Magee Marsh. Only 136 muskrat houses, of which 81 were under water, remained three weeks later following a spring storm. An increase in water levels from winter to spring also decreases the number of active muskrat houses. Water levels rose 55.9 cm (22 in.) in the spring of 1952 and remained

27.9 cm (11 in.) above normal. The number of active muskrat houses decreased from 174 in the winter of 1951 to 37 in the winter of 1952. Muskrats will excavate dike dens during periods of high water on Magee Marsh.

Some aspects of the life history of the raccoon were studied by Sagar (1956). Although most of his data were obtained from raccoons on Magee Marsh, the report also included data from raccoons collected in other parts of Ohio. The intrauterine sex ratio is approximately 50:50, but the juvenile sex ratio in spring and in late summer and fall favors females. The adult sex ratio favors females. These results suggested that a differential postnatal mortality occurs. The reproductive cycle of the raccoon on Magee Marsh was also discussed by Sagar (1956). The mean litter size of Magee Marsh raccoons is 3.652 young per litter and is larger than the mean litter size of central Ohio raccoons. Litter sizes range from 1 to 8 young per litter. Breeding begins in late January and ends in late March, with the peak of activity occurring in February. Yearling females have a mean litter size which is not different from older females and may represent nearly half the population of breeding females. Wood duck boxes were the den sites most frequently used by raccoons (Sagar, 1956). One den was located on top of a muskrat house, but the other 14 dens examined were in wood duck boxes. All ages and sexes of raccoons utilized wood duck boxes, probably because of the lack of good den sites in the marsh.

Some aspects of the life history of the striped skunk on Magee Marsh have been studied (Bailey, 1968, 1971). A majority of striped skunks have black or short-striped color patterns instead of narrow or broad striped patterns. Male striped skunks are heavier than females (Table 6-20). Females seem to gain weight less readily than males in the spring and summer, but males lose a higher percentage of their body weight during the winter than females. The sex ratio approaches 1 to 1.

Table 6-20. Monthly Mean Weights in kg (lbs.) of Adult and Juvenile, Male and Female Striped Skunk on Magee on Magee Marsh in 1967 and 1968[a]

Month	Adults		Juveniles	
	male	female	male	female
February	1.76 (3.87)			
March	1.41 (3.10)	1.05 (2.31)		
April	1.36 (2.99)	1.30 (2.86)		
May		1.39 (3.06)	0.23 (0.51)	0.17 (0.37)
June		1.42 (3.12)	0.32 (0.68)	0.74 (1.63)
July	1.93 (4.25)	1.25 (2.75)	0.79 (1.74)	0.45 (0.99)
August	2.21 (4.86)	1.87 (4.11)	0.57 (1.25)	0.62 (1.36)
September		1.70 (3.74)	1.08 (2.38)	0.77 (1.69)
December	2.50 (5.50)	1.30 (2.86)		

[a] Bailey, 1968, 1971

The reproductive characteristics of striped skunks from Magee Marsh and other nearby wetlands of southwestern Lake Erie were also reported by Bailey (1968, 1971). Breeding begins in mid-February and ends in mid-March. The mobility of males and the weather are important in determining precisely when breeding begins. The mean litter size is 6.4 young per litter. Young are born in mid-April and mid-May. Young striped skunks travel with the female in July and August and are independent of the female by mid to late August. The seasonal activity of striped skunk on Magee Marsh was revealed by capture data (Bailey, 1968, 1971). Striped skunk are primarily nocturnal and usually leave their dens within one hour after sunset. Males are most active in late winter and spring. Both sexes are difficult to capture in late spring and summer. Juvenile striped skunks are most frequently caught in late summer and fall.

Striped skunks seldom move great distances (Bailey, 1968, 1971). The amount of movement is related to the age and sex of the animal, to the time of year, and to the habitat type. The mean maximum distance between captures was 0.81 km (0.5 mi.) for adult males and females, 0.64 km (0.4 mi.) for juvenile females, and 0.32 km (0.2 mi.) for juvenile males. The mean home range of striped skunks on Magee Marsh was 30.0 ha (74.1 acres) (Bailey, 1968, 1971). The range of home range sizes was from 12.4 ha (30.6 acres) to 45.6 ha (112.7 acres). Many home ranges included large areas of bluejoint grass (Calamagrostis canadensis) which were easily reached from the dikes. Wide, gently sloping, grassy dikes with adjacent marsh were used more frequently than narrow, steep, brushy dikes which were surrounded by water.

All striped skunk dens on Magee Marsh were on dikes (Bailey, 1968, 1971), and the majority of the dens had been dug out by woodchucks (Marmota monax). The number of available dens greatly exceeded the number of skunks. Many dens were utilized by striped skunks on a temporary basis. The food items of the striped skunk are abundant on Magee Marsh during the time the marsh is drained in the summer but may become scarce once the marsh is reflooded in the fall (Bailey, 1968, 1971). Food items include meadow vole (Microtus pennsylvanicus) eggs of snapping turtles (Chelydra serpentina), duck carrion, unidentified beetles, and June bugs (Phylloghaga sp.).

Duck eggs are food items for several mammalian species found on Magee Marsh (Bailey, 1968, 1971). The red fox, raccoon, striped skunk, Virginia opossum, mink and long-tailed weasel (Mustela frenata) destroyed 45%, 17%, 9%, 4%, less than 1%, and less than 1%, respectively, of waterfowl nests on Magee Marsh in 1967 and 1968.

Nine mammalian species can be found on Ottawa National Wildlife Refuge Wetland (Table 6-21). The white-tailed deer (Odocoilus virginianus) is only an occasional visitor to this wetland.

Table 6-21. Mammalian Species on Ottawa National Wildlife Refuge Wetland[a]

Common name	Common name
Virginia opossum	red fox
eastern cottontail	raccoon
woodchuck	striped skunk
fox squirrel	white-tailed deer
muskrat	

U.S. Department of Interior, 1975

Several species of mammals are found on Metzger Marsh (U.S. Congress, 1961; Ohio Department of Natural Resources undated). Eastern cottontails, fox squirrels, raccoons, and striped skunks are especially common along dikes and ditch banks and around the perimeter of the marsh. Mink are uncommon. White-tailed deer are occasional visitors to Metzger Marsh. Muskrat are also found on this wetland, and muskrat trapping has always been an important economic activity on Metzger Marsh (U.S. Congress, 1961). During the late 1950's few muskrat were harvested because high water resulted in the deterioration of the barrier beach and marsh. The number and value of other furbearers trapped on Metzger marsh is considered negligible (U.S. Congress, 1961). Mink are not common and therefore few are trapped. Raccoons and striped skunks are also not extensively trapped.

The literature search yielded no site-specific information pertaining to seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, major food sources, or relationship to water levels of the mammals inhabiting Ottawa National Wildlife Refuge Wetland or Metzger Marsh.

Endangered Species

Bald eagles nested in Crane Creek State Park (part of Magee Marsh) in 1962 and 1963, and in Ottawa National Wildlife Refugee Wetland in 1968 and 1974 (Van Camp, 1974).

No other plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Ohio Division of Wildlife, 1976) were documented in the Ottawa Wetland Complex by the literature search.

Health

Site-specific information indicates that the environmental quality of the Ottawa Wetland Complex is good for waterfowl and mammals. Abundant vegetation for food and cover is present, and all three wetlands are a part of either state or national wildlife areas. However, an NPDES permit holder as well as commercial development in the area may affect the health of this wetland.

CULTURAL SETTING

Population

The Ottawa Wetland Complex is located in Carroll and Benton Townships of Ottawa County, Ohio and in Jerusalem Township of Lucas County, Ohio. Ottawa County is moderately populated, having a density of 149 persons per square mile, while Lucas County is densely populated (1,390 persons per square mile). Table 6-22 indicates that population growth between 1970 and 1975 varies from moderate population growth to a rapid decline in population for these counties and townships. Projections for 1990 indicate that both counties are expected to undergo slow population growth in the future.

Table 6-22. Population Data for the Vicinity of Ottawa Wetland Complex

	Estimated Population 1975[a]	Estimated % Δ 1970-1975[a]	Projected Population 1990[b]
Ottawa County	38,800	4.7	41,500
Carroll Township	1,410	4.1	--
Benton Township	2,231	-4.7	--
Lucas County	46,657	-1.4	505,831[c]
Jerusalem Township	2,999	-11.9	--

[a] U.S. Bureau of the Census (1977)
[b] Northern Ohio Urban System, Series 11 Method of Population Projections (1977)
[c] Wallace, et al., 1976

Land Use and Ownership

Land use within the Ottawa Wetland Complex and most of the surrounding area is rural open space. Levees are present throughout the Ottawa Wetland Complex, and drainage canals are located throughout Magee Marsh and Ottawa National Wildlife Refuge Wetland. Route 14 east runs through Magee Marsh and a parking lot is north of the marsh at the end of the road. Veler road runs along the southeastern corner of Ottawa National Wildlife Refuge Wetland. A few unimproved dirt roads run through Metzger Marsh and eastern Ottawa National Wildlife Refuge Wetland. The wetland complex is under mixed federal and private ownership, and its location suggests that it is subject to minimal development pressure (U.S.G.S. quadrangle map, Oak Harbor, Ohio, 1967; Reno Beach, Ohio, 1967; Metzger Marsh, Ohio, 1964; Lacarne, Ohio, 1967).

Recreation

Parts of the Ottawa Wetland Complex lie within the Magee Marsh Wildlife Area, Crane Creek State Park, the Metzgar Marsh Wildlife Area, and the Ottawa National Wildlife Refuge. Crane Creek State Park offers facilities for fishing and hunting, but no other state or federal recreational facilities are known to be present in the vicinity of the wetland complex.

Mineral, Energy, and Forest Resources

Potential mineral resources in the Ottawa Wetland Complex include limestone and dolomite (Great Lakes Basin Commission, 1974). No significant gas, oil, or forest resources are known to be present in the vicinity.

Public Utilities and Facilities

A roadside park lies on the south side of State Route 2, which borders Magee Marsh on the south (U.S.G.S. quadrangle map, Oak Harbor, Ohio, 1967).

Pollution Sources

Ottawa County Sewer District 13 holds a NPDES permit to discharge process water into Turtle Creek which may affect the Ottawa Wetland Complex. Commercial development (e.g. motels, restaurants, and service stations) has severely degraded drainage ditches and Crane Creek, and may have an impact on the Ottawa Wetland Complex (Toledo Metropolitan Area Council of Governments, 1976).

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

Historical and Archaeological Features

The Ohio Archaeological Inventory indicates that one archaeological feature (the Ward's Canal-Crane Creek Site) is located 250 feet northeast of the Ottawa Wetland Complex. Further information regarding field research and exact location can be obtained from the Ohio History Center (Ohio Historical Preservation Office).

RESEARCH PROJECTS LE 062-064

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

CEDAR POINT NATIONAL WILDLIFE REFUGE WETLAND

PHYSIOGRAPHIC SETTING

LE 065

Setting

Cedar Point National Wildlife Refuge Wetland is located on and to the south of a sand spit (locally known as little Cedar Point) that divides western Lake Erie from Maumee Bay. The wetland lies in Jerusalem Township of Lucas County, Ohio, about eight miles east of Toledo. This largely non-wooded, Palustrine wetland is protected from Lake Erie flooding by extensive earthen and rip-rap rock dikes (U.S.G.S. quadrangle map, Reno Beach, Ohio, 1967). This former hunting club preserve is now managed as a waterfowl refuge by the U.S. Fish and Wildlife Service.

Topography

The wetland lies at or near the mean elevation of Lake Erie (571 feet above mean sea level). The wetland has very low relief; it lies entirely below the 575-foot contour line (U.S.G.S. quadrangle map, Reno Beach, Ohio, 1967). The Little Cedar Point sand spit has been built from sand deposited by littoral currents from the southeast. The spit extends underwater in a northwestern direction toward Turtle Island, an exposed remnant of a once larger spit (Herdendorf and Cooper, 1975). Maumee Bay is partially separated from western Lake Erie by two spits: 1) Little Cedar Point projecting northwesterly from the Ohio shore and 2) Woodtick Peninsula, with North Cape at its southern tip, extending south from the Michigan shoreline. South of the wetlands the land surface only rises 10 feet in three miles.

Surficial Geology

The Maumee Bay shoreline of Lake Erie is generally very low, flat, and swampy (Forsyth, 1968). The surface material, both on and offshore, is clay. This clay is easily eroded by frost, ice push, rainwash, or waves; even the simple process of drying out causes it to slake, or break up. The bottom sediment nearshore is lacustrine clay with a thin overburden of silt, except near little Cedar Point where the clay is overlain by a relatively thick layer of fine sand (Herdendorf, 1975). The lacustrine clay, up to 30 feet thick, was laid down in a glacial lake which once covered a large part of northwestern Ohio and southwestern Michigan, and marshes were formed on its surface along the low, lagoon-bordered shores of the present lake and along small tributary streams. The lake clay is in turn underlain by sandy glacial till approximately 80 feet thick with Silurian dolomite bedrock below (U.S. Army Corp of Engineers, 1945).

When the level of Lake Erie is low, destructive erosion to the shore near Cedar Point National Wildlife Refuge Wetland is usually not great, for the broad gentle clay slope is exposed lakeward of the wetland, almost like a broad beach, to protect the shore (Forsyth, 1968). Waves break offshore and little damage is done. When the water is higher however, waves break at the top of the shore and over it, causing great erosion of the land and disruption of the interior wetlands. Because the land is so low and so clayey, unrestricted erosion is rapid; on unprotected sections of the shoreline of Maumee Bay, retreat of the shore has been as much as 20 feet per year, the highest shoreline recession observed anywhere on Lake Erie (Herdendorf, 1975).

Soils

Forsyth (1968) mapped the soils of Lucas County, Ohio and southern Monroe County, Michigan. The soils of the wetlands along the Lake Erie shoreline and estuaries are designated as Lake Marshes containing decayed organic matter mixed with sand, silt, and clay, which were formed on Toledo soils. The topsoil of Toledo soils is generally seven to nine inches thick, and is composed of dark gray silty clay that is sticky or plastic when wet and hard when dry. The subsoil is compact silty clay, mottled gray and brown.

Hydrology

No surface streams flow through Cedar Point National Wildlife Refuge Wetland but several drainage ditches empty into it. Wolf Creek and Cedar Creek enter the lake at the southeastern limit of the wetland. The low courses of the streams have been channelized and are referred to as Williams Ditch and Reno Side Cut, respectively (U.S.G.S. quadrangle map, Reno Beach, Ohio, 1967). The wetland contains numerous open-water ponds, ten of which are named on the quadrangle map. The wetland lies adjacent to Lake Erie and Maumee Bay, so it is strongly influenced by the water level of the lake. The elevation of the water surface of Lake Erie varies irregularly from year to year; and follows a consistent seasonal rise and fall, with the highest stage prevailing during the early summer months. In addition to these annual surface fluctuations, sudden appreciable local changes in elevation owing to wind or variations in barometric pressure frequently occur in the Maumee Bay-Toledo harbor area. Strong winds, acting to raise the elevation of the lake at the lee shore and lower it on the windward shore, have a very pronounced effect on Lake Erie and Maumee Bay because of their shallowness. As a result, the water level at the ends of the lake fluctuates markedly under the influence of the wind, particularly if the direction is either southwest or northeast which parallels the long axis of Lake Erie. The U.S. Army Corps of Engineers (1945) reported that at Toledo harbor wind-produced fluctuations occurring in conjunction with prevailing high or low water have resulted in water levels ranging from six feet above to 7.5 feet below Low Water Datum (568.6 above mean water level in the Gulf of St. Lawrence).

Stein (1962) reported that dolomite bedrock may yield from 100 to 250 gallons of water per minute from wells drilled to depths of up to 500 feet. However, the literature search provided no site-specific data pertaining to groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in Cedar Point National Wildlife Refuge Wetland.

Climate

The closest weather station providing climatic data for Cedar Point National Wildlife Refuge Wetland is located in the Ottawa National Wildlife Refuge. The average annual temperature is 49.8°F based on the normal period from 1941-1970. The mean monthly low for January is 22.5°F and the mean monthly high for July is 83.7^{o}F. The average annual precipitation is 32.97 inches, with a mean monthly precipitation of 2.35 inches in January and 3.35 inches in July. The growing season is approximately six months long, with the last killing frost (28^{o}F) in 1975 occurring on April 16 and the first killing frost on October 3 (National Oceanic and Atmospheric Administration).

Special Features

No natural special features are found in the vicinity of Cedar Point National Wildlife Refuge Wetland (U.S.G.S. quadrangle map, Reno Beach, Ohio, 1967).

BIOTIC SETTING

LE 065

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 Cedar Point National Wildlife Refuge Wetland.

Fish

An annotated list of fish species associated with wetland habitats or aquatic vegetation in the Lake Erie area of Ohio appears in Appendix A-3. Some of these species probably utilize Cedar Point National Wildlife Refuge Wetland. 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 Cedar Point National Wildlife Refuge Wetland.

Reptiles and Amphibians

Conant (1951) reported the northern brown snake (*Storeria dekayi dekayi*), eastern garter snake (*Thamnophis sirtalis sirtalis*), and midland painted turtle (*Chrysemys picta marginata*) from Cedar Point and Cedar Point Marsh. Other reptiles and amphibans recorded from wetland habitats in Lucas County are listed in Appendix C-1. Although not specifically reported from Cedar Point National Wildlife Refuge Wetland, some of these species may occur there.

The literature search yielded no site-specific information pertaining to seasonal abundance and distribution, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in Cedar Point National Wildlife Refuge Wetland.

Avifauna

The historical occurrence of Forster's tern (Sterna forsteri) in this wetland is recorded in Campbell and Trautman (1936). Major waterfowl species reported for this wetland are mallard (Anas platyrhynchos), black duck (A. rubripes), American wigeon (A. americana), wood duck (Aix sponsa), pintail (Anas acuta) and blue-winged teal (A. discors) (Hesselbart, 1969). This wetland is heavily utilized by migratory species during fall migration. The 1974 fall migration count for waterfowl species included 10,000 mallards from October to January; 25,000 ruddy ducks (Oxyura jamaicensis) and 20,000 lesser scaup (Aythya affinis) in late November; 8,000 black ducks from November to December; and 15,000 Canada geese (Branta canadensis). Whistling swans (Olor columbianus) utilize the area for resting during spring migration. The area sustains resident populations of 200-300 Canada geese, 200-300 mallards, and smaller numbers of blue-winged teal (Great Lakes Basin Commission, 1976).

The literature search provided no site-specific information pertaining to density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing Cedar Point Wildlife Refuge Wetland.

Mammals

General information concerning the wetlands of southwestern Lake Erie (Bednarik, 1953, 1956; Donohoe, 1961) may apply to Cedar Point National Wildlife Refuge Wetland. Information discussed concerning Muddy Creek Bay Wetland (LE 044) and Magee Marsh (LE 062) may also apply to this wetland. However, the literature search yielded no site-specific information pertaining to species composition, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, major food sources, or relationship to water levels of the mammals inhabiting Cedar Point National Wildlife Refuge 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; Ohio Division of Wildlife, 1976) were documented in Cedar Point National Wildlife Refuge 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

LE 065

Population

Cedar Point National Wildlife Refuge Wetland is located in Jerusalem Township of Lucas County, Ohio. The county is densely populated, having a density of 1,390 persons per square mile. Table 6-23 indicates that Lucas County experienced a slow decline in population, while Jerusalem Township experienced a rapid decline in population, between 1970 and 1975. Projections for 1990 indicate that Lucas County is expected to undergo slow population growth in the future.

Table 6-23. Population Data for the Vicinity of Cedar Point National Wildlife Refuge Wetland

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Lucas County	476,657	-1.4	505,831
Jerusalem Township	2,999	-11.9	--

[a] U.S. Bureau of the Census (1977)
[b] Wallace, et al., 1976

Land Use and Ownership

Land use within Cedar Point National Wildlife Refuge Wetland and most of the surrounding area is rural open space. Levees are present in Cedar Point National Wildlife Refuge Wetland. A few hard surface roads are located adjacent to the east and southwest borders, and an aquaduct for the city of Toledo water supply passes through the southern portion of the wetland. The wetland is under federal ownership, and its location suggests that it is subject to minimal development pressure (U.S.G.S. quadrangle map, Reno Beach, Ohio, 1967).

Recreation

Cedar Point National Wildlife Refuge Wetland lies within the Cedar Point National Wildlife Refuge, but no state or federal recreational facilities are located in the vicinity of the wetland.

Mineral, Energy, and Forest Resources

Potential mineral resources in Cedar Point National Wildlife Refuge Wetland include limestone and dolomite (Great Lakes Basin Commission, 1974), quarrying is unlikely since the wetland is within the Cedar Point National Wildlife Refuge. Other resources are unknown.

Public Utilities and Facilities

Two pumping stations are adjacent to Cedar Point National Wildlife Refuge Wetland (U.S.G.S. quadrangle map, Reno Beach, Ohio, 1967).

Pollution Sources

There are no NPDES permit holders adjacent to Cedar Point National Wildlife Refuge Wetland. No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

The Ohio Historical Inventory indicates that one historical site, the Bay View Yacht Club, is located 0.3 mile south of Cedar Point National Wildlife Refuge Wetland. Further information regarding field research and exact location can be obtained from The Ohio History Center (Ohio Historical Preservation Office).

The Ohio Archaeological Inventory indicates that three archaeological sites are located in the vicinity of the Cedar Point National Wildlife Refuge Wetland. The Waterworks Site is a habitation area and burial mound, located 0.4 mile southwest of the wetland. The Harmeyer Site is an ancient camp and is located 0.3 mile south. Further information regarding field research and exact location can be obtained from the Ohio History Center (Ohio Historical Preservation Office).

RESEARCH PROJECTS LE 065

The literature search identified no on-going or impending research projects pertaining to Cedar Point National Wildlife Refuge Wetland.

NILES BEACH AREA WETLAND

PHYSIOGRAPHIC SETTING

LE 066

Setting

Niles Beach Area Wetland is on the south shore of Maumee Bay in Jerusalem Township of Lucas County, Ohio. It is located about one mile west of Cedar Point National Wildlife Refuge and seven miles west of Toledo. This wetland is a Palustrine swamp forest, entirely wooded (U.S.G.S. quadrangle map, Reno Beach, Ohio, 1967).

Topography

Niles Beach Area Wetland lies at or near the mean elevation of Lake Erie (571 feet above mean sea level). The wetland has very low relief; it lies entirely below the 575-foot contour line. The land surface south of the wetland is relatively flat, rising only ten feet in about three miles (U.S.G.S. quadrangle map, Reno Beach, Ohio, 1967).

Surficial Geology

The Maumee Bay shoreline of Lake Erie is generally very low, flat, and swampy (Forsyth, 1968). The surface material, both on and offshore, is clay. This clay is easily eroded by frost, ice push, rainwash, or waves; even the simple process of drying out causes it to slake, or break up. The bottom sediment nearshore is lacustrine clay with a thin overburden of silt, except near little Cedar Point where the clay is overlain by a relatively thick layer of fine sand (Herdendorf, 1975). The lacustrine clay, up to 30 feet thick, was laid down in a glacial lake which once covered a large part of northwestern Ohio and southwestern Michigan; marshes have formed on its surface along the low, lagoon-bordered shores of the present lake and along small tributary streams. The lake clay is in turn underlain by sandy glacial till approximately 80 feet thick with Silurian dolomite bedrock below (U.S. Army Corp of Engineers, 1945).

Soils

Forsyth (1968) mapped the soils of Lucas County, Ohio and southern Monroe County, Michigan. The soils of the wetlands along the Lake Erie shoreline and esturaries are designated as Lake Marshes. The marsh deposits consist of decayed organic matter mixed with varying amounts of sand, silt, and clay. In color these deposits vary from grayish brown to brownish black, and in thickness they vary from a thin veneer to a maximum of several feet (U.S. Army Corps of Engineers, 1945). The marshes have formed on Toledo soils. The latter, which also flank the wetlands on the flat lake plain, have developed in lake-deposited silts and clay. Toledo topsoil, generally seven to nine inches thick, is dark gray silty clay that is sticky or plastic when wet and hard when dry. The subsoil is compact silty clay, mottled gray and brown.

Hydrology

Niles Beach Area Wetland lies adjacent to Maumee Bay and is therefore influenced by the water level of Lake Erie (see the Hydrology section of Cedar Point National Wildlife Refuge Wetland, LE 065). No surface streams flow through the wetland.

Stein (1962) reported that dolomite bedrock may yield from 100 to 250 gallons of water per minute from wells drilled to depths up to 500 feet. However, the literature search provided no site-specific data pertaining to water level fluctuations, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in this wetland.

Climate

The closest weather station providing climatic data for Niles Beach Area Wetland is located in the Ottawa National Wildlife Refuge. The average annual temperature is 49.8°F based on the normal period from 1941-1970. The mean monthly low for January is 22.5°F and the mean monthly high for July is 83.7°F. The average annual precipitation is 32.97 inches, with a mean monthly precipitation of 2.35 inches in January and 3.35 inches in July. The growing season is approximately six months long, with the last killing frost (28°F) in 1975 occurring on April 16 and the first killing frost on October 3 (National Oceanic and Atmospheric Administration).

Special Features

No natural special features are located in the vicinity of Niles Beach Area Wetland (U.S.G.S. quadrangle map, Reno Beach, Ohio, 1967).

BIOTIC SETTING

LE 066

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 Niles Beach Area Wetland.

Fish

The fish population of Maumee Bay in general has declined greatly in diversity during the past three decades. Fish species inhabiting Maumee Bay prior to 1957 are listed, with habitat preferences, in Appendix A-5, and a similar list of fish inhabiting the bay as of 1976 is presented in Appendix A-6. Three major causes of the decline or extinction of many species in Maumee Bay are (1) inability of fish such as northern pike (*Esox lucius*) and lake sturgeon (*Acipenser fulvescens*) to reach spawning grounds because of dams and other channel obstructions upstream, (2) increased turbidity, siltation, and industrial waste to which many species are intolerant, and (3) smothering of spawning grounds by siltation. Species intolerant of siltation and industrial pollution have declined in abundance in the bay and include many of the more valuable commercial and recreational species such as walleye (Stizostedion vitreum), lake whitefish (Coregonus clupeaformis), muskellunge (Esox masquinongy), northern pike, yellow perch (Perca flavescens), and smallmouth bass (Micropterus dolomieui). Species tolerant to siltation and some industrial pollution have thrived or maintained relatively high abundance in the bay. These include gizzard shad (Dorosoma cepedianum), bigmouth buffalo (Ictiobus cyprinellus), channel catfish (Ictalurus punctatus), brown bullhead (Ictalurus nebulosus), black bullhead (Ictalurus melas), white crappie (Pomoxis annularis), green sunfish (Lepomis cyanellus), sauger (Stizostedion canadense), and freshwater drum (Aplodinotus grunniens) (Pinsak and Meyer, 1976). Species presently inhabiting Maumee Bay which probably utilize wetlands bordering the bay, including Niles Beach Area Wetland, based on habitat preferences described by Trautman (1957) include gizzard shad, muskellunge, northern pike, carp (Cyprinus carpio), goldfish (Carassius auratus), brown bullhead, black bullhead, white crappie, black crappie (Pomoxis nigromaculatus), and yellow perch (Perca flavescens). Fraleigh and Tramer (1974) discussed fish community structure in Maumee Bay, but their study primarily concerned walleyes in three areas adjacent to the Toledo Harbor channel and did not involve wetlands. Although no specific information regarding spawning areas in Maumee Bay was located, Pinsak and Meyer (1976) suggested several spawning areas based on high catch locations of commercial fishermen. Based on a map of these areas (Appendix A-7), Niles Beach Area Wetland is probably a spawning area for carp, channel catfish, goldfish, and brown and black bullheads.

A search of the literature provided no site-specific information pertaining to 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 Niles Beach Area Wetland.

Reptiles and Amphibians

The following reptiles and amphibians with wetland affinities have been recorded in the Toledo vicinity and the lower Maumee River: eastern fox snake (Elaphe vulpina gloydi), Kirtland's water snake (Natrix kirtlandi), queen snake (Natrix septemvittata), northern water snake (Natrix sipedon sipedon), northern brown snake (Storeria dekayi dekayi), northern red-bellied snake (Storeria occipitomaculata occipitomaculata), Butler's garter snake (Thamnophis butleri), northern ribbon snake (Thamnophis sauritis septentrionalis), eastern garter snake (Thamnophis sirtalis sirtalis), snapping turtle (Chelydra serpentina), map turtle (Graptemys geographica), midland painted turtle (Chrysemys picta marginata), and eastern spiny softshell (Trionyx spiniferus spiniferus) (Conant, 1951). Some of these species may occur in Niles Beach Area Wetland. Other reptiles and amphibans recorded from wetland habitat in Lucas County are listed in Appendix C-1. Although not specifically reported from Niles Beach Area Wetland, some of these species may occur there.

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

Avifauna

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 Niles Beach Area Wetland.

Mammals

General information concerning the wetlands of southwestern Lake Erie (Bednarik, 1953, 1956; Donohoe, 1961) may apply to Niles Beach Area Wetland. Information discussed concerning Muddy Creek Bay Wetland (LE 044) and Magee Marsh (LE 062) may also apply to this wetland. However, the literature search yielded no site-specific information pertaining to species composition, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, major food sources, or relationship to water levels of the mammals inhabiting Niles Beach Area Wetland.

Endangered Species

The muskellunge, a fish species endangered in Ohio, is found in Maumee Bay and probably utilizes Niles Beach Area Wetland.

No other plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Ohio Division of Wildlife, 1976) were documented in this 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 — LE 066

Population

Niles Beach Area Wetland is located in Jerusalem Township of Lucas County, Ohio. The county is densely populated, having a density of 1,390 persons per square mile. Table 6-24 indicates that Lucas County experienced a slow decline in population, while Jerusalem Township experienced a rapid decline in population, between 1970 and 1975. Projections for 1990 indicate that Lucas County is expected to undergo slow population growth in the future.

Table 6-24. Population Data for the Vicinity of Niles Beach Area Wetland

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Lucas County	476,657	-1.4	505,831
Jerusalem Township	2,999	-11.9	--

[a] U.S. Bureau of the Census (1977)
[b] Wallace, et al., 1976

Land Use and Ownership

Land use within Niles Beach Area Wetland and most of the surrounding area is rural open space. The wetland is under private ownership, but its location suggests that it is subject to minimal development pressure (U.S.G.S. quadrangle map, Reno Beach, Ohio, 1967).

Recreation

No known state or federal recreational facilities are present in the vicinity of Niles Beach Area Wetland.

Mineral, Energy, and Forest Resources

Potential mineral resources in Niles Beach Area Wetland include limestone and dolomite (Great Lakes Basin Commission, 1974). No significant oil, gas, or forest resources are known to be present in the vicinity.

Public Utilities and Facilities

No public utilities or facilities are located within 0.5 mile of Niles Beach Area Wetland (U.S.G.S. quadrangle map, Reno Beach, Ohio, 1967).

Pollution Sources

There are no NPDES permit holders adjacent to Niles Beach 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 ft. of Niles Beach Area Wetland (Ohio Historical Preservation Office).

No known archaeological resources exist in the Niles Beach Area Wetland vicinity, but this area has not yet been systematically surveyed by a professional archaeologist (Ohio Historical Preservation Office).

RESEARCH PROJECTS LE 066

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

OTTER CREEK WETLAND (Ohio)

PHYSIOGRAPHIC SETTING LE 067

Setting

Otter Creek Wetland lies along the estuarine portion of Otter Creek, extending inland from the stream's mouth at Maumee for 1.8 miles. This wetland lies within the city limits of Oregon, Ohi, about four miles northeast of downtown Toledo. Otter Creek enters Maumee Bay in the Toledo harbor area, about one mile northeast of the mouth of the Maumee River at Bay View Park; the mouth of Otter Creek is on the east side of Presque Isle, a peninsula that separates the creek from the Maumee River. Otter Creek Wetland is a non-wooded Palustrine System (U.S.G.S. quadrangle map, Oregon, Ohio-Michigan, 1965).

Topography

This wetland lies along the estuarine portion of Otter Creek at or near the mean elevation of Maumee Bay and Lake Erie (571 feet above mean sea level). The wetland has very low relief; it lies entirely below the 575-foot contour line. The land surface is fairly flat south of the wetland, reaching an elevation of 600 feet about 3.5 miles from the bay shore.

Surficial Geology

The Maumee Bay shoreline of Lake Erie is generally very low, flat, and swampy (Forsyth, 1968). The surface material, both on and offshore, is clay. This clay is easily eroded by frost, ice push, rainwash, or waves; even the simple process of drying out causes it to slake, or break up. The bottom sediment nearshore is lacustrine clay with a thin overburden of silt, except near little Cedar Point where the clay is overlain by a relatively thick layer of fine sand (Herdendorf, 1975). The lacustrine clay, up to 30 feet thick, was laid down in a glacial lake which once covered a large part of northwestern Ohio and southwestern Michigan; marshes have formed on its surface along the low, lagoon-bordered shores of the present lake and along small tributary streams. The lake clay is in turn underlain by sandy glacial till approximately 80 feet thick with Silurian dolomite bedrock below (U.S. Army Corp of Engineers, 1945).

Soils

Forsyth (1968) mapped the soils of Lucas County, Ohio and southern Monroe County, Michigan. The soils of the wetlands along the Lake Erie shoreline and estuaries are designated as Lake Marshes, containing decayed organic matter mixed with sand, silt, and clay, which have formed on Toledo soils. The latter, which also flank the wetlands on the flat lake plain, have developed in lake-deposited silts and clay. Toledo topsoil, generally seven to nine inches thick, is dark gray silty clay that is sticky or plastic when wet and hard when dry. The subsoil is compact silty clay, mottled gray and brown.

Hydrology

Otter Creek, with a drainage area of less than 10 square miles, is the only stream to flow through the wetland. The Standard Oil refinery in Oregon, Ohio discharges approximately 26 million gallons per day (98,200 m^3/day) of process and cooling water into Maumee Bay via Otter Creek. In 1975, the loadings were 600 kg/day of oil and grease, 7773 kg/day of BOD and 6727 kg/day of solids. Ohio EPA issued an NPDES permit in 1976 for all parameters except temperatures, which is still being studied. Standard Oil installed a sand filtration system in 1977 (Ohio Environmental Protection Agency, 1977).

Stein (1962) reported that a shallow buried valley underlies the lower reach of Otter Creek. Sand and gravel layers, where present in the valley fill, generally yield less than 20 gallons of water per minute.

Since Otter Creek Wetland occupies the estuarine valley of Otter Creek, its water level is strongly influenced by the water level of Maumee Bay and Lake Erie (See Hydrology section of Cedar Point National Wildlife Refuge Wetland, LE 065). The literature search provided no site-specific data pertaining to water level fluctuations, groundwater drainage patterns and runoff, or seasonal changes in this wetland.

Climate

The closest weather station providing climatic data for Otter Creek Wetland is located in Toledo, Ohio. The average annual temperature is 52.0^{o}F based on the normal period from 1941-1970. The mean monthly low for January is 24.5^{o}F and the mean monthly high for July is 87.6^{o}F. The average annual precipitation is 31.87 inches, with a mean monthly precipitation of 2.13 inches in January and 3.28 inches in July. The growing season is approximately six months long, with the last killing frost (28^{o}F) in 1975 occurring on April 8 and the first killing frost on November 23* (National Oceanic and Atmospheric Administration).

* The average growing season is only six months; the last killing frost in 1975 was unusually late.

Special Features

No natural special features are found in the vicinity of Otter Creek Wetland (U.S.G.S. quadrangle map, Oregon, Ohio-Michigan, 1965).

BIOTIC SETTING LE 067

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 Otter Creek Wetland.

Fish

Fish species inhabiting Maumee Bay prior to 1957 are listed, with habitat preferences, in Appendix A-5, and a similar list of fish inhabiting the bay as of 1976 is presented in Appendix A-6. Fish species which probably utilize wetlands bordering Maumee Bay, based on habitat preferences described by Trautman (1957), include gizzard shad (Dorosoma cepedianum), muskellunge (Esox masquinongy), northern pike (Esox lucius), carp (Cyprinus carpio), goldfish (Carassius auratus), brown bullhead (Ictalurus nebulosus), black bullhead (Ictalurus melas), white crappie (Pomoxis annularis), black crappie (Pomoxis nigromaculatus), and yellow perch (Perca flavescens). Owing to siltation and industrial pollution in the bay and obstruction of upstream spawning runs by dams, northern pike and muskellunge are not common in the bay and probably do not utilize Otter Creek Wetland because of its urban location.

A search of the literature provided no site-specific information pertaining to 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 Otter Creek Wetland.

Reptiles and Amphibians

The following species with wetland affinities have been recorded in the Toledo vicinity and the lower Maumee River: eastern fox snake (Elaphe vulpina gloydi), Kirtland's water snake (Natrix kirtlandi), queen snake (Natrix septemvittata), northern water snake (Natrix sipedon sipedon), northern brown snake (Storeria dekayi dekayi), northern red-bellied snake (Storeria occipitomaculata occipitomaculata), Butler's garter snake (Thamnophis butleri), northern ribbon snake (Thamnophis sauritis septentrionalis), eastern garter snake (Thamnophis sirtalis sirtalis), snapping turtle (Chelydra serpentina), map turtle (Graptemys geographica), midland painted turtle (Chrysemys picta marginata), and eastern spiny softshell (Trionyx spiniferus) (Conant, 1951). Some of these species may occur in Otter Creek Wetland. Other reptiles and amphibans recorded from wetland habitats in Lucas County are listed in Appendix C-1. Although not specifically reported from Otter Creek Wetland, some of these species may occur there.

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

Avifauna

A list of birds and numbers observed in spring, 1974, in Maumee Bay appears in Appendix D-2. In addition, bald eagles (Haliaeetus leucocephalus), green-winged teal (Anas crecca), blue-winged teal (A. discors), northern shovelers (A. clypeata), American wigeon (A. americana), and American coot (Fulica americana) have been observed in the vicinity and may utilize this wetland (U.S. Army Corps of Engineers, 1976). The bald eagle is currently on the Federal and Ohio Endangered Species Lists.

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

Mammals

General information concerning the wetlands of southwestern Lake Erie (Bednarik, 1953, 1956; Donohoe, 1961) may apply to Otter Creek Wetland. Information discussed concerning Muddy Creek Bay Wetland (LE 044) and Magee Marsh (LE 062) may also apply to this wetland. However, the literature search yielded no site-specific information pertaining to species composition, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, major food sources, or relationship to water levels of the mammals inhabiting Otter Creek Wetland.

Endangered Species

Bald eagles have been observed in the vicinity and may utilize Otter Creek Wetland (U.S. Army Corps of Engineers, 1976). No other plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Ohio Division of Wildlife, 1976) were documented in this wetland by the literature search.

Health

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

CULTURAL SETTING LE 067

Population

Otter Creek Wetland is located within the city limits of Oregon in Lucas County, Ohio. The county is densely populated, having a density of 1,390 persons per square mile. Table 6-25 indicates that Lucas County experienced a slow decline in population, while Oregon (city) underwent rapid population growth between 1970 and 1975. Projections for 1990 indicate that Lucas County is expected to undergo slow population growth in the future.

Table 6-25. Population Data for the Vicinity of Otter Creek Wetland

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Lucas County	476,657	-1.4	505,831
City of Oregon	18,500	11.7	--

[a] U.S. Bureau of the Census (1977)
[b] Wallace, et al., 1976

Land Use and Ownership

Land use within Otter Creek Wetland is rural open space. The surrounding area is predominantly commercial. Otter Creek Wetland is flanked on both sides by multiple railroad tracks and oil refineries, and a hard surface road cuts across the northcentral part of the wetland. The wetland is under private ownership, and its location suggests that it is subject to severe development pressure (U.S.G.S. quadrangle map, Oregon, Ohio-Michigan, 1965).

Recreation

No known state or federal recreational facilities are present in the vicinity of Otter Creek Wetland.

Mineral, Energy, and Forest Resources

Potential mineral resources in Otter Creek Wetland include sand, gravel, limestone, and dolomite (Great Lakes Basin Commission, 1974). No significant forest, oil, or gas resources are known to be present in the vicinity.

Public Utilities and Facilities

A power transmission line lies approximately 0.2 mile south of Otter Creek Wetland (U.S.G.S. quadrangle map, Oregon, Ohio-Michigan, 1965).

Pollution Sources

The following NPDES permit holders discharge into Otter Creek and/or into Maumee Bay and may have an impact on Otter Creek Wetland: Standard Oil of Ohio discharges non-contact cooling water, treated process water, and sanitary waste; Liquid Carbonic Corporation discharges cooling waters and chlorinated process water; Presque Isle Docks and the Chesapeake and Ohio Railway discharge sanitary and process waste water from a settling pond; Fondessy Enterprises Inc. discharges sanitary land fill and run-off; and Sun Oil Company of Pennsylvania discharges contaminated process waste water and treated run-off from refinery operations.

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 ft. of Otter Creek Wetland (Ohio Historical Preservation Office).

No known archaeological resources exist in the Otter Creek Wetland vicinity, but this area has not yet been systematically surveyed by a professional archaeologist (Ohio Historical Preservation Office).

RESEARCH PROJECTS

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

DETWILER AREA WETLAND

PHYSIOGRAPHIC SETTING LE 068

Setting

Detwiler Area Wetland is located on the west shore of Maumee Bay within the city limits of Toledo, Ohio. The wetland is immediately north of the mouth of the Maumee River, between Bay View Park and Cullen Park. This non-wooded wetland merges with the shallow bottom of Maumee Bay and contains both Palustrine and Lacustrine components (U.S.G.S. quadrangle map, Oregon, Ohio-Michigan, 1965).

Topography

Detwiler Area Wetland borders Maumee Bay and lies at or near the mean elevation of Lake Erie (571 feet above mean sea level). The wetland has very low relief; it lies entirely below the 575-foot contour line (U.S.G.S. quadrangle map, Oregon, Ohio-Michigan, 1965). West of the wetland the land surface rises gently to an elevation of 585 feet within 0.5 mile.

Surficial Geology

The Maumee Bay shoreline of Lake Erie is generally very low, flat, and swampy (Forsyth, 1968). The surface material, both on and offshore, is clay. This clay is easily eroded by frost, ice push, rainwash, or waves; even the simple process of drying out causes it to slake, or break up. The bottom sediment nearshore is lacustrine clay with a thin overburden of silt, except near little Cedar Point where the clay is overlain by a relatively thick layer of fine sand (Herdendorf, 1975). The lacustrine clay, up to 30 feet thick, was laid down in a glacial lake which once covered a large part of northwestern Ohio and southwestern Michigan; marshes have formed on its surface along the low, lagoon-bordered shores of the present lake and along small tributary streams. The lake clay is in turn underlain by sandy glacial till approximately 80 feet thick with Silurian dolomite bedrock below (U.S. Army Corp of Engineers, 1945).

Soils

Forsyth (1968) mapped the soils of Lucas County, Ohio and southern Monroe County, Michigan. The soils of the wetlands along the Lake Erie shoreline and estuaries are designated as Lake Marshes, containing decayed organic matter mixed with sand, silt, and clay, which have formed on Toledo soils. The latter, which also flank the wetlands on the flat lake plain, have developed in lake-deposited silts and clay. Toledo topsoil, generally seven to nine inches thick, is dark gray silty clay that is sticky or plastic when wet and hard when dry. The subsoil is compact silty clay, mottled gray and brown.

Hydrology

Since Detwiler Area Wetland is directly connected to Maumee Bay, its water level is strongly influenced by the water level of Lake Erie (See Hydrology section of Cedar Point National Wildlife Refuge Wetland, LE 065). Detwiler Ditch flows through the northern end of the wetland into Maumee Bay.

The mouth of the Maumee River and the inner portion of Maumee Bay at Toledo exhibit numerous water quality problems, including low dissolved oxygen, high fecal coliform counts, and high phosphorus concentrations. There is significant agricultural runoff in addition to point source discharges (Ohio Environmental Protection Agency, 1977).

Stein (1962) reported that a shallow buried valley underlies the wetland and adjacent areas of northern Toledo. Sand and gravel layers, where present in the valley fill, generally yield less than 20 gallons of water per minute. The literatures search provided no site-specific data pertaining to water level fluctuations, groundwater drainage patterns and runoff, or seasonal changes in Detwiler Area Wetland.

Climate

The closest weather station providing climatic data for Detwiler Area Wetland is located in Toledo, Ohio. The average annual temperature is 52.0°F based on the normal period from 1941-1970. The mean monthly low for January is 24.5°F and the mean monthly high for July is 87.6°F. The average annual precipitation is 31.87 inches, with a mean monthly precipitation of 2.13 inches in January and 3.28 inches in July. The growing season is approximately six months long, with the last killing frost (28°F) in 1975 occurring on April 8 and the first killing frost on November 23* (National Oceanic and Atmospheric Administration).

* The average growing season is only six months; the last killing frost in 1975 was unusually late.

Special Features

No natural special features are found in the vicinity of Detwiler Area Wetland (U.S.G.S. quadrangle map, Oregon, Ohio-Michigan, 1965).

BIOTIC SETTING

LE 068

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 Detwiler Area Wetland.

Fish

Fish species inhabiting Maumee Bay prior to 1957 are listed, with habitat preferences, in Appendix A-5, and a similar list of fish inhabiting the bay as of 1976 is presented in Appendix A-6. Fish species which probably utilize wetlands bordering Maumee Bay, based on habitat preferences described by Trautman (1957), include gizzard shad (Dorosoma cepedianum), muskellunge (Esox masquinongy), northern pike (Esox lucius), carp (Cyprinus carpio), goldfish (Carassius auratus), brown bullhead (Ictalurus nebulosus), black bullhead (Ictalurus melas), white crappie (Pomoxis annularis), black crappie (Pomoxis nigromaculatus), and yellow perch (Perca flavescens). Owing to siltation and industrial pollution in the bay and obstruction of upstream spawning runs by dams, northern pike and muskellunge are not common in the bay and probably do not utilize Detwiler Area Wetland because of its urban location. Pinsak and Meyer (1976) suggested several possible spawning locations based on high catch areas of commercial fishermen. Based on a map of these areas (Appendix A-7), Detwiler Area Wetland is probably utilized for spawning by carp and goldfish.

A search of the literature provided no site-specific information pertaining to species composition, 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 Detwiler Area Wetland.

Reptiles and Amphibians

The following species with wetland affinities have been recorded in the Toledo vicinity and the lower Maumee River: eastern fox snake (Elaphe vulpina gloydi), Kirtland's water snake (Natrix kirtlandi), queen snake (Natrix septemvittata), northern water snake (Natrix sipedon sipedon), northern brown snake (Storeria dekayi dekayi), northern red-bellied snake (Storeria occipitomaculata occipitomaculata), Butler's garter snake (Thamnophis butleri), eastern ribbon snake (Thamnophis sauritis septentrianalis), eastern garter snake (Thamnophis sirtalis sirtalis), snapping turtle (Chelydra serpentina), map turtle (Graptemys geographica), midland painted turtle (Chrysemys picta marginata), and eastern spiny softshell (Trionyx spiniferus spiniferus) (Conant, 1951). Some of these species may occur in Detwiler Area Wetland. Other reptiles and amphibans recorded from wetland habitats in Lucas County are listed in Appendix C-1. Although not specifically reported from Detwiler Area Wetland, some of these species may occur there.

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

Avifauna

A list of birds and numbers observed in spring, 1974, in Maumee Bay appears in Appendix D-2. In addition, bald eagles (Haliaeetus leucocephalus), green-winged teal (Anas crecca), blue-winged teal (A. discors), northern shovelers (A. clypeata), American wigeon (A. americana), and American coot (Fulica americana) have been observed in the vicinity and may utilize this wetland (U.S. Army Corps of Engineers, 1976). The bald eagle is currently on the Federal and Ohio Endangered Species Lists.

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

Mammals

General information concerning the wetlands of southwestern Lake Erie (Bednarik, 1953, 1956; Donohoe, 1961) may apply to Detwiler Area Wetland. Information discussed concerning Muddy Creek Bay Wetland (LE 044) and Magee Marsh (LE 062) may also apply to this wetland. However, the literature search yielded no site-specific information pertaining to species composition, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories, major food sources, or relationship to water levels of the mammals inhabiting Detwiler Area Wetland.

Endangered Species

Bald eagles have been observed in the vicinity and may utilize Otter Creek Wetland (U.S. Army Corps of Engineers, 1976). No other plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Ohio Division of Wildlife, 1976) were documented in this wetland by the literature search.

Health

The available information is not sufficient to allow an evaluation of the environmental quality of this wetland. However, water quality in the area near the wetland is poor.

CULTURAL SETTING LE 068

Population

Detwiler Area Wetland is located within the city limits of Toledo, in Lucas County, Ohio. The county is densely populated, having a density of 1,390 persons per square mile. Table 6-26 indicates that Lucas County experienced a slow decline in population, while Toledo (city) underwent a moderate decline in population between 1970 and 1975. Projections for 1990 indicate that Lucas County is expected to undergo slow population growth in the future.

Table 6-26. Population Data for the Vicinity of Detwiler Area Wetland

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Lucas County	476,657	-1.4	505,831
City of Toledo	367,650	-4.0	--

[a] U.S. Bureau of the Census (1977)
[b] Wallace, et al., 1976

Land Use and Ownership

Land use within Detwiler Area Wetland is rural open space. The surrounding area is predominantly residential. U.S. Alternate Route 24 runs along the northeast border of Detwiler Area Wetland. The wetland is under private ownership, and its location suggests that it is subject to severe development pressure (U.S.G.S. quadrangle map, Oregon, Ohio-Michigan, 1965).

Recreation

Detwiler Area Wetland is adjacent to Bay View Park. Boating and golf are the only known recreational activities provided by the park.

Mineral, Energy, and Forest Resources

Potential mineral resources in Detwiler Area Wetland include sand, gravel, limestone, and dolomite (Great Lakes Basin Commission, 1974). No significant forest, oil, or gas resources are known to be present in the vicinity.

Public Utilities and Facilities

Detwiler Park, Bay View Park, and Cullen Park lie adjacent to Detwiler Area Wetland (U.S.G.S. quadrangle map, Oregon, Ohio-Michigan, 1965).

Pollution Sources

No NPDES permit holders are located adjacent to Detwiler Area Wetland. However, the inner portion of Maumee Bay and the river mouth immediately south of the wetland exhibit numerous water quality problems (low dissolved oxygen, high phosphorus, and high coliform counts), in addition to agricultural runoff. 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 ft. of Detwiler Area Wetland (Ohio Historical Preservation Office).

No known archaeological resources exist in the Detwiler Area Wetland vicinity, but this area has not yet been systematically surveyed by a professional archaeologist (Ohio Historical Preservation Office).

RESEARCH PROJECTS

LE 068

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

Table 6-27. Data Gaps-Lake Section 6

Data Gap*		Wetland Number	057	058–059	060–061	062–064	065	066	067	068
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	*	*	*	*	*	*	*	*
		Food Sources	*	*	*	*	*	*	*	*
	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	*	*	*	*	*	*	*	*
		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	*	*	*		*	*	*	*
		Endangered Species								
		Health	*	*	*		*	*	*	*
Cultural Setting		Population								
		Land Use and Ownership								
		Recreation								
		Mineral,Energy,Forest Resourc								
		Public Utilities/Facilities								
		Point Pollution Sources								
		Non-Point Pollution Sources	*	*	*	*	*	*	*	*
		Historic Features								
		Archaelogic Features			*			*	*	*

LAKE SECTION 7

INTRODUCTION

Lake Section 7 extends along the western shoreline of Lake Erie from the Ohio-Michigan border to the northern tip of Grosse Isle in Monroe County, Michigan. The region features fairly flat to gently rising topography in the vicinity of the wetlands. The predominant shore type along this 60 mile stretch of shoreline is low plain.

Figures 7-1 and 7-2 show the approximate location of the six coastal wetlands in Lake Section 7. Data concerning latitude, longitude, acreage, and classification for each of these wetlands are presented in Table 7-1. The wetlands of Lake Section 7 all lie at an elevation of 571 feet above sea level, which is the approximate mean elevation of Lake Erie. These wetlands are classified as Palustrine, Lacustrine, and Riverine.

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

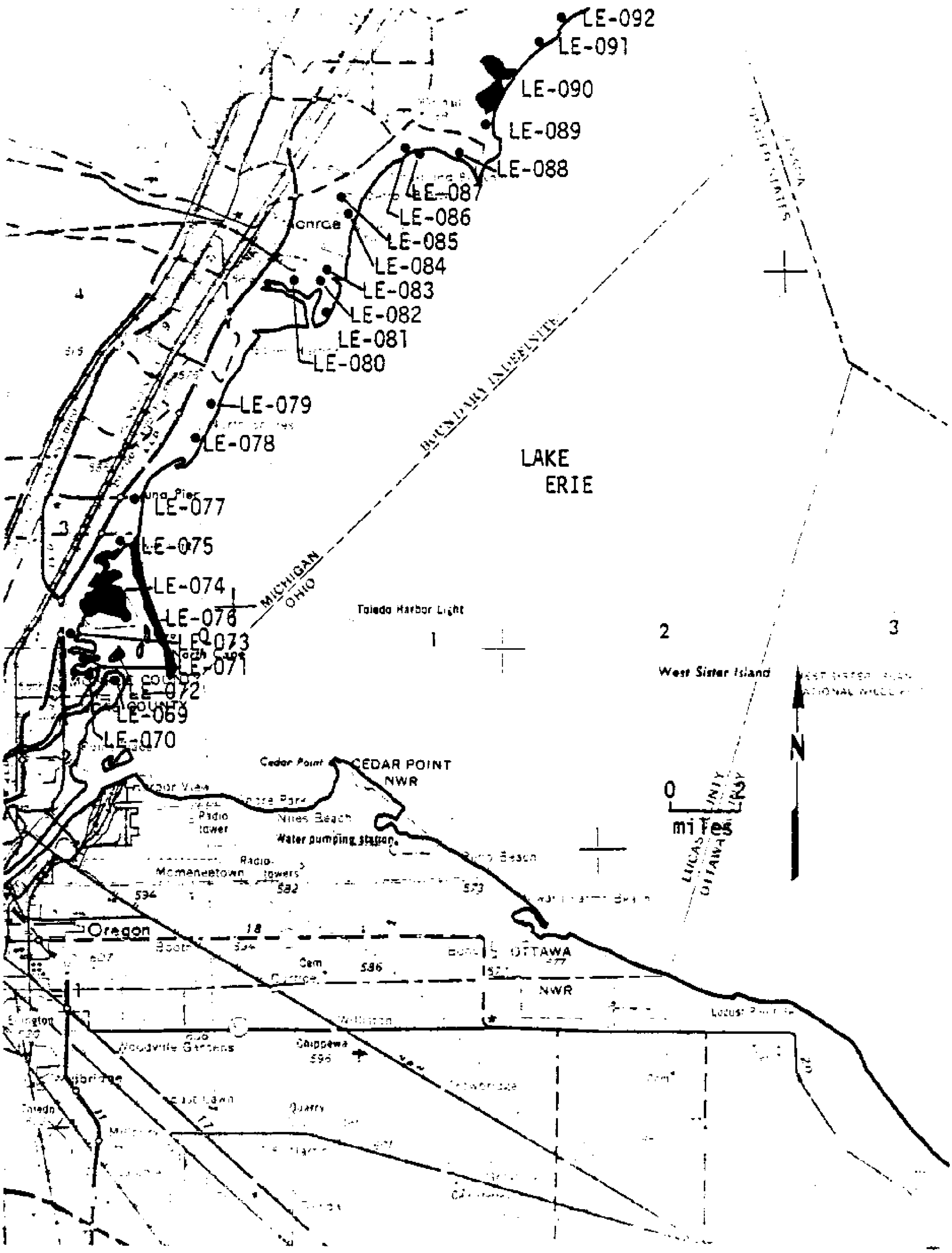

Figure 7-1. Lake Section 7 - Maumee Bay Area

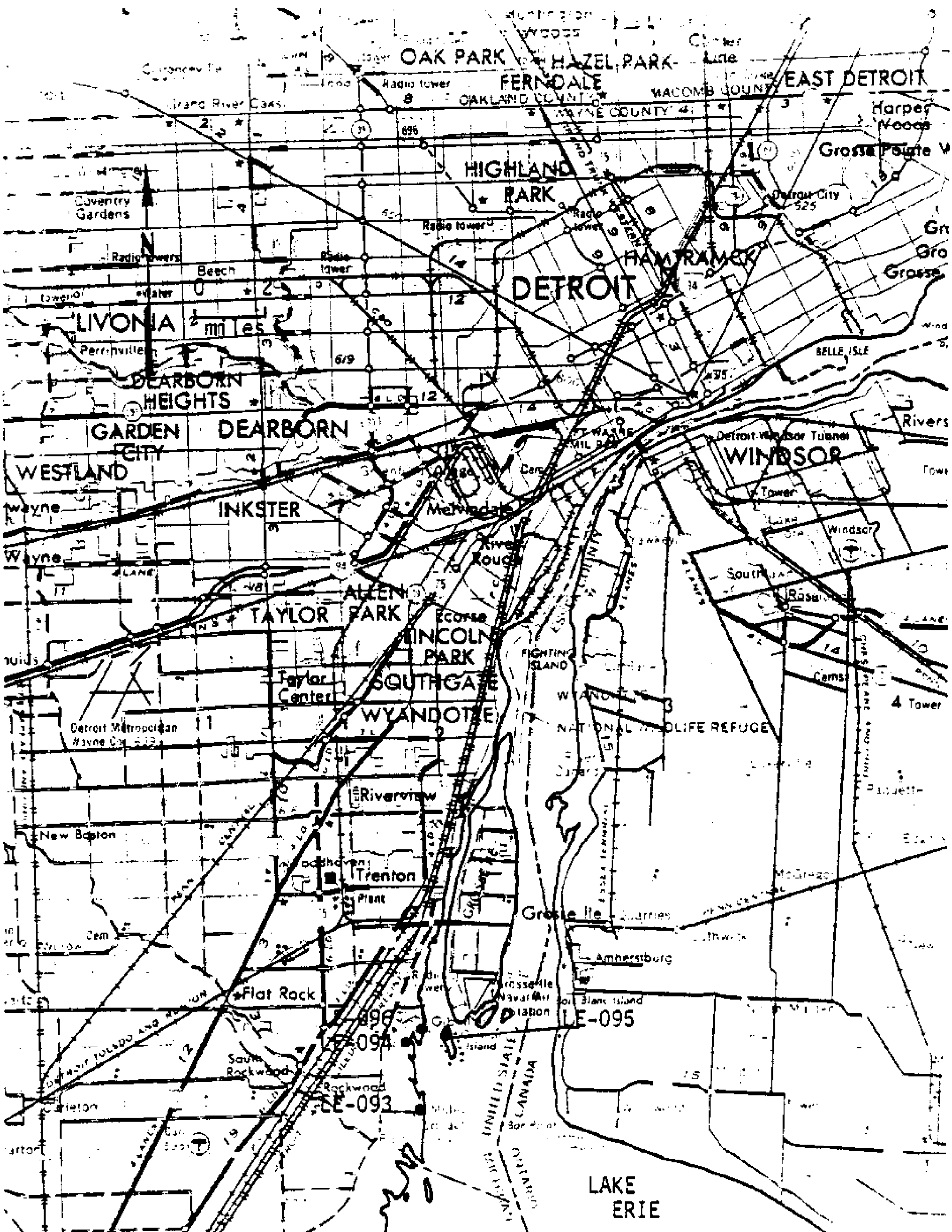

Figure 7-2. Lake Section 7 - Grosse Isle Area

Table 7-1. Location, Acreage, and Classification of Wetlands in Lake Section 7

Wetland Number	Wetland	Latitude	Longitude	Acreage	Classification[a]
	NORTH MAUMEE BAY WETLAND COMPLEX				
069	Carland Beach Wetland	41°44'09"	83°27'17"	80	L
070	Ottawa River Mouth Wetland	41°44'24"	83°27'55"	30	R
071	Halfway Creek Wetland	41°44'45"	83°28'15"	182	R
072	Indian Island Wetland	41°44'50"	83°27'10"	22	L
073	Flat Creek Wetland	41°45'27"	83°28'08"	75	L
074	Bay Creek Area Wetland	41°46'33"	83°27'46"	610	L
075	Erie Road Wetland	41°47'31"	83°27'04"	20	P
076	Woodtick Peninsula Wetland	41°46'15"	83°26'20"	400	L
077	Luna Pier Wetland	41°48'13"	83°26'50"	55	P
078	Toledo Beach Wetland	41°49'42"	83°25'35"	310	P
079	Otter Creek Wetland	41°50'48"	83°25'13"	165	P
080	LaPlaisance Creek Wetland	41°52'33"	83°22'18"	23	P,L
081	Frenchtown Wetland	41°52'38"	83°20'42"	5	P
	RIVER RAISIN WETLAND COMPLEX				
082	River Raisin Wetland #1	41°53'36"	83°21'10"	84	P
083	River Raisin Wetland #2	41°54'19"	83°20'50"	50	P
	SANDY CREEK WETLAND COMPLEX				
084	Sandy Creek Wetland #1	41°55'20"	83°19'52"	30	P
085	Sandy Creek Wetland #2	41°55'33"	83°20'10"	20	P
	STONY CREEK AREA WETLAND COMPLEX				
086	Stony Creek Wetland	41°56'42"	83°18'08"	25	P,L
087	Stony Creek Area Wetland	41°56'37"	83°17'38"	1	P,L
088	Stony Point Wetland	41°56'39"	83°16'16"	54	P
089	Enrico Fermi Wetland	41°57'18"	83°15'46"	65	P
090	Swan Creek Wetland	41°58'40"	83°15'03"	306	P
091	Estral Beach Wetland	41°59'19"	83°13'48"	18	P
092	Mouillee Marsh	42°01'03"	83°11'55"	1367	P,L,R
093	Rockwood Road Wetland	42°03'55"	83°11'48"	180	P
094	Cherry Isle Wetland	42°04'33"	83°11'40"	120	P
095	Celeron Island Wetland	42°04'43"	83°10'18"	80	P,L
096	Horse Island Wetland	42°05'00"	83°11'11"	5	P

[a]P=palustrine
L=lacustrine
R=riverine

NORTH MAUMEE BAY WETLAND COMPLEX

PHYSIOGRAPHIC SETTING LE 069-076

Setting

The North Maumee Bay Wetland Complex is located along the shore of western Lake Erie in the vicinity of Woodtick Peninsula which separates northern Maumee Bay from the lake. The complex lies within Erie Township of Monroe County, Michigan, except for a small portion at Carland Beach in the city of Toledo, Ohio. The complex is comprised of the following wetlands:

Wetland	Distance from Luna Pier, Michigan (Miles)	Direction from Luna Pier
Carland Beach	5.0	south
Ottawa River Mouth	4.7	south southwest
Halfway Creek	4.4	south southwest
Indian Island	4.0	south
Flat Creek	3.8	southwest
Bay Creek Area	2.5	southwest
Erie Road	1.0	south southwest
Woodtick Peninsula	1.0	south

Wetlands of this complex are largely non-wooded, except for small swamp forests at the southern end of Halfway Creek Wetland on Woodtick Peninsula. The wetlands are classified as Palustrine Systems, with some Lacustrine components. The center of the complex lies about nine miles northeast of downtown Toledo, Ohio (U.S.G.S. quadrangle maps, Oregon, Ohio-Michigan, 1965; Erie, Michigan-Ohio, 1967).

Topography

The wetlands of the North Maumee Bay Complex lie at or near the mean elevation of Maumee Bay and Lake Erie (571 feet above sea level). The wetlands have very little relief; all lie below the 575-foot contour line except the swamp forest on Halfway Creek Wetland which is a few feet above the line. The land surface rises gently to the northwest, reaching an elevation of 600 feet about four miles from the center of the complex (U.S.G.S. quadrangle maps, Oregon, Ohio-Michigan, 1965; Erie, Michigan-Ohio, 1967). The wetlands of this complex are largely within the Erie State Game Area or owned by private hunting clubs and a public utility. These entities have constructed earthern and rock dikes (approximately five feet above lake level) to protect the interior wetlands from flooding during periods of high lake levels.

Surficial Geology

The Maumee Bay shoreline of Lake Erie is generally very low, flat, and swampy (Forsyth, 1968). The surface material, both on and offshore, is clay. This clay is easily eroded by frost, ice push, rainwash, or waves; even the simple process of drying out causes it to slake, or break up. The bottom sediment nearshore is lacustrine clay with a thin overburden of silt, except near little Cedar Point where the clay is overlain by a relatively thick layer of fine sand (Herdendorf, 1975). The lacustrine clay, up to 30 feet thick, was laid down in a glacial lake which once covered a large part of northwestern Ohio and southwestern Michigan; marshes have formed on its surface along the low, lagoon-bordered shores of the present lake and along small tributary streams. The lake clay is in turn underlain by sandy glacial till approximately 80 feet thick with Silurian dolomite bedrock below (U.S. Army Corp of Engineers, 1945).

Soils

Forsyth (1968) mapped the soils of Lucas County, Ohio and southern Monroe County, Michigan. The soils of the wetlands along the Lake Erie shoreline and estuaries are designated as Lake Marshes, containing decayed organic matter mixed with sand, silt, and clay, which have formed on Toledo soils. The latter, which also flank the wetlands on the flat lake plain, have developed in lake-deposited silts and clay. Toledo topsoil, generally seven to nine inches thick, is dark gray silty clay that is sticky or plastic when wet and hard when dry. The subsoil is compact silty clay, mottled gray and brown.

Hydrology

The North Maumee Bay Wetland Complex lies adjacent to, and in places merges with, Maumee Bay and Lake Erie. Therefore, all of the wetlands in the complex are directly influenced by the water level in Lake Erie, with the exception of Erie Road Wetland which occupies a depression adjacent to a power plant about 0.2 mile from the bay. Six named tributaries to Maumee Bay flow through the complex; from north to south these include the Ottawa River, Halfway Creek, Rapideau Drain, Flat Creek, Little Lake Creek, and Bay Creek.

Fraleigh et al. (1975) conducted a study of the water quality in Maumee Bay. The major findings of this study are summarized below:

1. Maumee Bay is an area where waters from Lake Erie, the Maumee River, the Toledo Edison Bayshore Power Plant and the Ottawa River mix with one another. On the average, the mixing of these waters is characterized by:

    a. an intrusion of water from Lake Erie up the shipping channel;
    b. a plume of water from the Toledo Edison Power Plant that extends in a northeasterly direction from the point of discharge; and
    c. little apparent discharge from the Lower Maumee River directly into Maumee Bay.

    This mixing pattern is due to seiche action and is affected to a degree by the Toledo Edison Plant which draws a large quantity of water from the point where the Lower Maumee River joins Maumee Bay.

2. Definite water quality gradients exist across Maumee Bay from the Lower Maumee River.

3. Comparison with current water quality standards for most parameters has indicated that water of good quality exists in the outer regions of Maumee Bay.

4. The offshore waters of Maumee Bay are safe for swimming except when there is a heavy rainstorm causing an overflow of the sewage system, or other failures of the system. This conclusion does not apply to near shore waters.

5. Suspended solids levels result in extremely turbid waters in the bay, particularly in the spring. In addition, dredging operations have increased the suspended solids levels and turbidity in a portion of the bay.

6. Biologically, Maumee Bay is a very productive body of water, with greater productivity than either Lake Erie or the Lower Maumee River. The level of productivity, determined from chlorophyll measurements, is typical of what one might expect in a bay of an eutrophic body of water like Lake Erie.

7. During the spring and fall of 1974, fecal coliform levels in Maumee Bay were 5% of the levels found upriver; most of the microbial pollution was of human origin.

General information on water level fluctuations in Maumee Bay is presented in the Hydrology Section of Cedar Point National Wildlife Refuge Wetland (LE 065). Weist (1978) prepared a generalized map of the groundwater resources of the Michigan shore of Lake Erie showing that the unconsolidated deposits underlying the wetland complex typically yield 10 to 100 gallons per minute.

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

Climate

The closest weather station providing climatic data for the North Maumee Bay Wetland Complex is located in Toledo, Ohio. The average annual temperature is 52.0°F based on the normal period from 1941-1970. The mean monthly low for January is 24.5°F and the mean monthly high for July is 87.6°F. The average annual precipitation is 31.87 inches, with a mean monthly precipitation of 2.13 inches in January and 3.28 inches in July. The growing season is approximately six months long, with the last killing frost (28°F) in 1975 occurring on April 8 and the first killing frost on November 23* (National Oceanic and Atmospheric Administration, 1975).

* The average growing season is only six months; the last killing frost in 1975 was unusually late.

Special Features

No natural special features are found in the vicinity of the North Maumee Bay Wetland Complex (U.S.G.S. quadrangle maps; Oregon, Ohio-Michigan, 1965; Erie, Michigan-Ohio, 1967).

BIOTIC SETTING

Vegetation

According to King (1965), major species thriving in Bay Creek Area Wetland included narrow-leaved cattail, (Typha angustifolia), common cattail (T. latifolia), and the hybrid cattail, T. x glauca. Associated species of this cattail marsh included jewelweed (Impatiens spp.), marsh-mallow (Hibiscus palustris), and numerous mints (family-Labiatae). Managers of this wetland had carried out cattail control programs including water drawdown followed by plowing, diking, and mowing, as well as chemical control. In higher dry-meadows, blue-joint grass (Calamagrostis canadensis) and swamp milkweed (Asclepias incarnata) predominated. In the transition zone between open water and cattail stands, soft-stem bulrush was the dominant species with associates including three-square bulrush (Scirpus americanus), hard-stem bulrush (S. acutus), sedges (Cyperus diandrus, C. odoratus) and Walter's millet (Echinochloa walteri).

Major species comprising the vegetation of open water areas were pond weeds (Potamogeton pectinatus, P. foliosus, P. crispus), water star grass (Heteranthera dubia), elodea (Elodea canadensis), coontail (Ceratophyllum demersum), wild cherry (Vallisneria americana), naiad (Najas spp.) and stonewort (Chara spp.).

The literature search yielded no site-specific information pertaining to density and productivity or relationship to water levels for the vegetation of the eight wetlands comprising the North Maumee Bay Wetland Complex, nor to major species composition and distribution in the wetlands of this complex other than Bay Creek Area Wetland.

Fish

Species found Bay Creek Area Wetland, also referred to as Erie Marsh, include bowfin (Amia calva), carp (Cyprinus carpio), yellow perch (Perca flavescens), largemouth bass (Micropterus salmoides), smallmouth bass (Micropterus dolomieui), white bass (Morone chrysops), green sunfish (Lepomis cyanellus), bluegill (Lepomis macrochirus), black crappie (Pomoxis nigromaculatus), yellow bullhead (Ictalurus natalis), gizzard shad (Dorosoma cepedianum), shiner (Notropis sp.), and walleye (Stizostedion vitreum) (Hunt and Mickelson, 1976; Hunt, 1957; Hunt, 1958; Matulis and Pirnie, 1960; Schiller, 1968). All previous information on fishes of Erie Marsh has been summarized most recently by Hunt and Mickelson, 1976. The only fishes introduced into Erie Marsh were northern pike (Esox lucius) and black crappie (Hunt, 1958); brook trout (Salvelinus fontinalis) were stocked in the marsh in 1970 (Hunt and Mickelson, 1976).

Carp have been a troublesome fish in Erie Marsh, entering through weirs and screens from Lake Erie and remaining in the marsh throughout the year unless temporily eradicated by poisoning. Carp begin spawning in the marsh in late April and continue until early June. Carp retard the growth of aquatic vegetation in the marsh by consuming it and by roiling the water so that increased turbidity reduces photosynthetic efficiency (Hunt and Mickelson, 1976; King and Hunt, 1966; King and Hunt, 1967). Stomach analyses of carp from the marsh indicated that they primarily consumed aquatic plants (Foster, 1964; King and Hunt, 1967). Poisoning with toxaphene and rotenone has been practiced in the marsh since 1953 for the eradication of carp. Poisoning was largely successful in removing most carp from the treated areas, but reproduction by remaining carp and invasion by Lake Erie carp through weirs has resulted in reestablishment of this fish in the marsh. Beneficial results of carp removal were increased water clarity, decreased rooting and consumption of plants by carp, and increased plant growth. Dissolved oxygen in the marsh water also increased an average 0.6 mg/l, and in the Sulphur Springs unit in 1964 the growth of muskgrass (Chara spp.) increased 3,000+ percent. Adverse effects of poisoning included some destruction of aquatic invertebrates and possibly several water birds and one snake (Natrix sp.). No fish control operations have been used since 1964, and the use of toxaphene is now illegal according to regulations of the Michigan Department of Natural Resources. Electrical barriers to exclude carp would be economically unfeasible, and water level drawdowns during spawning season to reduce reproductive success of carp would be only partially successful (Hunt, 1953, 1958, 1959, 1964, 1967; Hunt and Mickelson, 1976; Tock and Singh, 1959; Wood, 1962; King, 1964; King and Hunt, 1967; Pirnie and Foster, 1964). The currently recommended program for carp control in Erie Marsh involves continued use of rotenone to keep carp populations low and installation and periodic maintenance of small mesh screens on all culverts and weirs (Hunt and Mickelson, 1976).

A discussion of the fishes of North Maumee Bay and Ottawa River Harbor by the U.S. Army Corps of Engineers (1976) is based largely on the work of Fraleigh and Tramer (1974) in Maumee Bay and does not deal specifically with wetlands.

The literature search yielded no site-specific information pertaining to major species, species composition, spawning and hatching areas, seasonal distribution and abundance, life histories, food sources, or recreational and commercial use of the fish populations in Carland Beach Wetland, Ottawa River Mouth Wetland, Halfway Creek Wetland, Indian Island Wetland, Flat Creek Wetland, and Woodtick Peninsula Wetland, although the species present in these five wetlands are probably the same as are found in Bay Creek Area Wetland; nor to Erie Road Wetland, nor to recreational and commercial use of the fish in Bay Creek Area Wetland.

Invertebrates

Information on the seasonal distribution, density and relationship to water levels for the invertebrates inhabiting Bay Creek Area Wetland is available in Hunt (1957, 1958), Foster (1962, 1964) and Schiller (1968). A summary of historical and recent information in these studies is available in Hunt and Mickelson (1976). However, the literature search yielded 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 other seven wetlands of the North Maumee Bay Wetland Complex, nor to productivity or major food sources of invertebrates in Bay Creek Area Wetland.

Reptiles and Amphibians

The following species were reported from Bay Creek Area Wetland (Erie Shooting Club Marsh) by Hunt (1957, 1958): bullfrog (Rana catesbeiana), eastern fox snake (Elaphe vulpina gloydi), garter snakes of possibly more than one unidentified species (Thamnophis spp.), northern water snake (Natrix sipedon sipedon), eastern spiny softshell (Trionyx spiniferus spiniferus), and snapping turtle (Chelydra serpentina). The literature search yielded no other site-specific information pertaining to major species, seasonal abundance and distribution, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in the eight wetlands comprising the North Maumee Bay Wetland Complex.

Avifauna

The historical occurrence of Forster's tern (Sterna forsteri) in Erie Marsh, which is part of Bay Creek Area Wetland, is available in Campbell and Trautman (1936). A list of birds and the numbers observed in spring, 1974 in Maumee Bay appears in Appendix D-2. In addition, bald eagles (Haliaeetus leucocephalus), green-winged teal (Anas crecca), blue-winged teal (A. discors), northern shovelers (A. clypeata), American wigeon (A. americana) and American coots (Fulica americana) have been observed in the vicinity and may utilize Carland Beach Wetland and Ottawa River Mouth Wetland (U.S. Army Corps of Engineers, 1976). The bald eagle is currently on the Federal and Ohio Endangered Species Lists. Population estimates of avian species inhabiting Erie Marsh in 1957-1959 are presented in Table 7-2.

Table 7-2. Approximate Yearly Populations of Waterbirds (other than Waterfowl) Observed at Erie Marsh 1957-1959[a]

Common name	Approximate yearly population
herring gull	200-1200
common tern	200
Bonaparte's gull	35
great blue heron	30
great egret	30
black-crowned night heron	6
green heron	5
sora	4
common gallinule	4
ring-billed gull	4
Caspian tern	4
black tern	4
pied-billed grebe	2
king rail	2

[a] Taken from Hunt et al., 1976

The number of waterfowl nests, broods and young found in Erie Marsh between 1957 and 1968 is presented in Table 7-3. The important fall food sources of several waterfowl species in this area are listed in Table 7-4. The analysis of fall food items for 16 species of waterfowl appears in Appendices D-3 through D-5. A species account of the 1953 spring shorebird migration at North Cape, at the southern tip of Woodtick Peninsula Wetland, is available in Butsch (1954). Table 7-5 lists the species observed in Woodtick Peninsula Wetland by Michigan Department of Natural Resources personnel in 1975 and 1977.

The literature search provided no site-specific information pertaining to recreational and commercial use, life histories, or relationship to water levels of the birds utilizing the North Maumee Bay Wetland Complex.

Mammals

The mammalian species found on Bay Creek Area Wetland are listed with their relative abundance in Table 7-6. The Virginia opossum (*Didelphis virginiana*), red fox (*Vulpes vulpes*), raccoon (*Procyon lotor*), mink (*Mustela vison*), and striped skunk (*Mephitis mephitis*) are potential predators on waterfowl and their nests (Hunt and Mickelson, 1970, 1976).

20 acres

Table 7-3. Number of Waterfowl Broods and Young Seen in Erie Marsh[a]

Species	1957 # Nests	1957 # Broods	1957 # Young	1958 # Nests	1958 # Broods	1958 # Young	1959 # Nests	1959 # Broods	1959 # Young	1960 # Nests	1960 # Broods	1960 # Young	1961 # Nests	1961 # Broods	1961 # Young
black duck	0	1	10	0	2	7	0	1	11	no	data		2	0	0
mallard	0	2	12	0	2	14	0	3	18	no	data		10	6	31
pintail	0	1	4							no	data				
blue-winged teal										no	data		5	1	3
redhead							0	1	3	no	data		0	1	5
wood duck	0	1	6							no	data		0	1	7
American coot	0	1	3				30	55	550	no	data				
unknown				0	2	9	0	1	3	no	data		3	0	0
totals	0	6	35	0	6	30	30	61	585				20	9	46

Species	1962 # Nests	1962 # Broods	1962 # Young	1963 # Nests	1963 # Broods	1963 # Young	1964 # Nests	1964 # Broods	1964 # Young	1967 # Nests	1967 # Broods	1967 # Young	1968 # Nests	1968 # Broods	1968 # Young
black duck	1	2	11	4	4	29	0	3	23	3	1	5	2	2	16
mallard	4	4	23	3	4	24	0	6	48	3	3	13	8	4	15
pintail										1	0	0	2	0	0
blue-winged teal	2	3	16	5	3	20							1	0	0
redhead															
wood duck	0	4	27	0	2	15	0	2	11	0	2	11	0	1	6
American coot															
unknown										2	5	19	4	1	6
totals	7	13	77	12	13	88	0	11	82	9	11	48	17	8	43

[a]Taken from Hunt and Mickelson, 1970

1957-1963 from Hunt (1964)
1964 from Rich (1964)
1967-1968 from Schiller (1968)

Table 7-4. Percent Composition of Fall Food Items for Waterfowl in Erie Marsh[a]

Waterfowl species	Percentage of volume	Percentage of occurrence
Corn		
mallard	69.83	19.1
black duck	15.42	11.7
pintail	13.77	6.1
Smartweed		
mallard	18.42	82.5
black duck	69.88	79.2
pintail	76.77	94.0
northern shoveler	47.80	77.7
blue-winged teal	31.25	92.8
green-winged teal	54.48	78.1
Bulrush		
mallard	1.50	69.4
black duck	0.84	79.2
pintail	1.13	48.4
northern shoveler	4.34	77.7
blue-winged teal	14.07	57.1
green-winged teal	7.05	65.6

[a] Schiller, 1969

Table 7-5 . Birds Observed in Woodtick Peninsula Wetland on August 27, 1975 and July 19, 1977[a]

Common name	Common name
mallard	herring gull
blue-winged teal	ring-billed gull
American wigeon	common tern
wood duck	Caspian tern
belted kingfisher	red-winged blackbird
great blue heron	killdeer
green heron	spotted sandpiper
great egret	lesser yellowlegs
black-crowned night heron	least sandpiper

[a] Michigan Department of Natural Resources, 1975-1977

Table 7-6. The Relative Abundance of Mammalian Species on Bay Creek Area Wetland[a]

Common name	Relative abundance[b]
Virginia opossum	S
red bat	R
eastern cottontail	C
woodchuck	S
muskrat	C
Norway rat	S
red fox	S
raccoon	C
mink	S
striped skunk	C
white-tailed deer	F

[a] Hunt and Mickelson, 1970, 1976
[b] R=rare, F=few, S=several, C=common

Muskrat (Ondatra zibethicus) and mink are important furbearers in Bay Creek Area Wetland (Hunt and Mickelson, 1970, 1976). Between 600 and 1300 muskrat were harvested each winter during the 1950's. Less trapping took place during the 1960's.

The literature search yielded no site-specific information pertaining to seasonal distribution, density and productivity, life histories, major food sources, or relationship to water levels of the mammals inhabiting the eight wetlands of the North Maumee Bay Wetland Complex, nor to species composition and recreational and commercial use of the mammals in the wetlands of the complex other than the Bay Creek Area Wetland.

Endangered Species

Common terns (Sterna hirundo) and Caspian terns (Sterna caspia) were recorded in Woodtick Peninsula Wetland as recently as 1977. Bald eagles have been observed in the vicinity and may utilize Carland Beach Wetland and Ottawa River Mouth Wetland (U.S. Army Corps of Engineers, 1976). No other plants or animals appearing on the federal or state lists of endangered or threatened species (U.S. Fish and Wildlife Service, 1977; Ohio Division of Wildlife, 1976; Michigan Endangered and Threatened Species Program, 1978) were documented in the North Maumee Bay Wetland Complex by the literature search.

Health

Site-specific information shows that an abundance of vegetation, waterfowl, and mammals occur in the North Maumee Bay Wetland Complex. However, the water quality of Maumee Bay is poor, and may have some effect on the environmental quality of these wetlands.

Population

The North Maumee Bay Wetland Complex is located partly within the city limits of Toledo in Lucas County, Ohio, and partly in Erie Township and Luna Pier (city) of Monroe County, Michigan. Lucas County is densely populated, having a density of 1,390 persons per square mile, while Monroe County is moderately populated (228 persons per square mile). Table 7-7 indicates that population growth rates between 1970 annd 1975 varied from a moderate decline in population to rapid growth for these townships cities, and counties. Projections for 1990 indicate that Lucas County is expected to undergo slow population growth, while Monroe County is expected to undergo rapid population growth in the future.

Table 7-7. Population Data for the Vicinity of the North Maumee Bay Wetland Complex

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Lucas County (OH)	476,657	-1.4	505,831[b]
City of Toledo	367,650	-4.0	--
Monroe County (MI)	127,094	6.6	167,863[c]
Erie Township	4,614	2.7	--
City of Luna Pier	1,427	0.6	--

[a] U.S. Bureau of the Census (1977)
[b] Wallace, et al., 1976
[c] Michigan Department of Management and Budget, Information System Division

Land Use and Ownership

Land use within the North Maumee Bay Wetland Complex is rural open space. The surrounding area is predominantly residential. The wetland is under mixed private and state ownership, and its location suggests that it is subject to moderate development pressure. Carland Beach Wetland has boat docks and buildings in its northern portion and a paved road runs through the southern half. Halfway Creek Wetland has boat docks in its central part, buildings in the west, and paved roads in the west and south of the wetland. In Bay Creek Area Wetland, there are buildings in the southwest, a dirt road in the interior, and levees throughout the wetland; a paved road is adjacent to the southern edge. Erie Road Wetland has railroad tracks adjacent to its northern portion and paved roads within the southern and western parts. Flat Creek Wetland has levees in its northern part and a paved road adjacent to its western side. There are buildings in the northern portion of Ottawa River Mouth Wetland and levees in the northern part of Woodtick Peninsula Wetland (U.S.G.S. quadrangle maps, Oregon, Ohio-Michigan, 1965; Erie, Michigan-Ohio, 1967).

Recreation

Part of the North Maumee Bay Wetland Complex lies within the Erie State Game Area, but there are no known state or federal recreational facilities in the vicinity of the wetland.

Mineral, Energy, and Forest Resources

Potential mineral resources in the North Maumee Bay Wetland Complex include limestone and dolomite (Great Lakes Basin Commission, 1974). No significant forest, oil, or gas resources are known to be present in the vicinity.

Public Utilities and Facilities

A power plant is located 0.5 mile west of Erie Road Wetland, and associated power transmission lines run through the wetland (U.S.G.S. quadrangle map, Erie, Michigan-Ohio, 1967).

Pollution Sources

There are no NPDES permit holders adjacent to the North Maumee Bay Wetland Complex. No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

Seventeen known archaeological sites are located in the vicinity of the North Maumee Bay Wetland Complex (20-MR-151 through 20-MR-165 and 20-MR-40 and 20-MR-14; Peebles and Black, 1946). They are primarily habitation sites. No known historical sites are located within 500 feet of the wetland complex.

RESEARCH PROJECTS LE 069-076

The literature search identified no on-going or impending research projects pertaining to the North Maumee Bay Wetland Complex.

LUNA PIER WETLAND

PHYSIOGRAPHIC SETTING

LE 077

Setting

Luna Pier Wetland is located within the corporation limits of Luna Pier, Michigan, in Erie Township of Monroe County, 0.6 miles southwest of the center of Luna Pier and about 13 miles northeast of Toledo, Ohio. The wetland lies 0.2 mile inland from the shore of Lake Erie, adjacent to the estuarine portion of a small stream, Whitewood Creek. This wetland is largely non-wooded and Palustrine (U.S.G.S. quadrangle map, Erie, Michigan-Ohio, 1967).

Topography

Luna Pier Wetland lies at or near the elevation of Lake Erie (571 feet above mean sea level). Its relief is very low; all of the wetland lies below the 575-foot contour line. A raised, abandoned road bed running northeast-southwest has nearly severed the wetland into two sections; the western section contains some wooded swamp. The ground surface slopes gently upward to the west, reaching on elevation of 600 feet about three miles from the lake shore (U.S.G.S. quadrangle map, Erie, Michigan-Ohio, 1967).

Surficial Geology

Mozola (1970) reported that bedrock under Luna Pier Wetland lies at an approximately elevation of 510 feet, buried by about 60 feet of unconsolidated deposits. The surface material consists of glacial till overlain by lacustrine clay and marsh deposits. The bedrock is composed of Silurian dolomite (Tymochtee Formation).

Soils

Forsyth (1968) mapped the soils of Lucas County, Ohio and southern Monroe County, Michigan. The soils of the wetlands along the Lake Erie shoreline and estuaries are designated as Lake Marshes which have formed on Toledo soils. The latter, which also flank the wetlands on the flat lake plain, have developed in lake-deposited silts and clay. Toledo topsoil, generally seven to nine inches thick, is dark gray silty clay that is sticky or plastic when wet and hard when dry. The subsoil is compact silty clay, mottled gray and brown.

Hydrology

Luna Pier Wetland lies along the estuarine portion of Whitewood Creek and is influenced by the water level in Lake Erie (see the Hydrology section for Cedar Point National Wildlife Refuge Wetland, LE 065, for general information on water level fluctuations in Lake Erie). No other streams flow through the wetland except a drainage ditch which enters from the north and flows along the eastern side of the marsh.

Sherzer (1900) delineated the area in the vicinity of Luna Pier as a flowing well district, indicating that the piezometric level is above the land surface. Mozola (1970) mapped the piezometric water level at an elevation of 570 feet in the vicinity of the wetland. Weist (1978) reported a typical water yield of 10-100 gallons per minute from unconsolidated sediments in this area.

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

Climate

The closest weather station providing climatic data for Luna Pier Wetland is located in Toledo, Ohio. The average annual temperature is 52.0°F based on the normal period from 1941-1970. The mean monthly low for January is 24.5°F and the mean monthly high for July is 87.6°F. The average annual precipitation is 31.87 inches, with a mean monthly precipitation of 2.13 inches in January and 3.28 inches in July. The growing season is approximately six months long, with the last killing frost (28°F) in 1975 occurring on April 8 and the first killing frost on November 23* (National Oceanic and Atmospheric Administration, 1975).

* The average growing season is only six months; the last killing frost in 1975 was unusually late.

Special Features

No natural special features are found in the vicinity of Luna Pier Wetland (U.S.G.S. quadrangle map, Erie, Michigan-Ohio, 1967).

BIOTIC SETTING LE 077

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 Luna Pier 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 Luna Pier 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 Luna Pier Wetland.

Reptiles and Amphibians

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

Avifauna

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 Luna Pier 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 Luna Pier 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, 1978) were documented in Luna Pier 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

LE 077

Population

Luna Pier Wetland is located with the city of Luna Pier in Monroe County, Michigan. The county is moderately populated, having a density of 228 persons per square mile. Table 7-8 indicates that Monroe County experienced rapid population growth between 1970 and 1975, while the population of Luna Pier remained stable. Projections for 1990 indicate that rapid growth is expected to continue in Monroe County.

Table 7-8. Population Data for the Vicinity of Luna Pier Wetland

	Estimated Population 1975[a]	Estimated % Δ 1970-1975[a]	Projected Population 1990[b]
Monroe County	127,094	6.6	167,863
City of Luna Pier	1,427	0.6	--

[a] U.S. Bureau of the Census (1977)
[b] Michigan Department of Management and Budget, Office of the Budget, Information System Division

Land Use and Ownership

Land use within Luna Pier Wetland is rural open space. The surrounding area is predominantly residential. The wetland is under private ownership, and its location suggests that it is subject to moderate development pressure (U.S.G.S. quadrangle map, Erie, Michigan-Ohio, 1967).

Recreation

No known state or federal recreational facilities are present in the vicinity of Luna Pier Wetland.

Mineral, Energy, and Forest Resources

Potential mineral resources in Luna Pier Wetland include limestone and dolomite (Great Lakes Basin Commission, 1974). No significant forest, oil, or gas resources are known to be present in the vicinity.

Public Utilities and Facilities

Power transmission lines are located approximately 0.2 mile west of Luna Pier Wetland (U.S.G.S. quadrangle map, Erie, Michigan-Ohio, 1967).

Pollution Sources

There are no NPDES permit holders adjacent to Luna Pier 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 or archaeological features are present within 500 feet of Luna Pier Wetland.

RESEARCH PROJECTS

LE 077

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

TOLEDO BEACH WETLAND

PHYSIOGRAPHIC SETTING

LE 078

Setting

Toledo Beach Wetland occupies a broad headland in western Lake Erie. It is located partially within the corporation limits of Luna Pier in Erie Township and the remainder lies in La Salle Township of Monroe County, Michigan. The wetland is largely non-wooded and Palustrine. Its center lies about 1.8 miles northeast from the center of Luna Pier and 15 miles northeast of Toledo, Ohio (U.S.G.S. quadrangle map, Erie, Michigan-Ohio, 1967).

Topography

Toledo Beach Wetland lies adjacent to Lake Erie and the estuarine portion of two creeks. Its water surface is at or near the mean elevation of Lake Erie (571 feet above sea level). The wetland has very low relief; it lies entirely below the 575-foot contour line. For three miles west of the wetland the land surface rises only 25 feet, yielding a gentle slope inland from the shore (U.S.G.S. quadrangle map, Erie, Michigan-Ohio, 1967).

Surficial Geology

Mozola (1970) reported that the bedrock under Toledo Beach Wetland lies at an approximate elevation of 530 feet, buried by about 40 feet of unconsolidated deposits. The surface material consists of glacial till overlain by lacustrine clay and marsh deposits. The bedrock is composed of Silurian dolomite (Tymochtee Formation).

Soils

Forsyth (1968) mapped the soils of Lucas County, Ohio and southern Monroe County, Michigan. The soils of the wetlands along the Lake Erie shoreline and estuaries are designated as Lake Marshes containing decayed organic material mixed with sand, silt, and clay, which have formed on Toledo soils. The latter, which also flank the wetlands on the flat lake plain, have developed in lake-deposited silts and clay. Toledo topsoil, generally seven to nine inches thick, is dark gray silty clay that is sticky or plastic when wet and hard when dry. The subsoil is compact silty clay, mottled gray and brown.

Hydrology

Toledo Beach Wetland lies along the estuarine portions of Muddy Creek and Sulphur Creek, adjacent to Lake Erie. Therefore the water level in the wetland is directly influenced by levels in the lake (see the Hydrology section for Cedar Point National Wildlife Refuge Wetland, LE 065, for general information on water level fluctuations in Lake Erie). No other surface streams flow into the wetland, but the wetland contains several open-water ponds, including one in the northern portion that has been developed into a marina at the community of North Shore.

Sherzer (1900) delineated the vicinity of Luna Pier as a flowing well district, indicating that the piezometric level is above the land surface. Mozola (1970) mapped the piezometric water level at an elevation of 570 feet in the vicinity of the wetlands. Weist (1978) reported a typical water yield of 10-100 gallons per minute from unconsolidated sediments in this area.

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

Climate

The closest weather station providing climatic data for Toledo Beach Wetland is located in Toledo, Ohio. The average annual temperature is 52.0°F based on the normal period from 1941-1970. The mean monthly low for January is 24.5°F and the mean monthly high for July is 87.6°F. The average annual precipitation is 31.87 inches, with a mean monthly precipitation of 2.13 inches in January and 3.28 inches in July. The growing season is approximately six months long, with the last killing frost (28°F) in 1975 occurring on April 8 and the first killing frost on November 23* (National Oceanic and Atmospheric Administration, 1975).

* The average growing season is only six months; the last killing frost in 1975 was unusually late.

Special Features

No natural special features are found in the vicinity of Toledo Beach Wetland (U.S.G.S. quadrangle map, Erie, Michigan-Ohio, 1967).

BIOTIC SETTING LE 078

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 Toledo Beach 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 Toledo Beach 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 Toledo Beach Wetland.

Reptiles and Amphibians

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

Avifauna

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 Toledo Beach 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 Toledo Beach 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, 1978) were documented in Toledo Beach 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

LE 077

Population

Toledo Beach Wetland is located partly within the city of Luna Pier and partly in LaSalle Township of Monroe County, Michigan. The county is moderately populated, with a density of 228 persons per square mile. Table 7-9 indicates that population growth was rapid in Monroe County, stable in Luna Pier, and moderate in LaSalle Township between 1970 and 1975. Projections for 1990 indicate that rapid growth is expected to continue in Monroe County.

Table 7-9. Population Data for the Vicinity of Toledo Beach Wetland

	Estimated Population 1975[a]	Estimated % Δ 1970-1975[a]	Projected Population 1990[b]
Monroe County	127,094	6.6	167,863
City of Luna Pier	1,427	0.6	--
LaSalle Township	4,357	5.0	--

[a] U.S. Bureau of the Census (1977)
[b] Michigan Department of Management and Budget, Office of the Budget, Information System Division

Land Use and Ownership

Land use within Toledo Beach Wetland is rural open space. The surrounding area is predominantly residential. The wetland is under private ownership, and its location suggests that it is subject to moderate development pressure. Hard surface roads run across southern Toledo Beach Wetland and through the northwestern corner. There is a building in the southwestern section of the wetland (U.S.G.S. quadrangle map, Erie, Michigan-Ohio, 1967).

Recreation

No known state or federal recreational facilities are present in the vicinity of Toledo Beach Wetland.

Mineral, Energy, and Forest Resources

Potential mineral resources in Toledo Beach Wetland include limestone and dolomite (Great Lakes Basin Commission, 1974). No significant forest, oil, or gas resources are known to be present in the vicinity.

Public Utilities and Facilities

A radio tower is adjacent to Toledo Beach Wetland (U.S.G.S. quadrangle map, Erie, Michigan-Ohio, 1967).

Pollution Sources

There are no NPDES permit holders adjacent to Toledo Beach 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 or archaeological features are present within 500 feet of Toledo Beach Wetland.

RESEARCH PROJECTS

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

OTTER CREEK WETLAND (MICHIGAN)

PHYSIOGRAPHIC SETTING

LE 079

Setting

Otter Creek Wetland occupies the estuarine portion of Otter Creek near its mouth at Lake Erie. It is located in La Salle Township of Monroe County, Michigan between the communities of La Salle Station (1.5 miles inland) and Grand View (on the lake shore). The wetland is two miles southwest of Bolles Harbor, three miles northeast of Luna Pier and 17 miles northeast of Toledo, Ohio. This largely non-wooded Palustrine System is confined to the valley of Otter Creek (U.S.G.S. quadrangle map, Erie, Michigan-Ohio, 1967).

Topography

Otter Creek wetland lies at or near the mean elevation of Lake Erie (571 feet above mean seal level). The wetland has very low relief; it lies totally below the 575-foot contour line. The land surface to the west rises gently, reaching an elevation of 600 feet about three miles inland from the lake shore (U.S.G.S. quadrangle map, Erie, Michigan-Ohio, 1967).

Surficial Geology

Mozola (1970) reported that bedrock under Otter Creek WEtland lies at an approximate elevation of 520 feet, buried by about 50 feet of unconsolidated deposits. The surface material consists of glacial till overlain by lacustrine clay and marsh deposits. The bedrock is composed of Silurian dolomite (Tymochtee Formation).

Soils

Forsyth (1968) mapped the soils of Lucas County, Ohio and southern Monroe County, Michigan. The soils of the wetlands along the Lake Erie shoreline and estuaries are designated as Lake Marshes containing decayed organic material mixed with sand, silt, and clay, which have formed on Toledo soils. The latter, which also flank the wetlands on the flat lake plain, have developed in lake-deposited silts and clay. Toledo topsoil, generally seven to nine inches thick, is dark gray silty clay that is sticky or plastic when wet and hard when dry. The subsoil is compact silty clay, mottled gray and brown.

Hydrology

Otter Creek Wetland lies along the estuarine portion of Otter Creek and therefore is strongly influenced by the water level in Lake Erie (see the Hydrology section for Cedar Point National Wildlife Refuge Wetland, LE 065, for general information on water level fluctuations in Lake Erie). No other surface streams flow through the wetland.

Sherzer (1900) delineated the vicinity of Luna Pier as a flowing well district, indicating that the piezometric level is above the land surface. Mozola (1970) mapped the piezometric water level at an elevation of 570 feet in the vicinity of the wetlands. Weist (1978) reported a typical water yield of 10-100 gallons per minute from unconsolidated sediments in this area.

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

Climate

The closest weather station providing climatic data for Otter Creek Wetland is located in Monroe, Michigan. The average annual temperature is 50.1°F based on the normal period from 1941-1970. The mean monthly low for January is 21.7°F and the mean monthly high for July is 86.1°F. The average annual precipitation is 31.29 inches, with a mean monthly precipitation of 1.93 inches in January and 2.94 inches in July. The growing season is approximately six months long, with the last killing frost (28°F) in 1975 occurring on April 13 and the first killing frost on November 15* (National Oceanic and Atmospheric Administration, 1975).

* The average growing season is only six months; the last killing frost in 1975 was unusually late.

Special Features

No natural special features are found in the vicinity of Otter Creek Wetland (U.S.G.S. quadrangle map, Erie, Michigan-Ohio, 1967).

BIOTIC SETTING

LE 079

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 Otter 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 Otter 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 Otter Creek Wetland.

Reptiles and Amphibians

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

Avifauna

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 Otter Creek 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 Otter 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, 1978) were documented in Otter Creek 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 process water nearby and this may have some effect on the health of the wetland.

CULTURAL SETTING

LE 079

Population

Otter Creek Wetland is located in LaSalle Township of Monroe County, Michigan. The county is moderately populated, with a density of 228 persons per square mile. Table 7-10 indicates that Monroe County experienced rapid population growth, while LaSalle Township experienced moderate population growth between 1970 and 1975. Projections for 1990 indicate that rapid growth is expected to continue in Monroe County.

Table 7-10. Population Data for the Vicinity of Otter Creek Wetland

	Estimated Population 1975[a]	Estimated % Δ 1970-1975[a]	Projected Population 1990[b]
Monroe County	127,094	6.6	167,863
LaSalle Township	4,357	5.0	--

[a] U.S. Bureau of the Census (1977)
[b] Michigan Department of Management and Budget, Office of the Budget, Information System Division

Land Use and Ownership

Land use within Otter Creek Wetland is rural open space. The surrounding area is predominantly residential. The wetland is under private ownership, and its location suggests that it is subject to moderate development pressure. Railroad tracks cut across the western side of Otter Creek Wetland in two different paths. Interstate Route 75 cuts the wetland in half, and another hard surface road runs across its western end. Drainage canals are located in the northeastern part of the wetland (U.S.G.S. quadrangle map, Erie, Michigan-Ohio, 1967).

Recreation

No known state or federal recreational facilities are present in the vicinity of Otter Creek Wetland.

Mineral, Energy, and Forest Resources

Potential mineral resources in Otter Creek Wetland include limestone and dolomite (Great Lakes Basin Commission, 1974). No significant forest, oil, or gas resources are known to be present in the vicinity.

Public Utilities and Facilities

No public utilities or facilities are located within 0.5 mile of Otter Creek Wetland (U.S.G.S. quadrangle map, Erie, Michigan-Ohio, 1967).

Pollution Sources

The Toledo Water Plant holds an NPDES permit to discharge process water into Duck Creek and/or Otter Creek. This discharge may have an impact on Otter Creek 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 or archaeological features are present within 500 feet of Otter Creek Wetland.

RESEARCH PROJECTS

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

LA PLAISANCE CREEK WETLAND

PHYSIOGRAPHIC SETTING

LE 080

Setting

LaPlaisance Creek Wetland is located in Monroe Township of Monroe County, Michigan, three miles south southeast of Monroe, Michigan and 19 miles northeast of Toledo, Ohio. It lies along the shore of LaPlaisance Bay of western Lake Erie and inland along the north shore of LaPlaisance Creek. The wetland is largely non-wooded, with Palustrine and Lacustrine components (U.S.G.S. quadrangle maps, Erie, Michigan-Ohio, 1967; Stony Point, Michigan, 1973).

Topography

LaPlaisance Creek Wetland lies at or near the mean elevation of Lake Erie (571 feet above mean sea level). The wetland has very low relief; it is entirely below the 575-foot contour line. An earthen dike with an elevation above 575 feet separates the wetland from LaPlaisance Creek and Lake Erie, but a portion of the wetland lies lakeward of the dike and merges with the lake. The land surface west of the wetland rises gently, reaching an elevation of 600 feet about 3.5 miles from the lake shore (U.S.G.S. quadrangle map, Erie, Michigan-Ohio, 1967).

Surficial Geology

The marshes of the Michigan shore of Lake Erie are located on glacial deposits related to the Pleistocene Ice Age. These deposits average approximately 20 to 30 feet in thickness and cover Silurian and Devonian Age limestones and dolomites (Mozola, 1969 and 1970). The unconsolidated deposits range from clay-rich glacial till to coarser rock material overlain by early lake deposits and recent material from Lake Erie marshes (U.S. Army Corps of Engineers, 1978).

Soils

Whiteside, et al. (1968) prepared a generalized map of the soils along the Michigan shore of Lake Erie, which indicates that the soils associated with the lakeshore and estuary marshes are of the Toledo Association. These soils have developed in lake-deposited silts and clay (Forsyth, 1968). The topsoil, generally seven to nine inches thick, is dark gray silty clay that is sticky or plastic when wet and hard when dry. The subsoil is compact silty clay, mottled gray and brown. In the marshes, the surface consists of decayed organic matter mixed with varying amounts of sand, silt, and clay and ranging in color from grayish brown to brownish black (U.S. Army Corps of Engineers, 1945).

Hydrology

LaPlaisance Creek Wetland lies adjacent to the estuarine portion of LaPlaisance Creek and western Lake Erie, so its water level is directly influenced by the water level in the lake. LaPlaisance Creek is the only surface stream that flows through the wetland.

General information on lake level fluctuations and water quality for the western shore of Lake Erie in contained in the Hydrology Section for Mouillee Marsh, LE 092. Weist (1978) reported that the unconsolidated sediments in the vicinity of this wetland typically yield less than ten gallons of water per minute.

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

Climate

The closest weather station providing climatic data for LaPlaisance Creek Wetland is located in Monroe, Michigan. The average annual temperature is 50.1^{o}F based on the normal period from 1941-1970. The mean monthly low for January is 21.7^{o}F and the mean monthly high for July is 86.1^{o}F. The average annual precipitation is 31.29 inches, with a mean monthly precipitation of 1.93 inches in January and 2.94 inches in July. The growing season is approximately six months long, with the last killing frost* (28^{o}F) in 1975 occurring on April 13 and the first killing frost on November 15* (National Oceanic and Atmospheric Administration, 1975).

* The average growing season is only six months; the last killing frost in 1975 was unusually late.

Special Features

No natural special features are found in the vicinity of LaPlaisance Creek Wetland (U.S.G.S. quadrangle map, Stony Point, Michigan, 1973).

BIOTIC SETTING LE 080

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 LaPlaisance 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 LaPlaisance Creek Wetland.

Invertebrates

Information is available in Berry (1943) on the molluscs (Amnicolidae) of LaPlaisance Bay. *Amnicola binneyana*, *A. lustrica*, and *A. walkeri* were collected in the bay and may occur in LaPlaisance Creek Wetland owing to its proximity to the bay. However, 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

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

Avifauna

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 LaPlaisance Creek 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 LaPlaisance 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, 1978) were documented in LaPlaisance 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 LE 080

Population

LaPlaisance Creek Wetland is located in Monroe Township of Monroe County, Michigan. The county is moderately populated, with a density of 228 persons per square mile. Table 7-11 indicates that Monroe County experienced rapid population growth, while Monroe Township experienced slow population growth between 1970 and 1975. Projections for 1990 indicate that rapid growth is expected to continue in Monroe County.

Table 7-11. Population Data for the Vicinity of LaPlaisance Creek Wetland

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Monroe County	127,094	6.6	167,863
Monroe Township	9,464	1.2	--

[a] U.S. Bureau of the Census (1977)
[b] Michigan Department of Management and Budget, Office of the Budget, Information System Division

Land Use and Ownership

Land use within LaPlaisance Creek Wetland and most of the surrounding area is rural open space. The wetland is under private ownership, but its location suggests that it is subject to moderate development pressure. Levees are located along the western and northern borders of the wetland, and power transmission lines run across the northern part (U.S.G.S. quadrangle map, Stony Point, Michigan, 1967).

Recreation

No known state or federal recreational facilities are present in the vicinity of LaPlaisance Creek Wetland.

Mineral, Energy, and Forest Resources

Potential mineral resources in LaPlaisance Creek Wetland include limestone and dolomite (Great Lakes Basin Commission, 1974). The France Stone company, located inland (west) of the wetland, quarries calcite (yellow and colorless) and marcasite (Door, and Eschman, 1970). No forest, oil, or gas resources are known to be present in the vicinity.

Public Utilities and Facilities

No public utilities or facilities are located within 0.5 mile of LaPlaisance Creek Wetland (U.S.G.S. quadrangle map, Stony Point, Michigan, 1973).

Pollution Sources

There are no NPDES permit holders adjacent to LaPlaisance Creek 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 or archaeological features are present within 500 feet of LaPlaisance Creek Wetland.

RESEARCH PROJECTS LE 080

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

FRENCHTOWN WETLAND

PHYSIOGRAPHIC SETTING

LE 081

Setting

Frenchtown Wetland is located within a southern projection of Frenchtown Township of Monroe County, Michigan, three miles southeast of Monroe, Michigan and 20 miles northeast of Toledo, Ohio. The wetland lies along the western Lake Erie shore near the mouths of Plum Creek and River Raisin. The wetland is wooded, Palustrine and backed by a levee constructed to protect a large electric power generating plant (U.S.G.S. quadrangle map, Stony Point, Michigan, 1973).

Topography

Frenchtown Wetland merges with Lake Erie and lies at or near the mean elevation of the lake (571 feet above mean sea level). The relief of the wetland is very low; no portion of the wetland is above the 575-foot contour line. The land surface to the west rises gently, reaching an elevation of 600 feet about four miles from the lake shore (U.S.G.S. quadrangle maps, Erie, Michigan-Ohio, 1967; Stony Point, Michigan, 1973).

Surficial Geology

The marshes of the Michigan shore of Lake Erie are located on glacial deposits related to the Pleistocene Ice Age. These deposits average approximately 20 to 30 feet in thickness and cover Silurian and Devonian Age limestones and dolomites (Mozola, 1969 and 1970). The unconsolidated deposits range from clay-rich glacial Till to coarser rock material overlain by early lake deposits and recent material from Lake Erie marshes (U.S. Army Corps of Engineers, 1978).

Soils

Whiteside, et al. (1968) prepared a generalized map of the soils along the Michigan shore of Lake Erie, which indicates that the soils associated with the lakeshore and estuary marshes are of the Toledo Association. These soils have developed in lake-deposited silts and clay (Forsyth, 1968). The topsoil, generally seven to nine inches thick, is dark gray silty clay that is sticky or plastic when wet and hard when dry. The subsoil is compact silty clay, mottled gray and brown. In the marshes, the surface consists of decayed organic matter mixed with varying amounts of sand, silt, and clay and ranging in color from grayish brown to brownish black (U.S. Army Corps of Engineers, 1945).

Hydrology

Frenchtown Wetland lies along the shore of Lake Erie and is directly influenced by the water level of the lake. Plum Creek enters the lake at the southwestern end of the wetland. No other streams flow through the wetland.

General information on lake level fluctuations and water quality for the western shore of Lake Erie is contained in the Hydrology Section for Mouillee Marsh, LE 092. Weist (1978) reported that the unconsolidated sediments in the vicinity of this wetland typically yield less than ten gallons of water per minute.

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

Climate

The closest weather station providing climatic data for Frenchtown Wetland is located in Monroe, Michigan. The average annual temperature is 50.1°F based on the normal period from 1941-1970. The mean monthly low for January is 21.7°F and the mean monthly high for July is 86.1°F. The average annual precipitation is 31.29 inches, with a mean monthly precipitation of 1.93 inches in January and 2.94 inches in July. The growing season is approximately six months long, with the last killing frost (28°F) in 1975 occurring on April 13 and the first killing frost on November 15* (National Oceanic and Atmospheric Administration, 1975).

* The average growing season is only six months; the last killing frost in 1975 was unusually late.

Special Features

No natural special features are found in the vicinity of Frenchtown Wetland (U.S.G.S. quadrangle map, Stony Point, Michigan, 1973).

BIOTIC SETTING

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 Frenchtown 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 Frenchtown 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 Frenchtown Wetland.

Reptiles and Amphibians

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

Avifauna

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 Frenchtown 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 Frenchtown 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, 1978) were documented in Frenchtown 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

LE 081

Population

Frenchtown Wetland is located in Frenchtown Township of Monroe County, Michigan. The county is moderately populated, with a density of 228 persons per square mile. Table 7-12 indicates that Monroe County and Frenchtown Township both experienced rapid population growth between 1970 and 1975. Projections for 1990 indicate that rapid growth is expected to continue in Monroe County.

Table 7-12. Population Data for the Vicinity of Frenchtown Wetland

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Monroe County	127,094	6.6	167,863
Frenchtown Township	16,058	9.3	--

[a] U.S. Bureau of the Census (1977)
[b] Michigan Department of Management and Budget, Office of the Budget, Information System Division

Land Use and Ownership

Land use within Frenchtown Wetland is rural open space. The surrounding area is predominantly industrial. The wetland is under private ownership, but its location suggests that it is subject to heavy development pressure (U.S.G.S. quadrangle map, Stony Point, Michigan, 1967).

Recreation

No known state or federal recreational facilities are present in the vicinity of Frenchtown Wetland.

Mineral, Energy, and Forest Resources

Potential mineral resources in Frenchtown Wetland include limestone and dolomite (Great Lakes Basin Commission, 1974). The France Stone Company, which quarries calcite (yellow and colorless) and marcasite, is located near the wetland (Door, and Eschman, 1970). No forest, oil, or gas resources are known to be present in the vicinity.

Public Utilities and Facilities

No public utilities or facilities are located within 0.5 mile of Frenchtown Wetland (U.S.G.S. quadrangle map, Stony Point, Michigan, 1973).

Pollution Sources

There are no NPDES permit holders adjacent to Frenchtown 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 or archaeological features are present within 500 feet of Frenchtown Wetland.

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

RIVER RAISIN WETLAND COMPLEX

PHYSIOGRAPHIC SETTING LE 082-083

Setting

The River Raisin Wetland Complex lies on the north and south sides of the mouth of River Raisin nearly one mile inland from Lake Erie. The complex is located within the city of Monroe in Monroe County, Michigan. River Raisin Wetland #1 extends all the way across the 0.5 mile wide peninsula that separates Plum Creek and River Raisin. The northern portion of the complex (River Raisin Wetland #2) extends from the river north to Mason Run at the southern boundary of Sterling State Park. The wetlands are partially wooded, and are Palustrine Systems (U.S.G.S. quadrangle map, Stony Point, Michigan, 1973).

Topography

The wetlands of the River Raisin Complex lie adjacent to the estuarine portions of Plum Creek, River Raisin and Mason River and lie at or near the mean elevation of Lake Erie (571 feet above mean sea level). The wetlands have very low relief; all lie below the 575-foot contour line. The land surface to the west rises gently, reaching an elevation of 600 feet about three miles inland (U.S.G.S. quadrangle map, Stony Point, Michigan, 1973).

Surficial Geology

The marshes of the Michigan shore of Lake Erie are located on glacial deposits related to the Pleistocene Ice Age. These deposits average approximately 20 to 30 feet in thickness and cover Silurian and Devonian Age limestones and dolomites (Mozola, 1969 and 1970). The unconsolidated deposits range from clay-rich glacial till to coarser rock material overlain by early lake deposits and recent material from Lake Erie marshes (U.S. Army Corps of Engineers, 1978).

Soils

Whiteside, et al. (1968) prepared a generalized map of the soils along the Michigan shore of Lake Erie, which indicates that the soils associated with the lakeshore and estuary marshes are of the Toledo Association. These soils have developed in lake-deposited silts and clay (Forsyth, 1968). Toledo topsoil, generally seven to nine inches thick, is dark gray silty clay that is sticky or plastic when wet and hard when dry. The subsoil is compact silty clay, mottled gray and brown. In the marshes, the surface consists of decayed organic matter mixed with varying amounts of sand, silt, and clay and ranging in color from grayish brown to brownish black (U.S. Army Corps of Engineers, 1945).

Hydrology

The wetlands of the River Raisin Complex lie along the estuarine portion of the River Raisin and therefore are strongly influenced by the water level of

Lake Erie. Plum Creek forms the southern limit and Mason River forms the northern limit of the complex.

The River Raisin drainage basin covers 1063 sq. miles over relatively flat land. The maximum and minimum discharge rates are 1290 cfs and 2 cfs, respectively; the mean rate is 646 cfs. The River Raisin is the third largest tributary to the western basin of Lake Erie, but contributes less than 1% of the total discharge. Discharges of municipal and industrial wastes, as well as runoff from farmlands, are responsible for low levels of dissolved oxygen. Fecal coliform bacterial levels in 1970, within a three mile radius of the river mouth, had a mean concentration of 542/100 ml; a river station adjacent to the wetlands had a level of 146,560/100 ml. Lake water in the vicinity of the river mouth is very turbid, with Secchi disc readings of only 18-36 inches. The turbidity is primarily due to suspended solids which are greatest during the spring and fall. The suspended particulate matter contains high concentrations of phosphorus, nitrogen, carbon, and other biologically active elements which stimulate algal growth (U.S. Army Corps of Engineers, 1978).

General information on lake level fluctuations and water quality for the western shore of Lake Erie is contained in the Hydrology Section for Mouillee Marsh, LE 092. Weist (1978) reported that the unconsolidated sediments in the vicinity of this wetland typically yield less than ten gallons of water per minute.

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

Climate

The closest weather station providing climatic data for the River Raisin Wetland Complex is Monroe, Michigan. The average annual temperature is 50.1°F based on the normal period from 1941-1970. The mean monthly low for January is 21.7°F and the mean monthly high for July is 86.1°F. The average annual precipitation is 31.29 inches, with a mean monthly precipitation of 1.93 inches in January and 2.94 inches in July. The growing season is approximately six months long, with the last killing frost (28°F) in 1975 occurring on April 13 and the first killing frost on November 15* (National Oceanic and Atmospheric Administration, 1975).

* The average growing season is only six months; the last killing frost in 1975 was unusually late.

Special Features

No natural special features are found in the vicinity of the River Raisin Wetland Complex (U.S.G.S. quadrangle map, Stony Point, 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 two wetlands comprising the River Raisin Wetland Complex.

Fish

Major fish species of the lower River Raisin include yellow perch (Perca flavescens), gizzard shad (Dorosoma cepedianum), white bass (Morone chrysops), emerald shiner (Notropis atherinoides), spottail shiner (Notropis hudsonius), goldfish (Carassius auratus), and alewife (Alosa pseudoharengus) (Edwards, 1973). A list of fish species collected in the lower River Raisin from 1970 to 1972 is presented in Appendix A-8 and includes numbers and biomass of each species. Fish spawning and production in the Monroe area is evidently quite high, and fish larvae collected in the area of River Raisin include carp, goldfish, gizzard shad, rainbow smelt (Osmerus mordax), channel catfish (Ictalurus punctatus), freshwater drum (Aplodinotus grunniens), and yellow perch, but the larvae of gizzard shad were greatly predominant. The overall fish fauna of the lower River Raisin indicated degraded water quality, and the lower river was devoid of fish on some sampling dates (U.S. Army Corps of Engineers, 1976).

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 River Raisin 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 River Raisin Wetlands #1 and #2.

Reptiles and Amphibians

Thompson (1916) surveyed the herpetofauna in the vicinity of the city of Monroe and in the valley of the River Raisin. Although much of the habitat present in 1916 has been altered, the following species were found in a wetland behind a barrier beach in the vicinity of present Monroe Harbor and may still occur in River Raisin Wetlands #1 and #2: Blanchard's cricket frog (Acris crepitons blanchardi), northern leopard frog (Rana pipiens), and eastern garter snake (Thamnophis sirtalis sirtalis). The snapping turtle (Chelydra serpentina), midland painted turtle (Chrysemys picta marginata), and map turtle (Graptemys geographica) were common in the River Raisin.

The literature search yielded no site-specific information concerning seasonal abundance and distribution, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in River Raisin Wetlands #1 and #2.

Avifauna

Mute swans (*Cygnus olor*), mallards (*Anas platyrhynchos*), black ducks (*A. rubripes*), blue-winged teal (*A. discors*), wood ducks (*Aix sponsa*), canvasbacks (*Aythya valisineria*), double-crested cormorants (*Phalacrocorax auritus*), belted kingfishers (*Megaceryle alcyon*), great blue herons (*Ardea herodias*), great egrets (*Casmerodius albus*), black-crowned night herons (*Nycticorax nycticorax*), American coots (*Fulica americana*) and red-tailed hawks (*Buteo jamaicensis*) were observed in nearby wetland habitat by Michigan Department of Natural Resources personnel (1975) and may utilize the wetlands of the River Raisin Wetland Complex. General information on the avifauna in the vicinity of Monroe Harbor, which may be applicable to the wetlands of this complex, is available in Cole (1976) and Reed (1971).

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 the two wetlands comprising the River Raisin Wetland Complex.

Mammals

Virginia opossum (*Didelphis virginiana*), woodchuck (*Marmota monax*), muskrat (*Ondatra zibethicus*), red fox (*Vulpes vulpes*), raccoon (*Procyon lotor*), long-tailed weasel (*Mustela frenata*), mink (*M. vison*), and striped skunk (*Mephitis mephitis*) have been observed at the two wetlands of the River Raisin Wetland Complex (U.S. Army corps of Engineers, 1976).

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

Endangered Species

Double-crested cormorants were observed in nearby wetlands in 1975, and may utilize the wetlands of the River Raisin Wetland Complex. 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, 1978) were documented in these wetlands by the literature search.

Health

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

Population

The River Raisin Wetland Complex is located within the city limits of Monroe in Monroe County, Michigan. The county is moderately populated, having a density of 228 persons per square mile. Table 7-13 indicates that Monroe County underwent rapid population growth, while the city of Monroe experienced slow population growth, between 1970 and 1975. Projections for 1990 indicate that rapid growth is expected to continue in Monroe County.

Table 7-13. Population Data for the Vicinity of the River Raisin Wetland Complex

	Estimated Population 1975[a]	Estimated % Δ 1970-1975[a]	Projected Population 1990[b]
Monroe County	127,094	6.6	167,863
City of Monroe	24,612	3.0	--

[a] U.S. Bureau of the Census (1977)
[b] Michigan Department of Management and Budget, Office of the Budget, Information System Division

Land Use and Ownership

Land use within the River Raisin Wetland Complex is open space. The surrounding area is predominantly commercial and industrial. The wetland complex is largely under private ownership, and its location suggests that it is subject to heavy development pressure. Hard surface roads run through the central and northwestern portions of River Raisin Wetland #1 and railroad tracks run through its center. Power transmission lines run north to south through the center of River Raisin Wetland #2, and levees are located along the eastern border of this wetland. A large industrial building is on the southwestern border of River Raisin Wetland #2 (U.S.G.S. quadrangle map, Stony Point, Michigan, 1967).

Recreation

No known state or federal recreational facilities are present in the vicinity of the River Raisin Wetland Complex.

Mineral, Energy, and Forest Resources

Potential mineral resources in the River Raisin Wetland Complex include limestone and dolomite (Great Lakes Basin Commission, 1974). The France Stone Company, which quarries calcite (yellow and colorless) and marcasite, is located near the wetlands (Dorr and Eschman, 1970). No forest, oil, or gas resources are known to be present in the vicinity.

Public Utilities and Facilities

A substation and power plant with associated power transmission lines is located approximately 200 feet east of River Raisin Wetland #1 and 0.4 mile south of River Raisin Wetland #2 (U.S.G.S. quadrangle map, Stony Point, Michigan, 1973).

Pollution Sources

There are no NPDES permit holders adjacent to the River Raisin Wetland Complex. No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

Six known archaeological sites are located in the vicinity of the River Raisin Wetland Complex (20-MR-33, 20-MR-170, 20-MR-23, 20-MR-24, 20-MR-110, 20-MR-123; Peebles and Black, 1976). They are primarily habitation sites. No known historical sites are located within 500 feet of the wetland complex.

RESEARCH PROJECTS LE 082-083

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

SANDY CREEK WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LE 084-085

Setting

The Sandy Creek Wetland Complex is located in southern Frenchtown Township of Monroe County, Michigan, about four miles east northeast of the community of Monroe. The complex consists of Sandy Creek Wetland #1, which lies at the north end of Sterling State Park on the south shore of the creek mouth and Sandy Creek Wetland #2, which lies at the upper portion of the creek estuary on the north shore, near the community of Detroit Beach. Wetland #1 is non-wooded and #2 is approximately 25% wooded; both wetlands are Palustrine Systems (U.S.G.S. quadrangle map, Stony Point, Michigan, 1973).

Topography

The Sandy Creek Wetland Complex is in direct contact with Lake Erie and lies at or near the mean elevation of the lake (571 feet above mean sea level). The wetlands have very little relief; both lie below the 575-foot contour line. The land surface northwest of the complex rises gently to an elevation of 600 feet about 2.8 miles from the lake shore (U.S.G.S. quadrangle map, Stony Point, Michigan, 1973).

Surficial Geology

The marshes of the Michigan shore of Lake Erie are located on glacial deposits related to the Pleistocene Ice Age. These deposits average approximately 20 to 30 feet in thickness and cover Silurian and Devonian Age limestones and dolomites (Mozola, 1969 and 1970). The unconsolidated deposits range from clay-rich glacial till to coarser rock material overlain by early lake deposits and recent material from Lake Erie marshes (U.S. Army Corps of Engineers, 1978).

Soils

Whiteside, et al. (1968) prepared a generalized map of the soils along the Michigan shore of Lake Erie, which indicates that the soils associated with the lakeshore and estuary marshes are of the Toledo Association. These soils have developed in lake-deposited silts and clay (Forsyth, 1968). Toledo topsoil, generally seven to nine inches thick, is dark gray silty clay that is sticky or plastic when wet and hard when dry. The subsoil is compact silty clay, mottled gray and brown. In the marshes, the surface consists of decayed organic matter mixed with varying amounts of sand, silt, and clay and ranging in color from grayish brown to brownish black (U.S. Army Corps of Engineers, 1945).

Hydrology

The Sandy Creek Wetland complex occupies the estuarine mouth of Sandy Creek, and the water levels of the wetlands are directly influenced by the level of Lake Erie. Sandy Creek is the only stream that flows through the complex.

General information on lake level fluctuations and water quality for the western shore of Lake Erie is contained in the Hydrology Section for Mouillee Marsh, LE 092. Weist (1978) reported that the unconsolidated sediments in the vicinity of this wetland typically yield less than ten gallons of water per minute.

The literature search provided no site-specific data pertaining to water level fluctuations, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in the Sandy Creek Wetland Complex.

Climate

The closest weather station providing climatic data for the Sandy Creek Wetland Complex is Monroe, Michigan. The average annual temperature is 50.1°F based on the normal period from 1941-1970. The mean monthly low for January is 21.7°F and the mean monthly high for July is 86.1°F. The average annual precipitation is 31.29 inches, with a mean monthly precipitation of 1.93 inches in January and 2.94 inches in July. The growing season is approximately six months long, with the last killing frost (28°F) in 1975 occurring on April 13 and the first killing frost on November 15* (National Oceanic and Atmospheric Administration, 1975).

* The average growing season is only six months; the last killing frost in 1975 was unusually late.

Special Features

No natural special features are found in the vicinity of the Sandy Creek Wetland Complex (U.S.G.S. quadrangle map, Stony Point, Michigan, 1973).

BIOTIC SETTING

LE 084-085

Vegetation

Jaworski and Raphael (1978) report that the Sandy Creek Wetland Complex is composed of a soft, mudflat-like surface which has only about 10% vegetation cover. Major species of this habitat include sage pondweed (Potamogeton pectinatus), curly pondweed (Potamogeton crispus), and water milfoil (Myriophyllum exalbescens). During periods of low water levels in Lake Erie this submerged mudflat will be exposed and may become revegetated by sedges, grasses and other emergents. A small emergent wetland is located immediately north of the beach road. This area, approximately 50 to 100 feet in width, is comprised of beggar's-ticks (Bidens sp.), smartweed (Polygonum sp.), soft-stem bulrush (Scirpus validus), cattail (Typha sp.), and other bulrushes (Scirpus sp.). On the artificial ridges within the wetland are cottonwood (Populus deltoides), dogwood (Cornus sp.), and wild grape (Vitis sp.). Recently an aquatic lotus, Nelumbo pentapetala, was artificially seeded in the wetlands of the Sandy Creek estuary. Seeds were obtained from Wisconsin.

The literature search yielded no site-specific information concerning density and productivity of the vegetation in the two wetlands of this complex.

Fish

The Sandy Creek estuary and wetlands of Sterling State Park provide habitat for juvenile and adult fish. Major game fish species in the wetland and estuary include carp (Cyprinus carpio), carp x goldfish hybrids (Cyprinus carpio x Carassius auratus), bullheads (Ictalurus spp.), channel catfish (Ictalurus punctatus), yellow perch (Perca flavescens), and smallmouth bass (Micropterus dolomieui) (Jaworksi and Raphael, 1978). The backwaters of Sandy Creek were found to contain larvae of carp, carp x goldfish hybrids, rainbow smelt (Osmerus mordax), gizzard shad (Dorosoma cepedianum), alewife (Alosa pseudoharengus), shiners (Notropis spp.), yellow perch, white bass (Morone chrysops), white crappie (Pomoxis annularis), sunfish (Lepomis sp.), logperch (Percina caprodes), and brook silverside (Labidesthes sicculus) (Cole et al., 1978; Shauver and Schaeffer, 1976, as reported in Jaworski and Raphael, 1978). Larval density in the backwaters was 43 larvae/100 m^3, which was not high but included a wide diversity of species. Gizzard shad predominated in samples and composed 66% of the number of juvenile fish captured, followed by shiners at 33%. No fish larvae were found in shallow, mudflat-like wetlands of the inshore area of Sandy Creek (Shauver and Schaeffer, 1976; as reported in Jaworski and Raphael, 1978). Northern pike (Esox lucius) once spawned in the wetlands of Sandy Creek estuary, and the wetlands are one of the few areas remaining on the Lake Erie shore of Michigan which could provide suitable spawning habitat for pike if preserved (Jaworski and Raphael, 1978). No commercial fishing occurs in these inshore waters, but bank and pier recreational fishing for carp, channel catfish, bullheads, yellow perch, and white crappie is reported in Sterling State Park. Very little fishing, except for carp, probably occurs in the actual marsh areas. Bank and pier fishing at the park generates an estimated 105,000 angler days per year (U.S. Army Corps of Engineers, 1974; Jaworksi and Raphael, 1978).

The literature search yielded no site-specific information pertaining to seasonal distribution and abundance, life histories, food sources, or commercial use of the fish populations in the Sandy Creek Wetland Complex, nor to major species and spawning areas in Sandy Creek Wetland #2. However, characteristics of the fish in the latter wetland are probably similar to those cited for Sandy Creek Wetland #1.

Invertebrates

Jaworski and Raphael (1978) considered Sterling State Park, which includes Sandy Creek Wetland #1, an important area for Michigan's endangered, threatened, and rare species of mussels and snails. However, the literature search provided no site-specific data concerning other species, seasonal distribution and abundance, density and productivity, food sources, or relationship to water levels of the invertebrates present in the two wetlands of the Sandy Creek Wetland Complex.

Reptiles and Amphibians

The literature search yielded no site-specific information pertaining to major species, seasonal abundance and distribution, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in the two wetlands comprising the Sandy Creek Wetland Complex.

Avifauna

Great blue herons (*Ardea herodias*), black-crowned night herons (*Nycticorax nycticorax*), great egrets (*Casmerodius albus*), belted kingfishers (*Megaceryle alcyon*), and spotted sandpipers (*Actitis macularia*) were recorded in Sandy Creek Wetland #1 by Jaworski and Raphael (1978) and Gill (1975). Barn owls (*Tyto alba*), marsh hawks (*Circus cyaneus*), red-winged blackbirds (*Agelaius phoeniceus*), long-billed marsh wrens (*Cistothorus palustris*), and short-billed marsh wrens (*Cistothorus platensis*) nest in the vicinity of Monroe Harbor and may also utilize this wetland (U.S. Army Corps of Engineers, 1977). One of the few nesting records in the Great Lakes Region for the yellow-crowned night heron (*Nyctanassa violacea*) has been documented in Sterling State Park, which includes part of Sandy Creek Wetland #1 (Kriesman et al., 1976). Bonaparte's gull (*Larus philadelphia*) and the parasitic jaegar (*Stercorarius parasiticus*) have also been sighted in the park (Kelly, 1972). In addition, Sandy Creek Wetland #1 is an important resting and feeding stopover for migratory waterfowl. Mallards (*Anas platyrhynchos*), American wigeon (*A. americana*), lesser scaup (*Aythya affinis*), ruddy ducks (*Oxyura jamaicensis*), common goldeneyes (*Bucephala clangula*) and common mergansers (*Mergus merganser*) have been observed in the park and Brest Bay during migration (Reed, 1971). According to Jaworski and Raphael (1978), mallards, blue-winged teal (*Anas discors*), black ducks (*A. rubripes*), and wood ducks (*Aix sponsa*) probably utilize this wetland for nesting.

The information presented for Sandy Creek Wetland #1 may be pertinent to Sandy Creek Wetland #2 owing to the proximity of the two areas. The literature search provided no site-specific information pertaining to density and productivity, recreational and commercial use, health, life histories, relationship to water levels, or major food sources of the birds utilizing the two wetlands comprising the Sandy Creek Wetland Complex.

Mammals

The eastern cottontail (*Sylvilagus floridanus*), woodchuck (*Marmota monax*), muskrat (*Ondatra zibethicus*), red fox (*Vulpes vulpes*), raccoon (*Procyon lotor*), white-tailed deer (*Odocoileus virginianus*), and small rodents may be found on the two wetlands of the Sandy Creek Wetland Complex (U.S. Army Corps of Engineers, 1974). Muskrat are common on both wetlands although the population density is lower than muskrat densities of other wetlands where cattail stands are more extensive (Jaworski and Raphael, 1978).

The literature search yielded no site-specific information pertaining to seasonal distribution and abundance, productivity, recreational and commercial use, life histories, major food sources, or relationship to water levels of the mammals inhabiting the Sandy Creek Wetland Complex.

Endangered Species

The American lotus (Nelumbo lutea = N. pentapetala), an aquatic plant endangered in Michigan, was recently artificially seeded in the wetlands of the Sandy Creek estuary. According to Jaworski et al. (1978), Sterling State Park, which contains Sandy Creek Wetland #1, is an important area for Michigan's endangered, threatened, and rare species of mussels and snails. Barn owls and marsh hawks, both threatened in Michigan, rest in the vicinity and may utilize Sandy Creek Wetland #1 (U.S. Army Corps of Engineers, 1977), and one of the few nesting records in the Great Lakes region for the yellow-crowned night heron has been documented in Sterling State Park (Kriesman et al., 1976).

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, 1978) were documented in these wetlands by the literature search.

Health

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

CULTURAL SETTING

LE 084-085

Population

The Sandy Creek Wetland Complex is located in Frenchtown Township of Monroe County, Michigan. The county is moderately populated, having a density of 228 persons per square mile. Table 7-14 indicates that Monroe County and Frenchtown Township both experienced rapid population growth between 1970 and 1975. Projections for 1990 indicate that rapid growth is expected to continue in Monroe County.

Table 7-14. Population Data for the Vicinity of the Sandy Creek Wetland Complex

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Monroe County	127,094	6.6	167,863
Frenchtown Township	16,058	9.3	--

[a] U.S. Bureau of the Census (1977)
[b] Michigan Department of Management and Budget, Office of the Budget, Information System Division

Land Use and Ownership

Land use within the Sandy Creek Wetland Complex is rural open space. The surrounding area is residential. The wetland complex is under mixed private and state ownership, and its location suggests that it is subject to moderate development pressure. Levees are located in the southern, central, and western parts of Sandy Creek Wetland #1. A few buildings are located to the northeast of Sandy Creek Wetland #2 (U.S.G.S. quadrangle map, Stony Point, Michigan, 1967).

Recreation

A large part of the Sandy Creek Wetland Complex is within Sterling State Park. Recreational activities available in the park include camping, boating, picnicking, hiking, fishing, and snowmobiling.

Mineral, Energy, and Forest Resources

Potential mineral resources in the Sandy Creek Wetland Complex include limestone and dolomite (Great Lakes Basin Commission, 1974). Nearby in Monroe, Michigan, the France Stone Company quarries calcite (yellow and colorless) and marcasite. No forest, oil, or gas resources are known to be present in the vicinity.

Public Utilities and Facilities

No public utilities or facilities are located within 0.5 mile of the two wetlands comprising the Sandy Creek Wetland Complex (U.S.G.S. quadrangle map, Stony Point, Michigan, 1973).

Pollution Sources

There are no NPDES permit holders adjacent to the Sandy Creek Wetland Complex. No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

One known archaeological site is located in the vicinity of the Sandy Creek Wetland Complex (20-MR-56; Peebles and Black, 1976). It is an habitation site. No known historical sites are located within 500 feet of the wetland complex.

RESEARCH PROJECTS LE 084-085

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

STONY CREEK AREA WETLAND COMPLEX

PHYSIOGRAPHIC SETTING

LE 086-087

Setting

The Stony Creek Area Wetland Complex is located in Frenchtown Township of Monroe County, Michigan, about six miles northeast of the community of Monroe. The complex is comprised of Stony Creek Wetland, which lies along the north shore of the estuarine mouth of Stony Creek, and Stony Creek Area Wetland. The latter occupies a small island in Brest Bay of Lake Erie, 0.1 mile offshore from the mouth of Walker Drain and 0.5 mile east of the mouth of Stony Creek. The complex is non-wooded, with both Palustrine and Lacustrine characteristics (U.S.G.S. quadrangle map, Stony Point, Michigan, 1973).

Topography

The Stony Creek Area Wetland Complex is in direct contact with Lake Erie and lies at or near the mean elevation of the lake 571 feet above mean sea level. The wetlands have very low relief; both lie below the 575-foot contour line. Northwest of the complex the land surface rises gently, reaching an elevation of 600 feet about 3.5 miles from the lake shore (U.S.G.S. quadrangle map, Stony Point, Michigan, 1973).

Surficial Geology

The marshes of the Michigan shore of Lake Erie are located on glacial deposits related to the Pleistocene Ice Age. These deposits average approximately 20 to 30 feet in thickness and cover Silurian and Devonian Age limestones and dolomites (Mozola, 1969 and 1970). The unconsolidated deposits range from clay-rich glacial till to coarser rock material overlain by early lake deposits and recent material from Lake Erie marshes (U.S. Army Corps of Engineers, 1978).

Soils

Whiteside, et al. (1968) prepared a generalized map of the soils along the Michigan shore of Lake Erie, which indicates that the soils associated with the lakeshore and estuary marshes are of the Toledo Association. These soils have developed in lake-deposited silts and clay (Forsyth, 1968). Toledo topsoil, generally seven to nine inches thick, is dark gray silty clay that is sticky or plastic when wet and hard when dry. The subsoil is compact silty clay, mottled gray and brown. In the marshes, the surface consists of decayed organic matter mixed with varying amounts of sand, silt, and clay and ranging in color from grayish brown to brownish black (U.S. Army Corps of Engineers, 1945).

Hydrology

The Stony Creek Area Wetland Complex lies in the estuarine mouth of Stony Creek and on a small island in Lake Erie off Walker Drain, so the water level of this complex is strongly influenced by the level of the lake. No other surface streams are associated with the complex.

General information on lake level fluctuations and water quality for the western shore of Lake Erie is contained in the Hydrology Section for Mouillee Marsh, LE 092. Weist (1978) reported that the unconsolidated sediments in the vicinity of this wetland typically yield less than ten gallons of water per minute.

The literature search provided no site-specific data pertaining to water level fluctuations, groundwater drainage patterns and runoff, water quality, depth, or seasonal changes in the Stony Creek Area Wetland Complex.

Climate

The closest weather station providing climatic data for the Stony Creek Area Wetland Complex is Monroe, Michigan. The average annual temperature is 50.1^{O}F based on the normal period from 1941-1970. The mean monthly low for January is 21.7^{O}F and the mean monthly high for July is 86.1^{O}F. The average annual precipitation is 31.29 inches, with a mean monthly precipitation of 1.93 inches in January and 2.94 inches in July. The growing season is approximately six months long, with the last killing frost* (28^{O}F) in 1975 occurring on April 13 and the first killing frost on November 15* (National Oceanic and Atmospheric Administration, 1975).

* The average growing season is only six months; the last killing frost in 1975 was unusually late.

Special Features

No natural special features are found in the vicinity of the Stony Creek Area Wetland Complex (U.S.G.S. quadrangle map, Stony Point, Michigan, 1973).

BIOTIC SETTING LE 086-087

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 Stony Creek 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 two wetlands comprising the Stony Creek 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 Stony Creek Area Wetland Complex.

Reptiles and Amphibians

The literature search yielded no site-specific information pertaining to major species, seasonal abundance and distribution, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in the two wetlands comprising the Stony Creek Area Wetland Complex.

Avifauna

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 the Stony Creek Area Wetland Complex.

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 Stony 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, 1978) were documented in the Stony 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

LE 086-087

Population

The Stony Creek Area Wetland Complex is located in Frenchtown Township of Monroe County, Michigan. The county is moderately populated, having a density of 228 persons per square mile. Table 7-15 indicates that Monroe County and Frenchtown Township both experienced rapid population growth between 1970 and 1975. Projections for 1990 indicate that rapid growth is expected to continue in Monroe County.

Table 7-15. Population Data for the Vicinity of the Stony Creek Area Wetland Complex

	Estimated Population 1975[a]	Estimated % Δ 1970-1975[a]	Projected Population 1990[b]
Monroe County	127,094	6.6	167,863
Frenchtown Township	16,058	9.3	--

[a] U.S. Bureau of the Census (1977)
[b] Michigan Department of Management and Budget, Office of the Budget, Information System Division

Land Use and Ownership

Land use within the Stony Creek Area Wetland Complex is rural open space. The surrounding area is predominantly residential. The wetlands area is under private ownership, and their location suggests that they are subject to moderate development pressure. Dredged canals are present in the southern half of Stony Creek Wetland. Buildings and an unimproved dirt road are also located in the southern part of this wetland, and a hard surface road runs along the eastern border (U.S.G.S. quadrangle map, Stony Point, Michigan, 1967).

Recreation

No known state or federal recreational facilities are present in the vicinity of the Stony Creek Area Wetland Complex.

Mineral, Energy, and Forest Resources

Potential mineral resources in the Stony Creek Area Wetland Complex include clay, limestone, and dolomite (Great Lakes Basin Commission, 1974). No significant forest, oil, or gas resources are known to be present in the vicinity.

Public Utilities and Facilities

No public utilities or facilities are located within 0.5 mile of the two wetlands comprising the Stony Creek Area Wetland Complex (U.S.G.S. quadrangle map, Stony Point, Michigan, 1973).

Pollution Sources

There are no NPDES permit holders adjacent to the Stony Creek Area Wetland Complex. No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

No known historical or archaeological features are present within 500 feet of the Stony Creek Area Wetland Complex.

RESEARCH PROJECTS

LE 086-087

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

STONY POINT WETLAND

PHYSIOGRAPHIC SETTING

LE 088

Setting

Stony Point Wetland is located along the shore of Brest Bay in western Lake Erie, within Frenchtown Township of Monroe County, Michigan. The wetland lies immediately northwest of the community of Stony Point and about seven miles northeast of Monroe, Michigan. It covers the interior portion of Stony Point, and lies adjacent to the lake near the southwest base of the point. Stony Point Wetland is sparsely wooded and Palustrine in nature (U.S.G.S. quadrangle map, Stony Point, Michigan, 1973).

Topography

Stony Point Wetland lies at or near the mean elevation of Lake Erie (571 feet above sea level). An earthern dike at an elevation of about 575 feet separates the wetland from the lake. The wetland has very low relief; it lies entirely below the 575-foot contour line. The land surface to the north northwest rises moderately rapidly for this part of the lake plain, reaching an elevation of 600 feet at the crest of a gentle knob about 1.5 miles from the wetland (U.S.G.S. quadrangle map, Stony Point, Michigan, 1973).

Surficial Geology

The marshes of the Michigan shore of Lake Erie are located on glacial deposits related to the Pleistocene Ice Age. These deposits average approximately 20 to 30 feet in thickness and cover Silurian and Devonian Age limestones and dolomites (Mozola, 1969 and 1970). The unconsolidated deposits range from clay-rich glacial till to coarser rock material overlain by early lake deposits and recent material from Lake Erie marshes (U.S. Army Corps of Engineers, 1978).

Soils

Whiteside, et al. (1968) prepared a generalized map of the soils along the Michigan shore of Lake Erie, which indicates that the soils associated with the lakeshore and estuary marshes are of the Toledo Association. These soils have developed in lake-deposited silts and clay (Forsyth, 1968). The topsoil, generally seven to nine inches thick, is dark gray silty clay that is sticky or plastic when wet and hard when dry. The subsoil is compact silty clay, mottled gray and brown. In the marshes, the surface consists of decayed organic matter mixed with varying amounts of sand, silt, and clay and ranging in color from grayish brown to brownish black (U.S. Army Corps of Engineers, 1945).

Hydrology

Stony Point Wetland lies adjacent to Lake Erie and therefore its water level is influenced by the level of the lake. No surface streams flow through the wetland.

General information on lake level fluctuations and water quality for the western shore of Lake Erie is contained in the Hydrology Section for Mouillee Marsh, LE 092. Weist (1978) reported that the unconsolidated sediments in the vicinity of this wetland typically yield less than ten gallons of water per minute.

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

Climate

The closest weather station providing climatic data for Stony Point Wetland is located in Monroe, Michigan. The average annual temperature is 50.1°F based on the normal period from 1941-1970. The mean monthly low for January is 21.7°F and the mean monthly high for July is 86.1°F. The average annual precipitation is 31.29 inches, with a mean monthly precipitation of 1.93 inches in January and 2.94 inches in July. The growing season is approximately six months long, with the last killing frost* (28°F) in 1975 occurring on April 13 and the first killing frost on November 15 (National Oceanic and Atmospheric Administration, 1975).

* The average growing season is only six months; the last killing frost in 1975 was unusually late.

Special Features

No natural special features are found in the vicinity of Stony Point Wetland (U.S.G.S. quadrangle map, Stony Point, Michigan, 1973).

BIOTIC SETTING

LE 088

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 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 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 Wetland.

Reptiles and Amphibians

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

Avifauna

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 Stony Point 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 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, 1978) were documented in Stony Point 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 LE 088

Population

Stony Point Wetland is located in Frenchtown Township of Monroe County, Michigan. The county is moderately populated, with a density of 228 persons per square mile. Table 7-16 indicates that Monroe County and Frenchtown Township both experienced rapid population growth between 1970 and 1975. Projections for 1990 indicate that rapid growth is expected to continue in Monroe County.

Table 7-16. Population Data for the Vicinity of Stony Point Wetland

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Monroe County	127,094	6.6	167,863
Frenchtown Township	16,058	9.3	--

[a] U.S. Bureau of the Census (1977)
[b] Michigan Department of Management and Budget, Office of the Budget, Information System Division

Land Use and Ownership

Land use within Stony Point Wetland is rural open space. The surrounding area is predominantly residential. The wetland is under private ownership, and its location suggests that it is subject to moderate development pressure. Drainage canals are located in the northeastern part of Stony Point Wetland (U.S.G.S. quadrangle map, Stony Point, Michigan, 1973).

Recreation

No known state or federal recreational facilities are present in the vicinity of Stony Point Wetland.

Mineral, Energy, and Forest Resources

Potential mineral resources in Stony Point Wetland include clay, limestone, and dolomite (Great Lakes Basin Commission, 1974). No significant forest, oil, or gas resources are known to be present in the vicinity.

Public Utilities and Facilities

No public utilities or facilities are located within 0.5 mile of Stony Point Wetland (U.S.G.S. quadrangle map, Stony Point, Michigan, 1973).

Pollution Sources

There are no NPDES permit holders adjacent to Stony Point 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 or archaeological features are present within 500 feet of Stony Point Wetland.

RESEARCH PROJECTS

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

ENRICO FERMI WETLAND

PHYSIOGRAPHIC SETTING

LE 089

Setting

Enrico Fermi Wetland is located on the western shore of Lake Erie in northeastern Frenchtown Township of Monroe County, Michigan, about eight miles northeast of the community of Monroe. The multiple-unit Enrico Fermi Nuclear Power Station is located immediately north of the wetland and the community of Stony Point lies 0.5 mile to the south. This Palustrine wetland lies along the inside of barrier beach and an associated lagoon at the northern base of Pointe aux peaux. The wetland adjacent to the barrier beach is wooded but the lagoon marshland is open (U.S.G.S. quadrangle map, Stony Point, Michigan, 1973).

Topograpy

Enrico Fermi Wetland lies at or near the mean elevation of Lake Erie (571 feet above sea level). An earthern and rock dike at an elevation of approximately 575 feet separates the wetland from the lake. The wetland has very low relief; it lies entirely below the 575-foot contour line. The land surface to the northwest rises moderately rapidly for this part of the lake plain, reaching an elevation of 600 feet at the crest of a gentle knob about 0.7 mile from the wetland (U.S.G.S. quadrangle map, Stony Point, Michigan, 1973).

Surficial Geology

The marshes of the Michigan shore of Lake Erie are located on glacial deposits related to the Pleistocene Ice Age. These deposits average approximately 20 to 30 feet in thickness and cover Silurian and Devonian Age limestones and dolomites (Mozola, 1969 and 1970). The unconsolidated deposits range from clay-rich glacial till to coarser rock material overlain by early lake deposits and recent material from Lake Erie marshes (U.S. Army Corps of Engineers, 1978).

Soils

Whiteside, et al. (1968) prepared a generalized map of the soils along the Michigan shore of Lake Erie, which indicates that the soils associated with the lakeshore and estuary marshes are of the Toledo Association. These soils have developed in lake-deposited silts and clay (Forsyth, 1968). The topsoil, generally seven to nine inches thick, is dark gray silty clay that is sticky or plastic when wet and hard when dry. The subsoil is compact silty clay, mottled gray and brown. In the marshes, the surface consists of decayed organic matter mixed with varying amounts of sand, silt, and clay and ranging in color from grayish brown to brownish black (U.S. Army Corps of Engineers, 1945).

Hydrology

Enrico Fermi Wetland lies adjacent to Lake Erie and therefore is influenced by the water level in the lake. A small unnamed tributary enters the wetland from the northwest.

General information on lake level fluctuations and water quality for the western shore of Lake Erie is contained in the Hydrology Section for Mouillee Marsh, LE 092. Weist (1978) reported that the unconsolidated sediments in the vicinity of this wetland typically yield less than ten gallons of water per minute.

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

Climate

The closest weather station providing climatic data for Enrico Fermi Wetland is located in Monroe, Michigan. The average annual temperature is 50.1°F based on the normal period from 1941-1970. The mean monthly low for January is 21.7°F and the mean monthly high for July is 86.1°F. The average annual precipitation is 31.29 inches, with a mean monthly precipitation of 1.93 inches in January and 2.94 inches in July. The growing season is approximately six months long, with the last killing frost (28°F) in 1975 occurring on April 13 and the first killing frost on November 15* (National Oceanic and Atmospheric Administration, 1975).

* The average growing season is only six months; the last killing frost in 1975 was unusually late.

Special Features

No natural special features are found in the vicinity of Enrico Fermi Wetland (U.S.G.S. quadrangle map, Stony Point, Michigan, 1973).

BIOTIC SETTING

LE 089

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 Enrico Fermi 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 Enrico Fermi 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 Enrico Fermi Wetland.

Reptiles and Amphibians

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

Avifauna

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 Enrico Fermi 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 Enrico Fermi 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, 1978) were documented in Enrico Fermi 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

LE 089

Population

Enrico Fermi Wetland is located in Frenchtown Township of Monroe County, Michigan. The county is moderately populated, with a density of 228 persons per square mile. Table 7-17 indicates that Monroe County and Frenchtown Township both experienced rapid population growth between 1970 and 1975. Projections for 1990 indicate that rapid growth is expected to continue in Monroe County.

Table 7-17. Population Data for the Vicinity of Enrico Fermi Wetland

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Monroe County	127,094	6.6	167,863
Frenchtown Township	16,058	9.3	--

[a] U.S. Bureau of the Census (1977)
[b] Michigan Department of Management and Budget, Office of the Budget, Information System Division

Land Use and Ownership

Land use within Enrico Fermi Wetland is rural open space. The surrounding area is predominantly residential. The wetland is under private ownership, and its location suggests that it is subject to moderate development pressure. Levees are present in Enrico Fermi Wetland. Power transmission lines run east to west across the northern part, and a tank is situated in the northeastern corner. A hard surface road lies adjacent to the wetland on the north (U.S.G.S. quadrangle map, Stony Point, Michigan, 1973).

Recreation

No known state or federal recreational facilities are present in the vicinity of Enrico Fermi Wetland.

Mineral, Energy, and Forest Resources

Potential mineral resources in Enrico Fermi Wetland include clay, limestone, and dolomite (Great Lakes Basin Commission, 1974). No significant forest, oil, or gas resources are known to be present in the vicinity.

Public Utilities and Facilities

Enrico Fermi Power Plant lies approximately 0.2 mile north of Enrico Fermi Wetland and power transmission lines run through the wetland (U.S.G.S. quadrangle map, Stony Point, Michigan, 1973).

Pollution Sources

There are no NPDES permit holders adjacent to Enrico Fermi 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 or archaeological features are present within 500 feet of Enrico Fermi Wetland.

RESEARCH PROJECTS

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

SWAN CREEK WETLAND

PHYSIOGRAPHIC SETTING

LE 090

Setting

Swan Creek Wetland is located along the shore of western Lake Erie at the estuarine mouth of Swan Creek, within Frenchtown and Berlin Townships of Monroe County, Michigan, about nine miles northeast of the community of Monroe. It is bordered on the south by the Enrico Fermi Nuclear Power Station and on the north by the community of Estral Beach. The wetland occupies both the southwest and northeast sides of the creek mouth and extends inland for 0.6 mile; it is a largely non-wooded, and Palustrine System (U.S.G.S. quadrangle maps, Stony Point, Michigan, 1973; Estral Beach, Michigan-Ohio-Ontario, 1967).

Topography

Swan Creek Wetland lies at or near the mean elevation of Lake Erie (571 feet above sea level). The northern portion of the wetland is protected from lake flooding by an earthen and rock dike which fronts the beach community of Estral Beach at an approximate elevation of 575 feet. The wetland has very low relief; it lies entirely below the 575-foot contour line. The land surface to the southwest rises moderately rapidly for this part of the lake plain, reaching an elevation of 600 feet at the crest of a gentle knob about one mile from the wetland (U.S.G.S. quadrangle maps, Stony Point, Michigan, 1973; Estral Beach, Michigan-Ohio-Ontario, 1967).

Surficial Geology

The marshes of the Michigan shore of Lake Erie are located on glacial deposits related to the Pleistocene Ice Age. These deposits average approximately 20 to 30 feet in thickness and cover Silurian and Devonian Age limestones and dolomites (Mozola, 1969 and 1970). The unconsolidated deposits range from clay-rich glacial till to coarser rock material overlain by early lake deposits and recent material from Lake Erie marshes (U.S. Army Corps of Engineers, 1978).

Soils

Whiteside, et al. (1968) prepared a generalized map of the soils along the Michigan shore of Lake Erie, which indicates that the soils associated with the lakeshore and estuary marshes are of the Toledo Association. These soils have developed in lake-deposited silts and clay (Forsyth, 1968). The topsoil, generally seven to nine inches thick, is dark gray silty clay that is sticky or plastic when wet and hard when dry. The subsoil is compact silty clay, mottled gray and brown. In the marshes, the surface consists of decayed organic matter mixed with varying amounts of sand, silt, and clay and ranging in color from grayish brown to brownish black (U.S. Army Corps of Engineers, 1945).

Hydrology

Swan Creek Wetland occupies the estuarine mouth of Swan Creek and therefore is directly influenced by the water level in Lake Erie. Besides Swan Creek, two small unnamed tributaries flow through the northeastern part of the wetland.

General information on lake level fluctuations and water quality for the western shore of Lake Erie is contained in the Hydrology Section for Mouillee Marsh, LE 092. Weist (1978) reported that the unconsolidated sediments in the vicinity of this wetland typically yield less than ten gallons of water per minute.

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

Climate

The closest weather station providing climatic data for Swan Creek Wetland is located in Monroe, Michigan. The average annual temperature is 50.1°F based on the normal period from 1941-1970. The mean monthly low for January is 21.7°F and the mean monthly high for July is 86.1°F. The average annual precipitation is 31.29 inches, with a mean monthly precipitation of 1.93 inches in January and 2.94 inches in July. The growing season is approximately six months long, with the last killing frost (28°F) in 1975 occurring on April 13 and the first killing frost on November 15* (National Oceanic and Atmospheric Administration, 1975).

* The average growing season is only six months; the last killing frost in 1975 was unusually late.

Special Features

No natural special features are found in the vicinity of Swan Creek Wetland (U.S.G.S. quadrangle maps, Stony Point, Michigan, 1973; Estral Beach, Michigan-Ohio-Ontario, 1967).

BIOTIC SETTING

LE 090

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 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 Swan 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 Swan Creek Wetland.

Reptiles and Amphibians

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

Avifauna

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 Swan Creek 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 Swan 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, 1978) were documented in Swan 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

LE 090

Population

Swan Creek Wetland is located in Frenchtown and Berlin Townships of Monroe County, Michigan. The county is moderately populated, with a density of 228 persons per square mile. Table 7-18 indicates that Monroe County, Frenchtown Township, and Berlin Township all experienced rapid population growth between 1970 and 1975. Projections for 1990 indicate that rapid growth is expected to continue in Monroe County.

Table 7-18. Population Data for the Vicinity of Swan Creek Wetland

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Monroe County	127,094	6.6	167,863
Frenchtown Township	16,058	9.3	--
Berlin Township	5,901	7.1	--

[a] U.S. Bureau of the Census (1977)
[b] Michigan Department of Management and Budget, Office of the Budget, Information System Division

Land Use and Ownership

Land use within Swan Creek Wetland and most of the surrounding area is rural open space. The wetland is under private ownership, but its location suggests that it is subject to minimal development pressure. A dike is located in the northern part of Swan Creek Wetland (U.S.G.S. quadrangle maps, Stony Point, Michigan, 1973; Estral Beach, Michigan-Ohio-Ontario, 1967).

Recreation

No known state or federal recreational facilities are present in the vicinity of Swan Creek Wetland.

Mineral, Energy, and Forest Resources

Potential mineral resources in Swan Creek Wetland include clay, limestone, and dolomite (Great Lakes Basin Commission, 1974). No significant forest, oil, or gas resources are known to be present in the vicinity.

Public Utilities and Facilities

The Enrico Fermi Nuclear Power Plant site borders Swan Creek Wetland on the south (U.S.G.S. quadrangle maps, Stony Point, Michigan, 1967; Estral Beach, Michigan-Ohio-Ontario, 1967).

Pollution Sources

There are no NPDES permit holders adjacent to Swan Creek 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 or archaeological features are present within 500 feet of Swan Creek Wetland.

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

ESTRAL BEACH WETLAND

PHYSIOGRAPHIC SETTING

LE 091

Setting

Estral Beach Wetland is located along the shore of western Lake Erie in Berlin Township of Monroe County, Michigan, about 11 miles northeast of the community of Monroe. The wetland lies 0.1 mile inland from shore on the landward side of a drainage ditch which services the community of Estral Beach. The western portion of this Palustrine wetland is wooded (U.S.G.S. quadrangle map, Estral Beach, Michigan-Ohio-Ontario, 1967).

Topography

Estral Beach Wetland lies at or slightly below the mean elevation of Lake Erie (571 feet above mean sea level). Because of the extensive dike and drainage system surrounding this wetland, its elevation is held below the 570-foot contour line giving it very low relief. West of the wetland the land surface rises gently to an elevation of 600 feet about five miles from the lake shore (U.S.G.S. quadrangle maps, Stony Point, Michigan, 1973; Estral Beach, Michigan-Ohio-Ontario, 1967).

Surficial Geology

The marshes of the Michigan shore of Lake Erie are located on glacial deposits related to the Pleistocene Ice Age. These deposits average approximately 20 to 30 feet in thickness and cover Silurian and Devonian Age limestones and dolomites (Mozola, 1969 and 1970). The unconsolidated deposits range from clay-rich glacial till to coarser rock material overlain by early lake deposits and recent material from Lake Erie marshes (U.S. Army Corps of Engineers, 1978).

Soils

Whiteside, et al. (1968) prepared a generalized map of the soils along the Michigan shore of Lake Erie, which indicates that the soils associated with the lakeshore and estuary marshes are of the Toledo Association. These soils have developed in lake-deposited silts and clay (Forsyth, 1968). The topsoil, generally seven to nine inches thick, is dark gray silty clay that is sticky or plastic when wet and hard when dry. The subsoil is compact silty clay, mottled gray and brown. In the marshes, the surface consists of decayed organic matter mixed with varying amounts of sand, silt, and clay and ranging in color from grayish brown to brownish black (U.S. Army Corps of Engineers, 1945).

Hydrology

Estral Beach Wetland lies below the level of Lake Erie by virtue of dikes and a drainage system. However, the lake exerts a potential influence on the water level of the wetland. Other than the drainage system, no surface streams flow through the wetland.

General information on lake level fluctuations and water quality for the western shore of Lake Erie is contained in the Hydrology Section for Mouillee Marsh, LE 092. Weist (1978) reported that the unconsolidated sediments in the vicinity of this wetland typically yield less than ten gallons of water per minute.

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

Climate

The closest weather station providing climatic data for Estral Beach Wetland is located in Monroe, Michigan. The average annual temperature is 50.1^{o}F based on the normal period from 1941-1970. The mean monthly low for January is 21.7^{o}F and the mean monthly high for July is 86.1^{o}F. The average annual precipitation is 31.29 inches, with a mean monthly precipitation of 1.93 inches in January and 2.94 inches in July. The growing season is approximately six months long, with the last killing frost* (28^{o}F) in 1975 occurring on April 13 and the first killing frost on November 15* (National Oceanic and Atmospheric Administration, 1975).

* The average growing season is only six months; the last killing frost in 1975 was unusually late.

Special Features

No natural special features are found in the vicinity of Estral Beach Wetland (U.S.G.S. quadrangle map, Estral Beach, Michigan-Ohio-Ontario, 1967).

BIOTIC SETTING

LE 091

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 Estral Beach 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 Estral Beach 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 Estral Beach Wetland.

Reptiles and Amphibians

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

Avifauna

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 Estral Beach 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 Estral Beach 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, 1978) were documented in Estral Beach 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

LE 091

Population

Estral Beach Wetland is located in Berlin Township of Monroe County, Michigan. The county is moderately populated, with a density of 228 persons per square mile. Table 7-19 indicates that Monroe County and Berlin Township both experienced rapid population growth between 1970 and 1975. Projections for 1990 indicate that rapid growth is expected to continue in Monroe County.

Table 7-19. Population Data for the Vicinity of Estral Beach Wetland

	Estimated Population 1975[a]	Estimated % Δ 1970-1975[a]	Projected Population 1990[b]
Monroe County	127,094	6.6	167,863
Berlin Township	5,901	7.1	--

[a] U.S. Bureau of the Census (1977)
[b] Michigan Department of Management and Budget, Office of the Budget, Information System Division

Land Use and Ownership

Land use within Estral Beach Wetland and most of the surrounding area is rural open space. The wetland is under private ownership, but its location suggests that it is subject to moderate development pressure. A hard surface road runs through the southern part of Estral Beach Wetland, and a few buildings are located in the southwest. Beach cottages line the dike that separates the wetland from the lake. Drainage canals cross the northwestern corner of the wetland (U.S.G.S. quadrangle map, Estral Beach, Michigan-Ohio-Ontario, 1967).

Recreation

No known state or federal recreational facilities are present in the vicinity of Estral Beach Wetland.

Mineral, Energy, and Forest Resources

Potential mineral resources in Estral Beach Wetland include clay, limestone, and dolomite (Great Lakes Basin Commission, 1974). No significant forest, oil, or gas resources are known to be present in the vicinity.

Public Utilities and Facilities

No public utilities or facilities are located within 0.5 mile of Estral Beach Wetland (U.S.G.S. quadrangle map, Estral Beach, Michigan-Ohio, 1967).

Pollution Sources

There are no NPDES permit holders adjacent to Estral Beach 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 or archaeological features are present within 500 feet of Estral Beach Wetland.

RESEARCH PROJECTS

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

MOUILLEE MARSH

PHYSIOGRAPHIC SETTING

LE 092

Setting

Mouillee Marsh is located along the western shore of Lake Erie five miles south of the mouth of the Detroit River, partly within Berlin Township of Monroe County and partly in Brownstown Township of Wayne County, Michigan. The center of the marsh lies about four miles southeast of the community of Rockwood, Michigan. This is thee most extensive wetland along the Michigan shore of Lake Erie and has Lacustrine, Riverine, and Palustrine components. The marsh lies between the small beach communities of Estral Beach (on the south) and Milleville Beach (on the north), a distance of nearly five miles. The estuarine mouths of the Huron River and Mouillee Creek are located near the center of the wetland. Most of the wetland is within the Pointe Mouillee State Game Area, and portions of the marsh are protected by onshore and offshore dikes (U.S.G.S. quadrangle maps, Estral Beach, Michigan-Ohio-Ontario, 1967; Rockwood, Michigan-Ontario, 1973). The Pointe Mouillee State Game Area is a marsh of approximately 2,600 acres, roughly 3 miles long by 1½ miles wide, situated just below the mouth of the Detroit River. The Huron River meanders across the northern end for a distance of 1 3/4 miles, and the east and south sides of the marsh are bordered by Lake Erie, with a total shoreline of 4½ miles. A sand barrier beach runs between the lake and the marsh; on the west the marsh is bordered by low farmlands and wet meadows. The marsh is traversed by a number of channels, which have widened out into an embayment on the south end of the marsh, which opens into the lake. A confined dredge disposal site is currently under construction offshore.

Topography

Mouillee Marsh is in direct contact with Lake Erie and lies at or near the mean elevation of the lake (571 feet above mean sea level). The marsh has very low relief; it lies entirely below the 575-foot contour line. Approximately 40 offshore islands, lying only slightly above lake level, form a large part of the wetland at the Huron River mouth. Pointe Mouillee itself is the southernmost tip of the largest of these islands. West of the marsh the land surface rises gently, reaching a crest of 593 feet at the top of a low hill about two miles from the lake shore.

Surficial Geology

The Pointe Mouillee area is a part of the Huron-Erie Plain, formed by lacustrine clays laid down during the later stages of the Wisconsin glacial period. While the glacier was receding, the area was covered and uncovered by a series of glacial lake stages, and deposits of fine clays resulted. The surfaces of these clays are not even, but are in undulations or ridges, the higher of which formed the base for the islands which rise above the level of the marsh. These ridges in general run from northwest to southeast and probably represent ridges between early distributaries of the Detroit River. As Lake Erie declined in size and level, the Huron River extended its mouth across the newly exposed land, forming the channel it now fills. At two of the later stages the level of Lake Erie was considerably lower than at present. During that time the Huron River eroded its channel nearly to base level with a deltaic formation at its mouth. Later Lake Erie rose and the mouth of the river was drowned for four miles upriver. The sand of the old barrier beach came from a beach formed at the time of the lower stage of the lake (U.S. Army Corps of Engineers, 1974).

Mouillee Marsh was formed by the rise in lake level as the Huron River wound through the area, with little current most of the time. Mouillee Creek was also drowned, and its old channel can be traced across the now open bay. It emptied into the lake through a gap in the old barrier beach. The barrier beach, which had been built up by the lake during the stages when it was at lower levels, reached approximately two feet above normal cyclical high water level, and was as much as 150 feet wide in places.

Mouillee Marsh south of the Huron River has been subject to severe inundation accompanied by significant erosion of the barrier beach by high water and seiches and wind-driven waves during the last four decades. Forty borings have been taken since 1971 from the vicinity of a proposed barrier dike. The top strata vary between fibrous peat, weak organic silts and clays, silty sands, and sands. These top strata lie directly on thin strata of soft silty clays, soft clay, fibrous peats, organic clays, sands, and organic silts. The different types of subsoil strata are in various horizons and alternate in position. Directly under these strata are stiff to hard clays and sandy clays, known as hardpan, which are in turn overlying limestone rock of the Niagara formation. The fibrous peat stratum is either directly over other sediments or directly beneath them. The hardpan is in its existing state because of glacial pressure; the top of this stratum was the surface upon which the glacier rested approximately 10,000 years ago. All the material above the hardpan was deposited or formed in the post-glacial period (U.S. Army Corps of Engineers, 1974).

Soils

The soils of Mouillee Marsh were mapped in detail by the Game Division of the Michigan Department of Conservation (now the Michigan Department of Natural Resources) in 1944. Seven soil types were identified in the Mouillee District, although the incidence of two of them was relatively minor. The farmland on the inner side of the marsh consists of Brookston and Conover clay loams, fertile dark-colored soils underlain by clay. The original cover on these soils was hardwood forest, which is now represented by a few woodlots. Several islands in the marsh are also covered by Conover clay loam. Bordering these soils is a band of Clyde clay, with a much higher percentage of organic matter (sometimes even mucky) at the surface, underlain by clay; the original cover was hardwood forest or sedges and grasses. This clay also forms a band along the lake shore. The central area of the marsh is Houghton muck, dark brown fibrous peat and muck, with a cover largely of cattail. The river is bordered by Griffin silty clay, an alluvial soil. On the river bank near the Game Area Headquarters there is a patch of Berrien loamy fine sand. The sand ridge along the beach consists of Eastport fine sand, loose sand containing large numbers of shells.

The area as a whole is a clay plain of heavy, impervious to slightly pervious clay. This clay material has been subjected to heavy wave action, and a slight mounding up of heavy-textured materials has occurred along the beach lines and along some lines which were formerly beaches but are now some distance inland. In a few small isolated strips, sand material has been heaped up by waves and wind to form narrow and usually short sand dune ridges generally not over 3 to 5 feet of sand over clay. The Huron River entering Lake Erie at this point has caused the deposition of clay and silt over much of the area. Sheltered standing water inland from the main beach has been protected from strong wave action, and finely divided organic matter has settled on the bottom (U.S. Army Corps of Engineers, 1974).

Hydrology

Surface streams that flow through the marsh include (from south to north): Langton Ditch, Bathgate Drain, Mouillee Creek, Laudenschlager Drain, Huron River, Silver Creek, and Morrison Drain.

Since Mouillee Marsh is in direct contact with Lake Erie, the water level of the marsh is strongly influenced by the level of the Lake. The elevation of the surface of western Lake Erie varies irregularly from year to year. During the course of each year, the surface is subject to a seasonal rise and fall, the lowest stages prevailing during the winter season and the highest stages during the spring and early summer. During the period 1970-1975, the maximum monthly means ranged between 3.0 to 4.9 feet above low water datum (LWD) for Lake Erie (568.6 above mean water level in the Gulf of St. Lawrence) and the minimum monthly means ranged from 1.9 to 3.2 feet above LWD. The highest monthly mean stage measured at Monroe, Michgan during this period was in June 1973 at 4.9 feet above LWD (U.S. Army Corps of Engineers, 1977).

In addition to seasonal fluctuations there are also oscillations of irregular amplitude and duration produced by storms. Some, with periods of a few minutes to a few hours, are the result of squall conditions, the fluctuations being produced by a combination of winds and barometric pressure changes that accompany the squalls. At other times the lake level is affected for somewhat longer periods, such as many hours or days, by strong winds of sustained speed and direction which drive the surface water forward to raise its level on one shore and lower it on the opposite shore. This type of fluctuation has a very pronounced effect on western Lake Erie, because of its shallowness which affords little opportunity for the impelled upper water to return through reverse currents beneath the depth disturbed by storms. As a result, the water level near the end of the lake fluctuates markedly under the influence of winds, varying with their direction, strength, and persistence. Water levels along the western shore have varied from seven feet above to seven feet below Low Water Datum for Lake Erie (568.6 feet above mean water level in the Gulf of St. Lawrence) during such storms (U.S. Army Corps of Engineers, 1974).

Water quality in the vicinity of Point Mouillee is influenced considerably by both the Huron and Detroit Rivers. The Huron River contributes wastes high in coliform densities, phosphates, and nitrogen compounds. These substances are introduced primarily by numerous waste treatment facilities along the river. The lower Huron River does not meet total body contact (TBC) standards, mainly because of high fecal coliform counts (U.S. Army Corps of Engineers, 1974). Water quality characteristics of the Detroit River at its mouth in 1971 are listed below:

Parameter	Concentration
pH	8.1
Iron (Fe)	0.35 mg/l
Phosphorus (P)	0.07 mg/l
Total dissolved solids	154 mg/l
Suspended solids	10 mg/l

Data Source: U.S. Army Corps of Engineers (1974)

Weist (1978) reported that the unconsolidated sediments in the vicinity of this wetland typically yield less than ten gallons of water per minute. The literature provided no site-specific data pertaining to water level fluctuations, groundwater drainage patterns and runoff, depth, or seasonal changes in Pointe Mouillee Marsh.

Climate

The closest weather station providing climatic data for Mouillee Marsh is located in Monroe, Michigan. The average annual temperature is 50.1°F based on the normal period from 1941-1970. The mean monthly low for January is 21.7°F and the mean monthly high for July is 86.1°F. The average annual precipitation is 31.29 inches, with a mean monthly precipitation of 1.93 inches in January and 2.94 inches in July. The growing season is approximately six months long, with the last killing frost (28°F) in 1975 occurring on April 13 and the first killing frost on November 15* (National Oceanic and Atmospheric Administration, 1975).

* The average growing season is only six months; the last killing frost in 1975 was unusually late.

Special Features

No natural special features are found in the vicinity of Mouillee Marsh (U.S.G.S. quadrangle map, Estral Beach, Michigan-Ohio-Ontario, 1967; Rockwood, Michigan-Ontario, 1973).

BIOTIC SETTING

LE 092

Vegetation

Cattails (*Typha* spp.) are the natural dominant species in Mouillee Marsh (Sellman, et al., 1974). However, the area is managed for waterfowl and such food plants as smartweeds (*Polygonum* spp.), pigweed (*Amaranthus* sp.), and burreed (*Sparganium* spp.) are propagated in diked management areas, to the exclusion of cattails. Outside those areas in which water level is controllable, cattail provides necessary wildlife cover.

Other species occurring in Mouillee Marsh include beggar's ticks (Bidens spp.), bulrushes (Scirpus spp.) marsh mallow (Hibiscus sp.), jewelweed (Impatiens sp.), fireweed (Epilobium sp.), and grasses (family-Gramineae). Species occurring in open water areas include pond weeds (Potamogeton spp.) waterlilies (Nymphaea sp.) and water milfoil (Myriophyllum sp.).

Historical information concerning vegetation in the marsh is provided by MacDonald (1951). However, the literature search yielded no site-specific information pertaining to current major species distribution, or density and productivity of the vegetation in this wetland.

Fish

McDonald (1951) noted the presence of 18 species of fishes in the Mouillee Marsh, which are listed in Table 7-20. Carp (Cyprinus carpio) were most abundant. The U.S. Army Corps of Engineers (1973) presented no on-site collection data but suggested that the marsh may be utilized by carp, goldfish (Carassius auratus), yellow perch (Perca flavescens), gizzard shad (Dorosoma cepedianum), white bass (Morone chrysops), alewife (Alosa pseudoharengus), freshwater drum (Aplodinotus grunniens), emerald shiner (Notropis atherinoides), and spottail shiner (Notropis hudsonius). The literature search produced no site-specific data pertaining to spawning and hatching areas, seasonal locations and abundance, life histories, food sources, or recreational and commercial use of the fish populations in Mouillee Marsh.

Invertebrates

Information regarding the distribution, major food sources, and relationship to water levels of the cattail-inhabiting insects in Mouillee Marsh is available in McDonald (1951). The species observed during this study were two leaf eaters, Arsilonche and Conocephalus, a head borer, Lymnaecia, and the most abundant, Nonagria oblonga, a stem borer. The bryozoans, Paludicella articulata, Plumatella casmiana and P. repens jugalis, were collected by Rogick et al. (1950) at Point Mouillee near the mouth of the Huron River, while van der Schalie (1938) collected the mollusc, Lampsilis siliquoidea. The amnicolid molluscs, Amnicola binneyana and A. limosa, were reported in this area also (Berry, 1943). These organisms may or may not occur in Point Mouillee Marsh at the present time. General information on insects associated with cattails which may be applicable to Mouillee Marsh is available in Claassen (1921), Cole (1931), and McDonald (1951). However, the literature search yielded no site-specific data pertaining to seasonal distribution, density and productivity, major food sources, or relationship to water levels of the invertebrates present in the marsh.

Reptiles and Amphibians

McDonald (1951) recorded the following species from Mouillee Marsh: bullfrog (Rana catesbeiana), green frog (Rana clamitans melanota), northern leopard frog (Rana pipiens), cricket frog (Acris crepitans blanchardi), Blanchard's western chorus frog (Pseudacris triseriata triseriata), American toad (Bufo americanus americanus), eastern fox snake (Elaphe vulpina gloydi), queen snake (Natrix septemvittata), northern brown snake (Storeria dekayi

Table 7-20. Fish Species Found at Pointe Mouillee Marsh, Monroe County, Michigan[a]

Family and Species	Family and Species
Petromyzontidae	Ictaluridae
sea lamprey (on carp)	black bullhead
Lepisosteidae	Atherinidae
longnose gar	brook silverside
Amiidae	Centrarchidae
bowfin	largemouth bass
	pumpkinseed
Clupeidae	bluegill
gizzard shad	rock bass
Esocidae	Percidae
grass pickerel	walleye
northern pickerel	yellow perch
Cyprinidae	Sciaenidae
carp	freshwater drum
goldfish	
spottail shiner	

[a]McDonald (1951)

dekayi), eastern garter snake (Thamnophis sirtalis sirtalis), snapping turtle (Chelydra serpentina), midland painted turtle (Chrysemys picta marginata), and Blanding's turtle (Emydoidea blandingi). The literature search yielded no site-specific information pertaining to seasonal abundance and distribution, density, recreational and commercial use, life histories, major food sources, or relationship to water levels of the reptiles and amphibians in Mouillee Marsh.

Avifauna

A list of the major species of birds observed in Mouillee Marsh is presented in Table 7-21. Canada geese (Branta canadensis), black ducks (Anas rubripes), mallards (A. platyrhynchos), gadwalls (A. strepera), blue-winged teal (A. discors), and wood ducks (Aix sponsa) are common nesting species. According to the U.S. Army Corps of Engineers (1973), the utilization of this wetland by migrating and nesting waterfowl has been greatly reduced by the loss of the interior dikes controlling high water levels. Sixteen thousand dabbling ducks and 75,000 diving ducks were observed during the 1973 fall and spring migrations, respectively. Mouillee Marsh is also a staging area for large numbers of duck in late summer. Two thousand five hundred drake mallards utilized the area in 1973 (U.S. Army Corps of Engineers, 1973).

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

Mammals

The mammalian species found on Mouillee Marsh are listed in Table 7-22 with their seasonal distribution. Muskrat (Ondatra zibethicus) are dependent on the marsh for food, shelter, and breeding areas. Virginia opossum (Didelphis virginia), red fox (Vulpes vulpes), raccoon (Procyon lotor), mink (Mustela vison), and striped skunk (Mephitis mephitis) utilize the marsh as a foraging area (U.S. Army Corps of Engineers 1973).

Table 7-21. Birds Observed in Mouillee Marsh (Point Mouillee State Game Area[a])

Common name	Common name
whistling swan	Virginia rail[b]
Canada goose[b]	sora[b]
snow (blue) goose	American coot[b]
black duck[b]	killdeer[b]
mallard[b]	common gallinule[b]
American wigeon	ruddy turnstone
gadwall[b]	semi-palmated plover
blue-winged teal[b]	piping plover
green-winged teal	black-bellied plover
pintail	marsh wren
wood duck[b]	American golden plover
northern shoveler	American woodcock[b]
greater scaup	common snipe[b]
lesser scaup	long-billed dowitcher
canvasback	short-billed dowitcher
redhead	whimberal
ring-necked duck	American avocet
bufflehead	willet
oldsquaw	greater yellowlegs
common merganser	lesser yellowlegs
ruddy duck	spotted sandpiper
common scoter	solitary sandpiper
white-winged scoter	dunlin
surf scoter	sanderling
hooded merganser	white-rumped sandpiper
red-breasted merganser	red knot
common loon	pectoral sandpiper
pied-bill grebe	Wilson's phalarope
horned grebe	great black-backed gull
double-crested cormorant	ring-billed gull
black-crowned night heron	Bonaparte's gull
great blue heron	herring gull
green heron[b]	common tern
great egret	Caspian tern
American bittern[b]	black tern
least bittern[b]	bald eagle[c]
king rail[b]	osprey[c]

[a] Taken from U.S. Army Corps of Engineers (1973)
[b] common nesting birds in Pointe Mouillee State Game Area; observations made by resident wildlife biologist.
[c] formerly common along the barrier beach; only transient visitors today

Table 7-22. Seasonal Distribution and Preferred Habitat of Mammalian Species Found on Mouillee Marsh[a]

Common name	Seasonal distribution[b]	Preferred habitat[c]
Virginia opossum	V	B,M
short-tailed shrew	R	B
eastern cottontail	R	B,I
woodchuck	R	B
white-footed mouse	R	B,I
meadow vole	R	B,M,I
muskrat	R	B,M
Norway rat	R	B,M
red fox	W.V.	M
raccoon	R	B,M,I
mink	R	M
striped skunk	P	
white-tailed deer	P	

[a] McDonald, 1951; U.S. Army Corps of Engineers, 1973
[b] V=occasionally visits area; R=resident; S=summer; W=winter; Tr=transient; P=present
[c] B=beach, sandbar to willow-cottonwood grove; M=marsh, open water to sedge-meadow; I=permanent islands, wet meadow to meadow thicket

The density of muskrat on Mouillee Marsh varied greatly in the late 1940's as a result of spring storms and a die-off of marsh vegetation (McDonald 1951). The number of muskrat houses was estimated to be 2839 in the spring of 1946. Only 280 muskrat houses were counted in the spring of 1948 on a section of the marsh which had had 1139 houses in 1946.

Muskrat trapping has been an important economic activity on Mouillee Marsh. The number of muskrat harvested is related to the size of the cattail and reed areas in the marsh (Table 7-23).

Table 7-23. Muskrat Harvest from Mouillee Marsh for Seasons between 1945 to 1950[a]

Season	Harvest	Muskrat harvested per hectare (acre) of reed marsh	Muskrat harvested per hectare (acre) of cattail marsh
1945-1946	1094	4.20 (1.70)	2.05 (0.48)
1946-1947	3012	10.75 (4.35)	11.43 (4.63)
1947-1948	295	1.13 (0.45)	1.25 (0.29)
1948-1949	629	2.18 (0.88)	2.40 (0.97)
1949-1950	466	1.33 (0.54)	1.58 (0.64)

[a] McDonald, 1951

The literature search yielded no site-specific information pertaining to abundance, productivity, life histories, major food sources, or relationship to water levels of the mammals inhabiting Mouillee Marsh.

Endangered Species

Of the avian species recorded in Mouillee Marsh (U.S. Army Corps of Engineers, 1973) two are endangered in Michigan (common tern, *Sterna hirundo* and double-crested cormorant, *Phalacrocorax auritus*; four are threatened (piping plover, *Charadrius melodus*; Caspian tern, *Sterna caspia*; osprey, *Pandion haliaetus*; and bald eagle, *Leucocephalus haliaeetus*); and three are rare (black-crowned night heron, *N. nycticorax*; American bittern, *Botaurus lentiginosus*; and common loon, *Gavia immer*).

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, 1978) were documented in Mouillee Marsh by the literature search.

Health

The presence of an abundance of waterfowl and mammals, and the occurrence of several endangered or rare biotic species indicates that the environmental quality of Mouillee Marsh is good.

CULTURAL SETTING

LE 092

Population

Mouillee Marsh is located partly in Berlin Township of Monroe County, Michigan and partly in Brownstown Township of Wayne County, Michigan. Monroe County is moderately populated, having a density of 228 persons per square mile, while Wayne County is densely populated (4,162 persons per square mile). Table

7-24 indicates that Monroe County, Berlin Township, and Brownstown Township all experienced rapid population growth, while Wayne County underwent a rapid popultion decline, between 1970 and 1975. Projections for 1990 indicate that rapid growth is expected to continue in Monroe County, while Wayne County is expected to undergo a slow decline in population in the future.

Table 7-24. Population Data for the Vicinity of Mouillee Marsh

	Estimated Population 1975[a]	Estimated % Δ 1970-1975[a]	Projected Population 1990[b]
Monroe County	127,094	6.6	167,863
Berlin Township	5,901	7.1	--
Wayne County	2,517,726	-5.7	2,318,625
Brownstown Township	8,696	22.7	--

[a] U.S. Bureau of the Census (1977)
[b] Michigan Department of Management and Budget, Office of the Budget, Information System Division

Land Use and Ownership

Land use within Mouillee Marsh and most of the surrounding area is rural open space. The wetland is under state ownership, and its location suggests that it is subject to minimal development pressure. Levees are located throughout Mouillee Marsh, and there are drainage canals in the northcentral and southern parts of the wetland. A few buildings are present in the north of Mouillee Marsh. Unimproved dirt roads run through the southern and northeastern parts of the wetland, and a hard surface road runs a short way into the northwestern corner (U.S.G.S. quadrangle maps, Estral Beach, Michigan-Ohio-Ontario, 1967; Rockwood, Michigan-Ontario, 1973).

Recreation

Mouillee Marsh is mostly within the boundaries of the Point Mouillee State Game Area, and hunting, fishing, and boating facilities are available in the area.

Mineral, Energy, and Forest Resources

Potential mineral resources in Mouillee Marsh include clay, limestone, and dolomite (Great Lakes Basin Commission, 1974). Nearby in Rockwood, Michigan is the Rockwood Quarry, which mines calcite and celestite, including crystalline geodes (Dorr and Eschman, 1979). No significant forest, oil, or gas resources are known to be present in the vicinity.

Public Utilities and Facilities

No public utilities or facilities are located within 0.5 mile of Mouillee Marsh (U.S.G.S. quadrangle maps, Estral Beach, Michigan-Ohio-Ontario, 1977; Rockwood, Michigan-Ontario, 1973).

Pollution Sources

There are no NPDES permit holders are located adjacent to Mouillee Marsh. However, the Huron River contributes wastes high in coliform densities, phosphates, and nitrogen to the Pointe Mouillee Wetlands, introduced primarily by numerous waste treatment facilities along the river. No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

Five known archaeological sites are located in the Mouillee Marsh area (20-MR-9, 20-MR-102, 20-WN-102, 20-WN-104, 20-WN-143; Peebles and Black, 1976). They are primarily habitation sites. No known historical sites exist within 500 feet of the wetland.

RESEARCH PROJECTS LE 092

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

ROCKWOOD ROAD WETLAND

PHYSIOGRAPHIC SETTING LE 093

Setting

Rockwood Road Wetland is an extension of Mouillee Marsh which has been severed by the construction of boating and home-site lagoons at Milleville Beach. The wetland is located in Brownstown Township of Wayne County, Michigan, about two miles south of the Detroit River mouth and 2.5 miles east of the community of Rockwood. It extends from Maple Beach to the southern boundary of Gibraltar, Michigan, on the western side of the ridge forming Cherry Isle, a distance of two miles. This long and narrow Palustrine wetland is largely non-wooded (U.S.G.S. quadrangle map, Rockwood, Michigan, 1967).

Topography

Rockwood Road Wetland lies at or near the mean elevation of Lake Erie (571 feet above mean sea level). The wetland has very low relief; it lies entirely below the 575-foot contour line. West of the wetland the land surface rises gently, not exceeding an elevation of 590 feet within three miles of the lake shore (U.S.G.S. quadrangle map, Rockwood, Michigan, 1973).

Surficial Geology

The marshes of the Michigan shore of Lake Erie are located on glacial deposits related to the Pleistocene Ice Age. These deposits average approximately 20 to 30 feet in thickness and cover Silurian and Devonian Age limestones and dolomites (Mozola, 1969 and 1970). The unconsolidated deposits range from clay-rich glacial till to coarser rock material overlain by early lake deposits and recent material from Lake Erie marshes (U.S. Army Corps of Engineers, 1978).

Soils

Whiteside, et al. (1968) prepared a generalized map of the soils along the Michigan shore of Lake Erie, which indicates that the soils associated with the lakeshore and estuary marshes are of the Toledo Association. These soils have developed in lake-deposited silts and clay (Forsyth, 1968). The topsoil, generally seven to nine inches thick, is dark gray silty clay that is sticky or plastic when wet and hard when dry. The subsoil is compact silty clay, mottled gray and brown. In the marshes, the surface consists of decayed organic matter mixed with varying amounts of sand, silt, and clay and ranging in color from grayish brown to brownish black (U.S. Army Corps of Engineers, 1945).

Hydrology

Rockwood Road Wetland lies along the estuarine portions of two unnamed creeks, so its water level is influenced by the level of Lake Erie. Other than these two streams, one north-flowing and one south-flowing, no other streams enter this wetland.

General information on lake level fluctuations and water quality for the western shore of Lake Erie is contained in the Hydrology Section for Mouillee Marsh, LE 092. Weist (1978) reported that the unconsolidated sediments in the vicinity of this wetland typically yield less than ten gallons of water per minute.

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

Climate

The closest weather station providing climatic data for Rockwood Road Wetland is located in Monroe, Michigan. The average annual temperature is $50.1^{\circ}F$ based on the normal period from 1941-1970. The mean monthly low for January is $21.7^{\circ}F$ and the mean monthly high for July is $86.1^{\circ}F$. The average annual precipitation is 31.29 inches, with a mean monthly precipitation of 1.93 inches in January and 2.94 inches in July. The growing season is approximately six months long, with the last killing frost* ($28^{\circ}F$) in 1975 occurring on April 13 and the first killing frost on November 15* (National Oceanic and Atmospheric Administration, 1975).

* The average growing season is only six months; the last killing frost in 1975 was unusually late.

Special Features

No natural special features are found in the vicinity of Rockwood Road Wetland (U.S.G.S. quadrangle map, Rockwood, Michigan-Ontario, 1973).

BIOTIC SETTING LE 093

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 Rockwood Road 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 Rockwood Road 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 Rockwood Road Wetland.

Reptiles and Amphibians

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

Avifauna

Ruddy ducks (Oxyura jamaicensis), great blue herons (Ardea herodias), green herons (Butorides striatus), great egrets (Casmerodius albus), black-crowned night herons (Nycticorax nycticorax), ring-billed gulls (Larus delawarensis), common terns (Sterna hirundo), red-winged blackbirds (Agelaius phoeniceus), and common grackles (Quiscalus quiscula) were observed in this wetland in 1975 by Michigan Department of Natural Resources personnel (1975). The common tern is presently on the Michigan and Ohio Endangered Species lists.

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

Endangered Species

Common terns (Sterna hirundo), which are now on the Michigan and Ohio lists of endangered species, and black-crowned night herons, (N. nycticorax), a species rare in Michigan, were observed in Rockwood Road Wetland in 1975.

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, 1978) were documented in this wetland by the literature search.

Health

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

Population

Rockwood Road Wetland is located in Brownstown Township of Wayne County, Michigan. The county is densely populated, having a density of 4,162 persons per square mile. Table 7-25 indicates that Wayne County underwent a rapid population decline, while Brownstown Township experienced rapid population growth, between 1970 and 1975.

Table 7-25. Population Data for the Vicinity of Rockwood Road Wetland

	Estimated Population 1975[a]	Estimated % Δ 1970-1975[a]	Projected Population 1990[b]
Wayne County (Michigan)	2,536,700	-5.0	2,318,625
Brownstown Township	8,696	22.7	--

[a] U.S. Bureau of the Census (1977)
[b] Michigan Department of Management and Budget, Office of the Budget, Information System Division

Land Use and Ownership

Land use within Rockwood Road Wetland and most of the surrounding area is rural open space. The wetland is under state ownership, but its location suggests that it is subject to minimal development pressure. Drainage canals run north to south through the southern part of Rockwood Road Wetland. Cherry Island Road cuts east to west across the northern portion of the wetland, and Rockwood Road passes a short distance through the narrow central section of the wetland. An unimproved dirt road also runs across the northern part of the wetland (U.S.G.S. quadrangle map, Rockwood, Michigan-Ontario, 1973).

Recreation

No known state or federal recreational facilities are present in the vicinity of Rockwood Road Wetland.

Mineral, Energy, and Forest Resources

Potential mineral resources in Rockwood Road Wetland include clay, limestone, and dolomite (Great Lakes Basin Commission, 1974). Nearby in Rockwood, Michigan is the Rockwood Quarry, which mines calcite and celestite, including crystalline in geodes (Dorr and Eschman, 1970). No significant forest, oil, or gas resources are known to be present in the vicinity.

Public Utilities and Facilities

No public utilities or facilities are located within 0.5 mile of Rockwood Road Wetland (U.S.G.S. quadrangle map, Rockwood, Michigan-Ontario, 1973).

Pollution Sources

There are no NPDES permit holders adjacent to Rockwood Road Wetland. No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

Two known archaeological sites (20-W46 and 20-WN-146) are located in the vicinity of Rockwood Road Wetland (Peebles and Black, 1976). They are habitation sites. No known historical sites exist within 500 feet of the wetland.

RESEARCH PROJECTS

LE 093

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

CHERRY ISLE WETLAND

PHYSIOGRAPHIC SETTING

LE 094

Setting

Cherry Isle Wetland is located on the western shore of Lake Erie about one mile south of the Detroit River mouth, within Brownstown Township of Wayne County, Michigan, partially with the corporation limits of Gibraltar, Michigan. This primarily non-wooded, Palustrine wetland lies at the mouths of Brownstown Creek and Frank and Poet Drain (U.S.G.S. quadrangle map, Rockwood, Michigan, 1973).

Topography

Cherry Isle Wetland lies at or near the mean elevation of Lake Erie (571 feet above mean sea level). It has very low relief, and lies entirely below the 575-foot contour line. West of the wetland the land surface rises gently, not exceeding an elevation of 590 feet within three miles of the lake shore (U.S.G.S. quadrangle map, Rockwood, Michigan, 1973).

Surficial Geology

The marshes of the Michigan shore of Lake Erie are located on glacial deposits related to the Pleistocene Ice Age. These deposits average approximately 20 to 30 feet in thickness and cover Silurian and Devonian Age limestones and dolomites (Mozola, 1969 and 1970). The unconsolidated deposits range from clay-rich glacial till to coarser rock material overlain by early lake deposits and recent material from Lake Erie marshes (U.S. Army Corps of Engineers, 1978).

Soils

Whiteside, et al. (1968) prepared a generalized map of the soils along the Michigan shore of Lake Erie, which indicates that the soils associated with the lakeshore and estuary marshes are of the Toledo Association. These soils have developed in lake-deposited silts and clay (Forsyth, 1968). The topsoil, generally seven to nine inches thick, is dark gray silty clay that is sticky or plastic when wet and hard when dry. The subsoil is compact silty clay, mottled gray and brown. In the marshes, the surface consists of decayed organic matter mixed with varying amounts of sand, silt, and clay and ranging in color from grayish brown to brownish black (U.S. Army Corps of Engineers, 1945).

Hydrology

Cherry Isle Wetland lies adjacent to Lake Erie near the mouth of the Detroit River and along the estuarine portion of Brownstown Creek, so the water level in the wetland is influenced by the level of the lake and the flow of the Detroit River. Frank and Poet Drain also flows along the northeast side of the wetland.

General information on lake level fluctuations and water quality for the western shore of Lake Erie is contained in the Hydrology Section for Mouillee Marsh, LE 092. Weist (1978) reported that the unconsolidated sediments in the vicinity of this wetland typically yield less than ten gallons of water per minute.

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

Climate

The closest weather station providing climatic data for Cherry Isle Wetland is located in Monroe, Michigan. The average annual temperature is 50.1^{o}F based on the normal period from 1941-1970. The mean monthly low for January is 21.7^{o}F and the mean monthly high for July is 86.1^{o}F. The average annual precipitation is 31.29 inches, with a mean monthly precipitation of 1.93 inches in January and 2.94 inches in July. The growing season is approximately six months long, with the last killing frost* (28^{o}F) in 1975 occurring on April 13 and the first killing frost on November 15 (National Oceanic and Atmospheric Administration, 1975).

* The average growing season is only six months; the last killing frost in 1975 was unusually late.

Special Features

No natural special features are found in the vicinity of Cherry Isle Wetland (U.S.G.S. quadrangle map, Rockwood, Michigan-Ontario, 1973).

BIOTIC SETTING LE 094

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 Cherry Isle 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 Cherry Isle 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 Cherry Isle Wetland.

Reptiles and Amphibians

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

Avifauna

A list of birds observed during a survey of Cherry Isle Wetland in 1975 is presented in Table 7-26. The Caspian tern has been recently added to the Michigan Threatened Species List. 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.

Table 7-26. Birds Observed in Cherry Isle Wetland on July 9,1975 and August 25, 1975[a]

Common name	Common name
mallard	great egret
blue-winged teal	black-crowned night heron
wood duck	common gallinule
ruddy duck	herring gull
belted kingfisher	ring-billed gull
great blue heron	Caspian tern
green heron	lesser yellowlegs

[a] Michigan Department of Natural Resources (1975-1977)

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 Cherry Isle Wetland.

Endangered Species

Caspian terns (*Sterna caspia*), a species threatened in Michigan, and black-crowned night herons (*N. nycticorax*), which are rare, were recorded in Cherry Isle Wetland in 1975.

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, 1978) were documented in this 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 LE 094

Population

Cherry Isle Wetland is located in Brownstown Township of Wayne County, Michigan. The county is densely populated, having a density of 4,162 persons per square mile. Table 7-27 indicates that Wayne County underwent a rapid population decline, while Brownstown Township experienced rapid population growth, between 1970 and 1975.

Table 7-27. Population Data for the Vicinity of Cherry Isle Wetland

	Estimated Population 1975[a]	Estimated % Δ 1970-1975[a]	Projected Population 1990[b]
Wayne County (Michigan)	2,536,700	-5.0	2,318,625
Brownstown Township	8,696	22.7	--

[a] U.S. Bureau of the Census (1977)
[b] Michigan Department of Management and Budget, Office of the Budget, Information System Division

Land Use and Ownership

Land use within Cherry Isle Wetland is rural, open space. The surrounding area is predominantly residential. The wetland is under private ownership, and its location suggests that it is subject to moderate development pressure. Cherry Isle Wetland has been dredged and diked in the northern section. A hard surface road runs through the central part of the wetland (U.S.G.S. quadrangle map, Rockwood, Michigan-Ontario, 1973).

Recreation

No known state or federal recreational facilities are present in the vicinity of Cherry Isle Wetland.

Mineral, Energy, and Forest Resources

Potential mineral resources in Cherry Isle Wetland include clay, limestone, and dolomite (Great Lakes Basin Commission, 1974). Nearby in Rockwood, Michigan is the Rockwood Quarry, which mines calcite and celestite, including crystalline geodes (Dorr and Eschman, 1970). No significant forest, oil, or gas resources are known to be present in the vicinity.

Public Utilities and Facilities

No public utilities or facilities are located within 0.5 mile of Cherry Isle Wetland (U.S.G.S. quadrangle map, Rockwood, Michigan-Ontario, 1973).

Pollution Sources

There are no NPDES permit holders adjacent to Cherry Isle 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 or archaeological features are present within 500 feet of Cherry Isle Wetland.

RESEARCH PROJECTS

LE 094

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

CELERON ISLAND WETLAND

PHYSIOGRAPHIC SETTING

LE 095

Setting

Celeron Island Wetland covers more than 50% of Celeron Island at the mouth of the Detroit River in western Lake Erie. The island lies at the downstream end of Trenton Channel in Grosse Ile Township of Wayne County, Michigan, one mile southeast of downtown Gibraltar and four miles east northeast from Rockwood, Michigan. The Lacustrine and Palustrine wetland is largely non-wooded (U.S.G.S. quadrangle map, Rockwood, Michigan-Ontario, 1973).

Topography

The wetland of Celeron Island is in direct contact with Lake Erie and lies at or near the mean elevation of the lake (571 feet above mean sea level). The wetland has very low relief; it lies entirely below the 575-foot contour line. Celeron island is one mile long and 0.3 mile wide at its widest part. The maximum elevations on the island are found at the crests of two wooded hills, one at the north end (583 feet) and one at the south end (581 feet). A natural channel 12 feet deep lies west of the island and another 18 feet deep lies to the northeast (U.S.G.S. quadrangle map, Rockwood, Michigan-Ontario, 1973).

Surficial Geology

The marshes of the Michigan shore of Lake Erie are located on glacial deposits related to the Pleistocene Ice Age. These deposits average approximately 20 to 30 feet in thickness and cover Silurian and Devonian Age limestones and dolomites (Mozola, 1969 and 1970). The unconsolidated deposits range from clay-rich glacial till to coarser rock material overlain by early lake deposits and recent material from Lake Erie marshes (U.S. Army Corps of Engineers, 1978).

Soils

Whiteside, et al. (1968) prepared a generalized map of the soils along the Michigan shore of Lake Erie, which indicates that the soils associated with the lakeshore and estuary marshes are of the Toledo Association. These soils have developed in lake-deposited silts and clay (Forsyth, 1968). The topsoil, generally seven to nine inches thick, is dark gray silty clay that is sticky or plastic when wet and hard when dry. The subsoil is compact silty clay, mottled gray and brown. In the marshes, the surface consists of decayed organic matter mixed with varying amounts of sand, silt, and clay and ranging in color from grayish brown to brownish black (U.S. Army Corps of Engineers, 1945).

Hydrology

Since Celeron Island Wetland is in direct contact with Lake Erie and the Detroit River, the water level in the wetland is strongly influenced by the level of the lake and flow rate of the river. No streams flow through the wetland.

General information on lake level fluctuations and water quality for the western shore of Lake Erie is contained in the Hydrology Section for Mouillee Marsh, LE 092. Weist (1978) reported that the unconsolidated sediments in the vicinity of this wetland typically yield less than ten gallons of water per minute.

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

Climate

The closest weather station providing climatic data for Celeron Island Wetland is located in Monroe, Michigan. The average annual temperature is 50.1°F based on the normal period from 1941-1970. The mean monthly low for January is 21.7°F and the mean monthly high for July is 86.1°F. The average annual precipitation is 31.29 inches, with a mean monthly precipitation of 1.93 inches in January and 2.94 inches in July. The growing season is approximately six months long, with the last killing frost* (28°F) in 1975 occurring on April 13 and the first killing frost on November 15* (National Oceanic and Atmospheric Administration, 1975).

* The average growing season is only six months; the last killing frost in 1975 was unusually late.

Special Features

No natural special features are found in the vicinity of Celeron Island Wetland (U.S.G.S. quadrangle map, Rockwood, Michigan-Ontario, 1973).

BIOTIC SETTING LE 095

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 Celeron 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 Celeron Island Wetland.

Invertebrates

Hunt (1962) studied the occurrence, density and ecology of invertebrates in the lower Detroit River in the vicinity of Grosse Ile. The fauna included tubificid worms, snails and fingernail clams. In the vicinity of Celeron Island the invertebrate fauna was composed of a tubificid worm aggregation (west side of the island) and a snail aggregation on the east side. The taxa of these aggregations appear in Table 7-28 in order of abundance. Table 7-29 presents the species of snails and fingernail clams which were collected by Hunt (1962) An annual production of 52 pounds per acre of mollusces and 55 pounds per acre of other invertebrates occurred in association with the extensive beds of wild celery (*Vallisnaria americana*) surrounding Celeron Island. An annual bottom fauna crop of 72,800 pounds has been estimated for this area (Michigan Department of Natural Resources, 1968).

Table 7-28. Taxa Collected in the Vicinity of Celeron Island, Detroit River[a]

Tubificid Worm Aggregation	Snail Aggregation (continued)
Oligochaeta	Hirudinea
Gastropoda	Coenagrionidae
Sphaeriidae	Ephemeroptera
Coenagrionidae	Tipulidae
Crustacea	Hydracarina
	Bryozoa
Snail Aggregation	*Dugesia tigrina*
Gastropoda	
Sphaeriidae	
Oligochaeta	
Crustacea	

[a] Hunt, 1962

Table 7-29. Species of Molluscs Collected in the Vicinity of Celeron Island, Detroit River[a]

Snails	Snails (continued)
Amnicola limosa	*Physa* sp.
Bithinia tentaculata	*Pleurocera acuta*
Campeloma decisum	*Valvata sincera*
C. integrum	*V. tricarinata*
Gyraulus sp.	
Helisoma antrosa	Fingernail Clams
H. trivolvis	*Musculium* sp.
Lymnaea catascopium	*Pisidum* sp.
L. columella	*Sphaerium* sp.

[a] Hunt, 1962

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

Reptiles and Amphibians

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

Avifauna

Waterfowl censuses conducted by Michigan Department of Natural Resources personnel during the past 20 years indicate an average winter use of this wetland by 43,000 birds. An average of 50,850 and 114,950 birds utilize the area each year during spring and fall migration, respectively. Approximately 10,000 whistling swans (*Olor columbianus*) rest and feed here during spring migration (Michigan Department of Natural Resources, 1968). Mallards (*Anas platyrhynchos*), lesser scaup (*Aythya affinis*), belted kingfishers (*Megaceryle alcyon*), great blue herons (*Ardea herodias*), green herons (*Butorides striatus*), black-crowned night herons (*Nycticorax nycticorax*), king rails (*Rallus elegans*), herring gulls (*Larus argentatus*), ring-billed gulls (*Larus delawarensis*), common terns (*Sterna hirundo*) and spotted sandpipers (*Actitis macularia*) were observed in this wetland in 1975 (Michigan Department of Natural Resources, 1975).

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

Endangered Species

Common terns (Sterna hirundo), a species endangered in Michigan, and black-crowned night herons (N. nyoticorax), which are rare, were recorded in Celeron Island Wetland in 1975.

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, 1978) were documented in this 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

LE 095

Population

Celeron Island Wetland is located in Grosse Ile Township of Wayne County, Michigan. The county is densely populated, having a density of 4,162 persons per square mile. Table 7-30 indicates that Wayne County underwent a rapid population decline, while Grosse Ile Township experienced rapid population growth, between 1970 and 1975.

Table 7-30. Population Data for the Vicinity of Celeron Island Wetland

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Wayne County (Michigan)	2,536,700	-5.0	2,318,625
Grosse Ile Township	9,303	12.0	--

[a] U.S. Bureau of the Census (1977)
[b] Michigan Department of Management and Budget, Office of the Budget, Information System Division

Land Use and Ownership

Land use within Celeron Island Wetland is rural open space. The remainder of the island is partially wooded. The wetland is under private ownership, but its location suggests that it is subject to minimal development pressure (U.S.G.S. quadrangle map, Rockwood, Michigan-Ontario, 1973).

Recreation

No known state or federal recreational facilities are present in the vicinity of Celeron Island Wetland.

Mineral, Energy, and Forest Resources

Potential mineral resources in Celeron Island Wetland include clay, limestone, and dolomite (Great Lakes Basin Commission, 1974). Nearby in Rockwood, Michigan is the Rockwood Quarry, which mines calcite and celestite, including crystalline geodes (Dorr and Eschman, 1970). No significant forest, oil, or gas resources are known to be present in the vicinity.

Public Utilities and Facilities

No public utilities or facilities are located within 0.5 mile of Celeron Island Wetland (U.S.G.S. quadrangle map, Rockwood, Michigan-Ontario, 1973).

Pollution Sources

There are no NPDES permit holders adjacent to Celeron Island 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 or archaeological features are present within 500 feet of Celeron Island Wetland.

RESEARCH PROJECTS LE 095

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

HORSE ISLAND WETLAND

PHYSIOGRAPHIC SETTING

LE 096

Setting

Horse Island Wetland lies between Gibraltar Island and Horse Island in western Lake Erie at the mouth of the Detroit River. It is located within the corporation boundary of Gibraltar in Brownstown Township of Wayne County, Michigan, 0.7 mile from downtown Gibraltar and 3.3 miles east northeast of Rockwood, Michigan. This Palustrine wetland is non-wooded (U.S.G.S. quadrangle map, Rockwood, Michigan-Ontario, 1973).

Topography

Horse Island Wetland is in direct contact with Lake Erie and lies at or near the mean elevation of the lake (571 feet above mean sea level). The wetland has very low relief; it lies entirely below the 575-foot contour line. The adjoining islands also have fairly low relief; Horse Island has a maximum elevation of 578 feet and Gibraltar Island rises to an elevation of 584 feet, or 13 feet above mean lake level (U.S.G.S. quadrangle map, Rockwood, Michigan-Ontario, 1973).

Surficial Geology

The marshes of the Michigan shore of Lake Erie are located on glacial deposits related to the Pleistocene Ice Age. These deposits average approximately 20 to 30 feet in thickness and cover Silurian and Devonian Age limestones and dolomites (Mozola, 1969 and 1970). The unconsolidated deposits range from clay-rich glacial till to coarser rock material overlain by early lake deposits and recent material from Lake Erie marshes (U.S. Army Corps of Engineers, 1978).

Soils

Whiteside, et al. (1968) prepared a generalized map of the soils along the Michigan shore of Lake Erie, which indicates that the soils associated with the lakeshore and estuary marshes are of the Toledo Association. These soils have developed in lake-deposited silts and clay (Forsyth, 1968). The topsoil, generally seven to nine inches thick, is dark gray silty clay that is sticky or plastic when wet and hard when dry. The subsoil is compact silty clay, mottled gray and brown. In the marshes, the surface consists of decayed organic matter mixed with varying amounts of sand, silt, and clay and ranging in color from grayish brown to brownish black (U.S. Army Corps of Engineers, 1945).

Hydrology

Horse Island Wetland lies in Lake Erie at the mouth of the Detroit River's Trenton Channel. Therefore, the water level in the wetland is directly influenced by the level of the lake and the flow of the river. No other surface streams flow through the wetland.

General information on lake level fluctuations and water quality for the western shore of Lake Erie is contained in the Hydrology Section for Mouillee Marsh, LE 092. Weist (1978) reported that the unconsolidated sediments in the vicinity of this wetland typically yield less than ten gallons of water per minute.

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

Climate

The closest weather station providing climatic data for Horse Island Wetland is located in Monroe, Michigan. The average annual temperature is 50.1°F based on the normal period from 1941-1970. The mean monthly low for January is 21.7°F and the mean monthly high for July is 86.1°F. The average annual precipitation is 31.29 inches, with a mean monthly precipitation of 1.93 inches in January and 2.94 inches in July. The growing season is approximately six months long, with the last killing frost* (28°F) in 1975 occurring on April 13 and the first killing frost on November 15 (National Oceanic and Atmospheric Administration, 1975).

* The average growing season is only six months; the last killing frost in 1975 was unusually late.

Special Features

No natural special features are found in the vicinity of Horse Island Wetland (U.S.G.S. quadrangle map, Rockwood, Michigan-Ontario, 1973).

BIOTIC SETTING LE 096

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 Horse 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 Horse Island Wetland.

Invertebrates

Hunt (1962) studied the occurrence, density and ecology of invertebrates in the lower Detroit River in the vicinity of Grosse Ile. The fauna included tubificid worms, snails, and fingernail clams. In the vicinity of Horse Island the invertebrate fauna was composed of a snail aggregation. The taxa of this aggregation appear in Table 7-31 in order of abundance. Table 7-32 presents the species of snails and fingernail clams which were collected by Hunt (1962).

Table 7-31. Taxa Collected in the lower Detroit River[a]

Tubificid Worm Aggregation	Snail Aggregation (continued)
Oligochaeta	Hirudinea
Gastropoda	Coenagrionidae
Sphaeriidae	Ephemeroptera
Coenagrionidae	Tipulidae
Crustacea	Hydracarina
	Bryozoa
Snail Aggregation	*Dugesia tigrina*
Gastropoda	
Sphaeriidae	
Oligochaeta	
Crustacea	

[a] Hunt, 1962

Table 7-32. Species of Molluscs Collected in the lower Detroit River[a]

Snails	Snails (continued)
Amnicola limosa	*Physa* sp.
Bithinia tentaculata	*Pleurocera acuta*
Campeloma decisum	*Valvata sincera*
C. integrum	*V. tricarinata*
Gyraulus sp.	
Helisoma antrosa	Fingernail Clams
H. trivolvis	*Musculium* sp.
Lymnaea catascopium	*Pisidum* sp.
L. columella	*Sphaerium* sp.

[a] Hunt, 1962

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

Reptiles and Amphibians

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

Avifauna

Information on helminth parasites in several species of diving ducks taken in the vicinity of Gibraltar and Horse Islands is available in Town (1960). However, 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 Horse Island 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 Horse 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 Threatened and Endangered Species Program, 1978) were documented in Horse Island 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

LE 096

Population

Horse Island Wetland is located in Brownstown Township of Wayne County, Michigan. The county is densely populated, having a density of 4,162 persons per square mile. Table 7-23 indicates that Wayne County underwent a rapid population decline, while Brownstown Township experienced rapid population growth, between 1970 and 1975.

Table 7-33. Population Data for the Vicinity of Horse Island Wetland

	Estimated Population 1975[a]	Estimated %Δ 1970-1975[a]	Projected Population 1990[b]
Wayne County (Michigan)	2,536,700	-5.0	2,318,625
Brownstown Township	8,696	22.7	--

[a] U.S. Bureau of the Census (1977)
[b] Michigan Department of Management and Budget, Office of the Budget, Information System Division

Land Use and Ownership

Land use within Horse Island Wetland is rural open space. The surrounding area is predominantly residential. The wetland is under private ownership, and its location suggests that it is subject to moderate development pressure (U.S.G.S. quadrangle map, Rockwood, Michigan-Ontario, 1973).

Recreation

No known state or federal recreational facilities are present in the vicinity of Horse Island Wetland.

Mineral, Energy, and Forest Resources

Potential mineral resources in Horse Island Wetland include clay, limestone, and dolomite (Great Lakes Basin Commission, 1974). Nearby in Rockwood, Michigan is the Rockwood Quarry, which mines calcite and celestite, including crystalline geodes (Dorr and Eschman, 1970). No significant forest, oil, or gas resources are known to be present in the vicinity.

Public Utilities and Facilities

No public utilities or facilities are located within 0.5 mile of Horse Island Wetland (U.S.G.S. quadrangle map, Rockwood, Michigan-Ontario, 1973).

Pollution Sources

There are no NPDES permit holders adjacent to Horse Island Wetland. No site-specific information was located through the literature search pertaining to non-point sources of pollution.

Historical and Archaeological Features

Two known archaeological sites are located within the vicinity of Horse Island Wetland (20-WN-9 and 20-WN-10; Peebles and Black, 1976). They are habitation sites. No known historical sites exist within 500 feet of the wetland.

RESEARCH PROJECTS

LE 096

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

Table 7-34. Data Gaps-Lake Section 7

Data Gap*		Wetland Number	069–076	077	078	079	080	081	082–083	084–085	086–087	088	089	090	091	092	093	094	095	096
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	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		Food Sources	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	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	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		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	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
		Endangered Species																		
		Health		*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*
Cultural Setting		Population																		
		Land Use and Ownership																		
		Recreation																		
		Mineral,Energy,Forest Resourc																		
		Public Utilities/Facilities																		
		Point Pollution Sources	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*	*
		Non-Point Pollution Sources																		
		Historic Features																		
		Archaelogic Features																		

SUMMARY

PHYSIOGRAPHIC SETTING

The information necessary to prepare the setting, topography, surficial geology, soil, hydrology, climate, and special feature elements for each wetland description was gathered from publications of various agencies of the states of Michigan, New York, Ohio, and Pennsylvania. Additional sources of information included U.S.G.S. quadrangle maps and publications of the Great Lakes Basin Commission and the National Oceanographic and Atmospheric Administration (NOAA). The coastal wetlands of Lake Erie and the U.S. waters of the Niagara River are almost entirely Palustrine in nature and most frequently are non-wooded. These areas lie at or near lake level and are underlain by lacustrine sediments and/or glacial till. Marsh soil associations predominate. The growing season for wetland vegetation extends from five to seven months. Annual precipitation ranges from 31.29 to 41.92 inches. Records of natural special features are absent.

BIOTIC SETTING

Vegetation

The available literature provides little current site-specific information regarding density and productivity of vegetation in the coastal wetlands of Lake Erie. However, for most major wetlands, recent literature provides information on species composition and relationship of vegetation to water levels. Little current information is available on Lake Erie coastal wetlands in New York, but historical information is available (Day, 1882-1883; Moseley, 1896; Muencher, 1929; Knobloch, 1933; Zenkert, 1934). Both historical and recent information is available for Pennsylvania's major coastal wetland, Presque Isle (Jennings, 1909; Kormandy, 1969; Zagorsky and O'Toole, 1969; Zagorsky and Gance, 1972; Ellenberger et al., 1973; Michael Baker, Jr. Inc., 1974). Ohio's coastal wetlands have received much attention of botanists, especially in recent years. Central basin wetlands are poorly represented in the literature, with the exception of Mentor Marsh (Izard, 1966, 1967; Tandy, 1976). However, unpublished species lists and notes are being generated, largely through the efforts of the Cleveland Museum of Natural History. Botanical research on the wetlands of the western basin has been active for many years.

Concerning wetlands in Erie and Ottawa Counties, theses from the Ohio State University represent the bulk of botanical information, supplemented by academic papers and wildlife management area reports. Current botanical work in Lucas County, Ohio and the Lake Erie coast of Michigan is largely lacking, but the excellent thesis of Mac Donald (1951) on Point Mouillee, Michigan provides a sound study of a far western basin marsh prior to extensive natural disruption caused by water level increases.

Wetlands of Lake Erie may be divided into several groups. New York's major wetland concentration is located in the Niagara River. These wetlands are largely non-wooded and associated with depressional areas. Further west, throughout the eastern and central basins most wetlands are associated with stream mouths; the unique sand spit wetlands of Presque Isle and the perched wetland of Mentor Marsh are notable exceptions. These stream mouth wetlands generally have both wooded and non-wooded components. Wetlands of the western basin are in general large expanses of low-lying shoreline. Many have been preserved by diking to combat the adverse effects of recent high water episodes. Throughout the Lake Erie coastal zone, dominant wetland species include cattail (Typha spp.), Burreed (Sparganium spp.), grasses (Echinochloa spp., Leersia aryzoides, Calamogrostis canadensis), spatterdock (Nuphar aduena), water lily (Nymphaea spp.), and water smartweed (Polygonum coccineum). Vegetational composition varies greatly among wetlands, with greatest species diversity occurring in the wetlands of the western basin. Upon a reduction in water levels, the acreage and quality of vegetated wetlands on Lake Erie may be expected to increase, particularly in stream mouth and embayment wetlands.

Invertebrates

The invertebrate fauna of Lake Erie 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 have 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 their fauna is better 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.

Fish

The major published source of information regarding the fishes of Lake Erie, their life histories, habitat associations, and utilization of wetlands was the work of Trautman (1957). However, this detailed survey was confined largely to Ohio waters and provided general rather than site-specific information. The value of the work is considerable, though, since its detailed habitat descriptions for each species allow extrapolation of the likely fish species composition of most wetlands, as has been done in Appendix A-3. Site-specific information was provided by Harrison (1978) regarding northern pike (Esox lucius) and muskellunge (Esox masquinongy) in the Upper Niagara River, by

Hunt and Mickelson (1976) regarding carp control in the Erie Shooting and Fishing Club marsh, and by Jaworski and Raphael (1978) regarding fishery values of the Sterling State Park marsh. The Winous Point Hunting Club of Ottawa County, Ohio, and the Erie Shooting and Fishing Club of Monroe County, Michigan, have conducted numerous wetland studies, most of them concerning waterfowl, and these organizations may be consulted for unpublished data. Similarly, the Ohio Department of Natural Resources in Sandusky, the Pennsylvania Fish Commission in Fairview, the New York State Department of Environmental Conservation in Olean, the Michigan Department of Natural Resources, the John Carroll University Biology Department in Cleveland, the Ohio State University Museum of Zoology in Columbus, and the Cleveland Museum of Natural History are the major repositories of unpublished fishery data which may be related to specific coastal wetlands. Ongoing projects which will eventually provide site-specific fishery data for coastal wetlands of Lake Erie are the Ohio Coastal Zone Management Program and an inventory and field sampling of nearshore fish habitats recently begun by the Ohio Department of Natural Resources, Division of Wildlife, at Sandusky.

Many species of fish utilize the coastal wetlands of Lake Erie, but comparatively few species are strongly dependent on aquatic vegetation for spawning, feeding, or cover. The more common wetland-dependent species found in the Lake Erie basin include longnose gar (Lepistosteus osseus), bowfin (Amia calva), central mudminnow (Umbra limi), grass pickerel (Esox americanus), goldenshiner (Notemigonus crysoleucas), and pumpkinseed (Lepomis gibbosus). Several other wetland-dependent species are either uncommon or rare in the Lake Erie basin. These are the spotted gar (Lepisosteus oculatus), northern pike, muskellunge, pugnose minnow (Notropis emiliae), pugnose shiner (Notropis amogenus), blackchin shiner (Notropis heterodon), blacknose shiner (Notropis heterolepis), tadpole madtom (Noturus gyrinus), banded killifish (Fundulus diaphanus), brook stickleback (Culaea inconstans), mosquitofish (Gambusia affinis), Iowa darter (Etheostoma exile), and mottled sculpin (Cottus bairdi). The brook stickleback and mottled sculpin are typically small stream inhabitants with a strong affinity for vegetation. Although these two species are uncommon in the coastal zone of Lake Erie, they are locally common in inland waters. The mosquitofish is an introduced species which has not as yet become common. The northern pike is sufficiently common in Lake Erie to support a minor recreational fishery, as does the more abundant pumpkinseed, but the extent of these fisheries has not been determined. The muskellunge is virtually extirpated from Lake Erie and supports a recreational fishery only in the Grand Island area of the Upper Niagara River (Harrison, 1978; Trautman, 1957; Van Meter and Trautman (1970). None of the above species is commercially harvested.

Several fish species found in the Lake Erie basin are common to abundant in wetlands and adjacent waters. The gizzard shad (Dorosoma cepedianum), carp (Cyprinus carpio), goldfish (Carassius auratus), 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, silt, or clay. These species are generally cover-oriented and are common in the larger coastal wetlands of Lake Erie, particularly the carp and bullheads, which are significant commercial species harvested by shore seiners (e.g., in Sandusky Bay). These species, in addition to the bluegill, largemouth bass, and crappies are also important game fishes.

Another group of species found in certain coastal wetlands of Lake Erie are those which are generally associated with lotic inland waters and clean sand or gravel bottoms. They are also associated with coastal wetlands having similar physical characteristics, especially deeper lacustrine wetlands. These species include the smallmouth bass (Micropterus dolomieui), mimic shiner (Notropis volucellus), sand shiner (Notropis stramineus), lake chubsucker (Erimyzon sucetta), spotted sucker (Minytrema melanops), rock bass (Ambloplites rupestris), green sunfish (Lepomis cyanellus), johnny darter (Etheostoma nigrum), and logperch (Percina caprodes). The smallmouth bass, rock bass, and green sunfish are significant game species.

Species of the open nearshore lake waters and river mouths often occur in the coastal wetlands. These species include the yellow perch (Perca flavescens), white bass (Morone chrysops), freshwater drum (Aplodinatus grunniens), bigmouth buffalo (Ictiobus cyprinellus), and channel catfish (Ictalurus punctatus). These are important commercial and game species, although only the yellow perch appears to have a strong affinity for aquatic vegetation. A critical spawning and cover relationship appears to exist between the yellow perch and the coastal wetlands of western Lake Erie, and this relationship warrants more intensive study.

Beyond a general knowledge of fish species composition and abundance, little is known about the actual relationships of the species to the wetlands in terms of their utilization for spawning, cover, and feeding, nor have sufficient data been accumulated regarding fish community structure, population dynamics, niche occupation, or interspecific relationships within the coastal wetlands of Lake Erie. These wetlands have been dramatically reduced in extent since the original settlement of Ohio in the 1800's. Drainage and filling of the extensive marshes of the western basin for agricultural, urban, industrial, and recreational development were among several factors, including extensive agricultural siltation and probable overexploitation by past commercial fishing activities, which have contributed to the decline of populations of such wetland-dependent species as northern pike, muskellunge, spotted gar, banded killifish, Iowa darter, blackchin shiner, blacknose shiner, pugnose minnow, pugnose shiner, and tadpole madtom. The contribution of the reduction in wetland acreage to increased thermal regimes, nutrient input, and siltation since the 1800's is still a topic of controversy, but wetland removal has certainly aggravated these problems. Other species, such as the valuable salmonid and percid game and commercial species, which were not directly dependent on vegetation itself, have suffered declines owing partly to the indirect environmental consequences of removal of vegetation in coastal areas (Trautman, 1957). Past and present abundances of fish species discussed in this volume are presented in Table 4.

At present, the large riverine coastal wetlands of Lake Erie are dominated by a warmwater, silt- and pollution-tolerant fish fauna composed primarily of carp, goldfish, bullheads, white sucker, yellow perch, and pumpkinseed. Several lacustrine wetlands, particularly along the Bass Islands shore, are

Table 4. Past and Present Abundance of Fish Species Associated with the Coastal Wetlands of Lake Erie[a]

Family and Common name	Abundance Pre-1900	Present
Lepisosteidae		
longnose gar	A	C
spotted gar	C	R
Amiidae		
bowfin	A	C
Clupeidae		
gizzard shad	U	A
Esocidae		
northern pike	A	U
muskellunge	A	R
grass pickerel	A	C
Umbridae		
central mudminnow	A	C
Catostomidae		
white sucker	A	A
lake chubsucker	A	R
spotted sucker	A	U
Cyprinidae		
carp	C	A
goldfish	C	A
goldenshiner	A	C
pugnose minnow	C	R
pugnose shiner	U	R
blackchin shiner	C	R
blacknose shiner	C	R
fathead minnow	C	C
bluntnose minnow	A	A
spottail shiner	A	A
emerald shiner	A	A
sand shiner	C	C
mimic shiner	C	C

-continued-

Table 4. (concluded)

Family and Common name	Abundance Pre-1900	Present
Ictaluridae		
yellow bullhead	C	C
brown bullhead	A	C
black bullhead	A	A
tadpole madtom	C	U
Cyprinodontida		
banded killifish	A	R
Poecillidae		
mosquitofish	*	U
Centrarchidae		
largemouth bass	A	C
smallmouth bass	A	C
rock bass	A	C
black crappie	A	C
white crappie	A	A
bluegill	A	C
pumpkinseed	A	C
green sunfish	A	C
Percidae		
yellow perch	A	C
logperch	A	C
johnny darter	A	A
Iowa darter	C	R
Gasterosteidae		
brook stickleback	A	C
Cottidae		
mottled sculpin	C	C

[a]Trautman (1957) and Van Meter and Trautman (1970)
*Absent, first introduced in 1947

evidently important feeding, cover, and nursery areas for smallmouth bass. These larger wetlands are clearly of great importance in terms of the biomass and diversity of economically important species, including forage fishes, which they support. However, several smaller lacustrine and palustrine wetland units, particularly those associated with sand spits and beach ridges, support scientifically interesting biological communities (i.e. Presque Isle and Mentor Marsh). Given the already stressed condition of most of the Lake Erie coastal wetlands, it is apparent that further degradation would be directly deleterious to large segments of existing fish communities, particularly in the western basin. However, little site-specific information exists upon which to base value judgments of any individual wetland in terms of its importance to fish production for recreation or commercial harvest or as a preserve for unique fish species or communities.

Reptiles and Amphibians

Site-specific information regarding amphibians and reptiles in Lake Erie coastal wetlands is scarce in the literature. Several general surveys provided distribution and habitat information and made fairly accurate extrapolations of species composition in most coastal wetlands possible. These included Conant's (1938, 1951) surveys of the reptiles of Ohio, Langlois' (1964) survey of reptiles and amphibians of the Bass Islands, Morse's (1904) survey of amphibians and reptiles of Ohio, McKinstry and Felege's (1973) survey of snakes of northwestern Pennsylvania, Walker's (1946) survey of frogs and toads of Ohio, and Thompson's (1916) survey of reptiles and amphibians of Monroe County, Michigan (1975). Site-specific studies included only McKinstry's study of the herpetology of Presque Isle State Park, Meeks' (1966) study of DDT cycling in reptiles and amphibians (among other taxa) in a section of Muddy Creek Bay Wetland in Sandusky Bay, hoop net collections in Toussaint River Wetland adjacent to the Davis-Besse Nuclear Power Station by the Center for Lake Erie Area Research (1975), Hunt's (1957, 1958) surveys of the Erie Shooting and Fishing Club marsh (Bay Creek Area Wetland), and McDonald's (1951) list of reptiles and amphibians found in Mouillee Marsh, Monroe County, Michigan. Except for McKinstry (1975), these surveys were not focused primarily on herpetology and provided only minimal information. Major sources of unpublished data which may pertain to reptiles and amphibians in specific coastal wetlands of Lake Erie include the New York State Museum, the Buffalo Society of Natural Science, the Cleveland Natural History Museum, the Ohio State University Museum of Zoology, and the University of Michigan Museums. State conservation and natural resource agencies have not generally collected herpetological data, although programs oriented toward non-game species management are being developed in the states bordering Lake Erie. Site-specific information pertaining to seasonal abundance and distribution, relative abundance, life histories, food sources, relationship to water levels, and recreational and commercial use of reptiles and amphibians in Lake Erie coastal wetlands was largely lacking.

At least 28 species of amphibians and 27 species of reptiles occur in U.S. Lake Erie drainage areas (Conant, 1951, 1975). Several of the reptiles are primarily terrestrial, although they may be found crossing wetlands or inhabiting meadows, brush, or forest areas bordering coastal wetlands. These include the eastern box turtle (*Terrapene carolina carolina*), wood turtle

(Clemmys insculpta), five-lined skink (Eumeces fasciatus), eastern smooth green snake (Opheodrys vernalis vernalis), blue racer (Coluber constrictor foxi), northern black racer (Coluber constrictor constrictor), eastern hognose snake (Heterodon platyrhinos), northern ringneck snake (Diadophis punctatus edwardsi), and black rat snake (Elaphe obsoleta obsoleta). Since all amphibians are dependent on water (or heavy moisture) for breeding, most of those species found in the Lake Erie drainage may occur at least seasonally in coastal wetlands.

The mudpuppy (Necturus maculosus) and the red-spotted newt (Notophthalmus viridescens viridescens) are generally associated with submersed aquatic vegetation, and the four-toed salamander (Hemidactylium scutatum) is often associated with sphagnum in bog habitats. These three species will usually be associated with wetlands. Most other perennially aquatic frogs and salamanders in the Lake Erie coastal region occur in a variety of aquatic habitats, including wetlands, where the abundance of cover may result in large populations. These species include the bullfrog (Rana catesbeiana), green frog (Rana clamitans melanota), northern leopard frog (Rana pipiens), and pickerel frog (Rana palustris). Semiaquatic species such as the small-mouthed salamander (Ambystoma texanum), Tremblay's salamander (Ambystoma tremblayi), blue-spotted salamander (Ambystoma laterale), silvery salamander (Ambystoma platineum), spotted salamander (Ambystoma maculatum), and eastern tiger salamander (Ambystoma tigrinum tigrinum), as well as semi-aquatic climbing species like the gray treefrog (Hyla versicolor), western chorus frog (Pseudacris triseriata triseriata), Blanchard's cricket frog (Acris crepitans blanchardi), and northern spring peeper (Hyla crucifer crucifer), may occur in Lake Erie coastal wetlands or their margins. Primarily terrestrial amphibians such as the wood frog (Rana sylvatica), Fowler's toad (Bufo woodhousei fowleri), American toad (Bufo americanus), red-backed salamander (Plethodon cinereus cinereus), marbled salamander (Ambystoma opacum), and slimy salamander (Plethodon glutinosus glutinosus) may occur in coastal wetlands during their respective breeding seasons. Several other salamanders found in the Lake Erie drainage are primarily restricted to upland woods or brooks and are less likely to be found in coastal wetlands.

Most of the aquatic and semi-aquatic reptiles in the Lake Erie coastal region may be found in coastal wetlands. These include the map turtle (Graptemys geographica), midland painted turtle (Chrysemys picta marginata), snapping turtle (Chelydra serpentina), spotted turtle (Clemmys guttata), stinkpot (Sternotherus odoratus), Blanding's turtle (Emydoidea blandingi), eastern spiny softshell (Trionyx spiniferus spiniferus), eastern garter snake (Thamnophis sirtalis sirtalis), northern and midland brown snakes (Storeria dekayi dekayi and S. d. wrightorum), northern ribbon snake (Thamnophis sauritus septentrionalis), queen snake (Natrix septemvittata), northern and Lake Erie water snakes (Natrix sipedon sipedon and N. s. insularum), Kirtland's water snake (Natrix kirtlandi), eastern milk snake (Lampropeltis triangulum triangulum), and Butler's garter snake (Thamnophis butleri). The eastern massasauga (Sistrurus catenatus catenatus) is largely a swamp and bog inhabitant which may occur uncommonly in coastal wetlands, and the eastern fox snake (Elaphe vulpina gloydi) is almost wholly restricted to and common in the coastal marshes of western Lake Erie.

The relative abundance of the various species of reptiles and amphibians in Lake Erie coastal wetlands is difficult to assess fully owing to a lack of site-specific information. On a state-wide or lakewide basis, the relative abundance of species and changes in abundance through time are easier to estimate, but recent published data of this nature are scarce. Throughout the individual wetland narratives of this volume, species known or thought to be present in Lake Erie coastal wetlands have been listed, with no remarks pertaining to their relative abundance; this omission was due to a lack of information. Table 5 lists reptiles and amphibians which occur in the Lake Erie drainage and provides estimates of their relative abundance in the past and at present, where possible. These estimates are based on regional, not wetland-specific data, but they provide a necessary perspective on general abundance and population trends of the species which may actually occur in the coastal wetlands. The importance of Lake Erie coastal wetlands to reptiles and amphibians is not fully understood. Although the wetlands may not be essential habitat for most species in the coastal region, their existence is probably vital to the continued abundance of most species. The presence of water, food, and cover, as well as relative isolation from the cultural development which impinges on most dry coastal areas, are among the factors which contribute to the importance of wetlands in maintaining a diverse and abundant herpetofauna. The snapping turtle, eastern spiny softshell, bullfrog, and green frog are edible species which are harvested to an unknown extent in coastal wetlands, and many reptiles and amphibians probably serve as food sources for fish, birds, and mammals utilizing the wetlands.

Avifauna

The avifauna of the coastal zone of Lake Erie is well documented in the literature. Available information concerning bird life was concentrated on the waterfowl in the southwestern part of the lake; however, records of the occurrence and distribution of several nongame and endangered birds were available also. Information pertaining to seasonal abundance, productivity, recreational use, relationship to water levels, and major food sources of the waterfowl along Lake Erie was found in Bailey (1968), Bandy (1965), Farney (1975), Hesselbart (1969), Koerner (1971), Schiller (1969), and Urban (1970). The red-winged blackbird (*Agelaius phoeniceus*), great blue heron (*Ardea herodias*), Forster's tern (*Sterna forsteri*), and bald eagle (*Haliaeetus leucocephalus*) were studied by Bernstein (1977), Edford (1976), Campbell and Trautman (1936), and VanCamp (1974).

In general, wetland habitat along lake Erie supports a diversity of bird life. Resident and migratory species of waterfowl, waterbirds, wading birds, shore birds, gulls and terns, raptors and perching birds use the region for nesting, feeding, and resting. The birds recorded for Lake Erie wetlands appear in Tables 6 and 7. Noteworthy migratory species which utilize the shoreline environment include the bald eagle, osprey (*Pandion haliaetus*), and Kirtland's warbler (*Dendroica kirtlandii*) (Walton and Kasselmann, 1977). Waterfowl commonly observed in the wetlands of southwestern Lake Erie are mallards (*Anas platyrhynchos*), wood ducks (*Aix sponsa*), black ducks (*A. rubripes*), pintails (*A. acuta*), blue-winged teal (*A. discors*), and American wigeon (*A. americana*).

Table 5. Past and Present Relative Abundance of Reptiles and Amphibians in the Coastal Region of Lake Erie[a]

Common name	Relative Abundance[b]					
	1904[c]	1916[d]	1946[e]	1951[f]	1964[g]	1979[h]
<u>Primarily Wetland Species</u>						
red-spotted newt	C				U	C
mud puppy	C	C			A	C
four-toed salamander	R					R
eastern fox snake	C	R		A	A	C
eastern massasauga	U			U		R
<u>Aquatic and Semi-Aquatic Species of General Distribution</u>						
bullfrog	C		C		U	C
green frog	A	U	C			C
northern leopard frog	A	C	A		C	C
pickerel frog	C		R			R
gray treefrog	C		U			C
northern spring peeper	C		U		C	C
western chorus frog	C	U	C		U	C
Blanchard's cricket frog	C	C	C		C	C
small-mouthed salamander	C				R	U
Tremblay's salamander	U				R	U
blue-spotted salamander						R
silvery salamander	U					R
spotted salamander	C				U	U
eastern tiger salamander	C				U	U
map turtle	C	C		C	C	C
midland painted turtle	A	C		A	C	A
snapping turtle	C	C		C	C	C
spotted turtle	U			U		U
stinkpot	C			C		C
Blanding's turtle	C			C	U	C
eastern spiny softshell	C	U		C		C
eastern garter snake	C	C		A	C	C
Butler's garter snake				C		C
brown snake (northern and midland)	U	R		C	C	C
northern red-bellied snake	C			C		C
northern ribbon snake	C			C		C
queen snake				A		C
northern water snake	A			A	C	A
Lake Erie water snake				A	A	A
Kirtland's water snake	C			C		C
eastern milk snake	C			C	U	C

-continued-

Table 5. (concluded)

Common name	Relative Abundance[b]					
	1904[c]	1916[d]	1946[e]	1951[f]	1964[g]	1979[h]
<u>Terrestrial and Upland Brook Species</u>						
marbled salamander	U					U
mountain dusky salamander						R
northern dusky salamander	C					C
northern spring salamander						R
northern red salamander	C					R
slimy salamander	C					C
red-backed salamander	A					C
northern two-lined salamander	C					C
wood frog	C		U			U
Fowler's toad			C		U	C
American toad	C	C	C		U	C
eastern box turtle	U			C		C
wood turtle				R		R
five-lined skink	C	C		C		C
eastern smooth green snake	C			U		U
blue racer	C			C	C	C
northern black racer	C			C	C	C
eastern hognose snake	C			C	U	C
northern ringneck snake	R			C	C	C
black rat snake	C			C	U	C

[a] presence in coastal region based on range maps of Conant (1975)
[b] A=abundant, C=common, U=uncommon, R=rare
[c] Morse (1904), Ohio in general
[d] Thompson (1916), Monroe County, Michigan, only
[e] Walker (1946), Ohio in general
[f] Conant (1951), Ohio in general
[g] Langlois (1964), Lake Erie Islands only
[h] Probable status, Lake Erie coastal region in general, but no documentation

Table 6. Birds Recorded for Lake Erie

Common name	Common name
Waterfowl	**Wading Birds (continued)**
mute swan	little blue heron
whistling swan	green heron
Canada goose	black-crowned night heron
snow (blue) goose	yellow-crowned night heron
mallard	American bittern
black duck	least bittern
gadwall	
pintail	**Shorebirds**
green-winged teal	piping plover
blue-winged teal	semipalmated plover
American wigeon	killdeer
northern shoveler	American golden plover
wood duck	black-bellied plover
redhead	ruddy turnstone
ring-necked duck	American woodcock
canvasback	common snipe
greater scaup	whimberal
lesser scaup	upland plover
common goldeneye	spotted sandpiper
bufflehead	solitary sandpiper
oldsquaw	willet
white-winged scoter	greater yellowlegs
surf scoter	lesser yellowlegs
common scoter	red knot
ruddy duck	pectoral sandpiper
hooded merganser	white-rumped sandpiper
common merganser	least sandpiper
red-breasted merganser	dunlin
	short-billed dowitcher
Waterbirds	long-billed dowitcher
common loon	semipalmated sandpiper
horned grebe	sanderling
pied-billed grebe	red phalarope
king rail	Wilson's phalarope
Virginia rail	
black rail	**Gulls and Terns**
sora	great black-backed gull
common gallinule	herring gull
purple gallinule	ring-billed gull
American coot	laughing gull
	Bonaparte's gull
Wading Birds	Forster's tern
great blue heron	common tern
great egret	Caspian tern
snowy egret	black tern

-continued-

Table 6. (concluded)

Common name
Raptors
bald eagle
osprey
Cooper's hawk
sharp-shinned hawk
red-tailed hawk
red-shouldered hawk
broad-winged hawk
marsh hawk
American kestrel
barred owl
short-eared owl
Perching Birds
eastern kingbird
long-billed marsh wren
short-billed marsh wren
brown thrasher
wood thrush
hermit thrush
Swainson's thrush
gray-checked thrush
veery
prothonotary warbler
northern waterthrush
Louisiana waterthrush
Perching Birds (continued)
bobolink
eastern meadowlark
yellow-headed blackbird
red-winged blackbird
orchard oriole
northern oriole
rusty blackbird
common grackle
brown-headed cowbird
savannah sparrow
sharp-tailed sparrow
vesper sparrow
chipping sparrow
field sparrow
swamp sparrow
song sparrow
Other Birds
black-billed cuckoo
common nighthawk
ruby-throated hummingbird
belted kingfisher
common flicker

Table 7. Bird Species Occurring in the Marshes and Within One-half Mile of the Shoreline of Lake Erie, Especially in Ohio and Particularly Ottawa County Compiled by Milton B. Trautman[a]

Species[b]	Specimen in Museum	Abundance after 1950	Abundance before 1950	Farm	Marsh	Shore	Trees	Water	Migrant	Nests
Common Loon	x	uncommon	common		x	x		x	x	
Red-throated Loon	x	rare	rare					x	x	
Red-necked Grebe	x	rare	rare		x	x		x	x	
Horned Grebe	x	usually common	usually common to abundant		x	x		x	x	
Eared Grebe	x	rare	rare		x			x	x	
Pied-billed Grebe	x	common	abundant		x			x	x	nests
White Pelican	x	very rare	very rare		x			x	x	
Gannet	x	very rare	very rare		x			x	x	
Double-crested Cormorant	x	rare	common		x	x		x	x	formerly
Great Blue Heron	x	common	very common to abundant	x	x	x	x	x	x	nests
Green Heron	x	uncommon	very common to abundant	x	x	x	x	x	x	nests
Little Blue Heron		rare	rare		x	x		x	x	
Cattle Egret	x	uncommon	absent	x	x	x	x		x	nests
Great Egret	x	common	rare	x	x	x	x	x	x	nests
Snowy Egret		rare	more often recorded early		x	x	x	x	x	
Louisiana Heron		very rare	absent?		x	x	x	x	x	?
Black-crowned Night Heron	x	common	abundant	x	x	x	x	x	x	nests
Yellow-crowned Night Heron	x	rare	absent?	x	x	x	x	x	x	?
Least Bittern	x	very rare	common to abundant	x	x	x		x	x	nests
American Bittern	x	very rare	common to abundant	x	x	x	x	x	x	nests
Wood Stork		very rare or accidental	very rare or accidental		x		x	x	x	
Wood Ibis		accidental			x					escape
Glossy Ibis	x	very rare	very rare		x	x		x	x	
American Flamingo		accidental	accidental		x			x		escape
Mute Swan		uncommon	absent		x	x		x	x	
Whistling Swan	x	common	very common	x	x	x		x	x	
Black Swan		accidental			x			x	x	escape
Snow Goose	x	rare to common	rare to common	x	x	x		x	x	
Grey-lag Goose	x	accidental		x	x			x		escape
White-fronted Goose		rare			x			x	x	
Lesser White-fronted Goose	x	accidental			x					escape
Canada Goose	x	common	uncommon	x	x	x		x	x	nests
Brant	x	rare	rare		x			x	x	
Barnacle Goose		accidental		x	x			x		escape
Bar-headed Goose		accidental		x	x			x		escape
Egyptian Goose		accidental		x	x			x		escape
Fulvous Whistling Duck	x	accidental			x			x	x	escape
Sheld-Duck		accidental			x			x		escape
Ruddy Sheld-Duck		accidental			x			x		escape
Mallard	x	common	abundant	x	x	x		x	x	nests
Black Duck	x	common	abundant after 1920	x	x	x		x	x	nests
Gadwall	x	uncommon	common	x	x	x		x	x	
Pintail	x	common	abundant	x	x	x		x	x	nests?
Green-winged Teal	x	common	very common to abundant	x	x	x		x	x	
Blue-winged Teal	x	common	abundant	x	x	x		x	x	nests
European Widgeon		accidental			x			x	x	escape?

-continued-

Table 7 -continued-

Species[b]	Specimen in Museum	Abundance after 1950	Abundance before 1950	Farm	Marsh	Shore	Trees	Water	Migrant	Nests
American Widgeon	x	common	abundant	x	x	x		x	x	
Northern Shoveler	x	uncommon	common	x	x	x		x	x	nests rarely
Wood Duck	x	uncommon	originally abundant	x	x	x	x	x	x	nests
Redhead	x	uncommon	very common to abundant	x	x	x		x	x	
Ring-necked Duck	x	uncommon	very common to abundant	x	x	x		x	x	
Canvasback	x	rare to uncommon	very common to abundant		x			x	x	
Greater Scaup	x	very uncommon			x			x	x	
Lesser Scaup	x	uncommon	very common to abundant	x	x			x	x	
Common Goldeneye	x	common	very common to abundant	x	x	x	x	x	x	nests rarely
Bufflehead	x	common	very common	x	x	x		x	x	
Oldsquaw	x	rare	rare		x			x	x	
Harlequin Duck	x	accidental			x			x	x	
King Eider	x	accidental	rare		x			x	x	
White-winged Scoter	x	rare			x			x	x	
Surf Scoter	x	rare	rare		x			x	x	
Black Scoter	x	rare	rare		x			x	x	
Ruddy Duck	x	uncommon	uncommon to abundant		x	x		x	x	
Hooded Merganser	x	uncommon	common	x	x		x	x	x	nests rarely
Common Merganser	x	uncommon	common to abundant		x	x		x	x	
Red-breasted Merganser	x	common to abundant	common to abundant		x			x	x	
Turkey Vulture		uncommon	uncommon	x	x	x	x		x	nests rarely
Goshawk	x	accidental	accidental	x	x		x		x	
Sharp-shinned Hawk	x	uncommon	common to abundant	x	x	x	x		x	
Cooper's Hawk	x	uncommon	common to very common	x	x		x		x	nests rarely
Red-tailed Hawk	x	common	common to very common	x	x	x	x		x	nests
Red-shouldered Hawk	x	rare to endangered	uncommon to abundant	x	x		x		x	nested formerly
Broad-winged Hawk	x	uncommon usually	uncommon to abundant	x	x	x	x		x	
Rough-legged Hawk	x	uncommon	uncommon	x	x	x	x		x	
Golden Eagle		accidental	accidental	x			x		x	
Bald Eagle		endangered	common	x	x	x	x		x	nests
Marsh Hawk	x	uncommon	common to very common	x	x	x		x	x	nested formerly
Osprey		rare	uncommon	x	x	x	x	x	x	
Gyrfalcon		accidental		x		x			x	
Peregrine Falcon	x	endangered	uncommon to common	x	x	x	x		x	
Merlin	x	endangered	uncommon to common	x	x	x	x		x	
American Kestrel	x	uncommon	common	x	x		x		x	nests
Ruffed Grouse			last seen in 1908	x						nested
Greater Prairie Chicken	x	extirpated	common to abundant	x	x		x		x	nested
Bobwhite	x	extirpated	rare	x	x					nested
Ring-necked Pheasant	x	uncommon	common to abundant	x	x	x	x			nested
Chukar		introduced		x						
Gray Partridge		extirpated	uncommon	x	x					nested
Turkey		extirpated	common to abundant	x	x		x			nested
Sandhill Crane		rare	uncommon	x	x				x	nested
King Rail	x	accidental	common	x	x				x	nested
Virginia	x	very rare	common	x	x				x	nested
Sora	x	common	common to abundant	x	x	x			x	nests
Yellow Rail	x	rare	rare	x	x				x	
Black Rail		accidental			x					

-continued-

Table 7 -continued-

Species[b]	Specimen in Museum	Abundance after 1950	Abundance before 1950	Farm	Marsh	Shore	Trees	Water	Migrant	Nests
Purple Gallinule	x	accidental	accidental		x				x	
Common Gallinule	x	uncommon	very common	x	x			x	x	nests
American Coot	x	common	abundant		x	x		x	x	nests rarely
Semipalmated Plover	x	common	common	x	x	x			x	
Piping Plover	x	endangered	uncommon			x			x	nested
Wilson's Plover	x	accidental				x			x	
Killdeer	x	common	very common to abundant	x	x	x			x	nests
American Golden Plover	x	rare to uncommon	rare to uncommon	x	x	x			x	
Black-bellied Plover	x	uncommon	uncommon		x	x			x	
Ruddy Turnstone	x	uncommon	uncommon	x	x	x			x	
American Woodcock	x	uncommon	common	x	x				x	nests
Common Snipe	x	common	common to abundant	x	x	x			x	
Whimbrel	x	rare	rare to uncommon	x	x	x			x	
Eskimo Curlew	x	extinct?	rare	x	x				x	
Upland Sandpiper	x	endangered	common to abundant	x	x				x	nests
Spotted Sandpiper	x	common	very common	x	x	x		x	x	nests
Solitary Sandpiper	x	uncommon	uncommon	x	x	x			x	
Willet	x	rare	rare		x	x			x	
Greater Yellowlegs	x	common	common	x	x	x			x	
Lesser Yellowlegs	x	common	common	x	x	x			x	
Knot	x	rare	rare to uncommon	x	x	x			x	
Purple Sandpiper	x	very rare	very rare			x			x	
Pectoral Sandpiper	x	common	very common to abundant	x	x	x			x	
White-rumped Sandpiper	x	rare	rare	x	x	x			x	
Baird's Sandpiper	x	rare	rare	x	x	x			x	
Least Sandpiper	x	uncommon to very common	common to very common	x	x	x			x	
Dunlin	x	common	common to abundant	x	x	x			x	
Short-billed Dowitcher	x	uncommon to abundant	uncommon to abundant	x	x	x			x	
Long-billed Dowitcher	x	rare	rare	x	x	x			x	
Stilt Sandpiper	x	rare to uncommon	rare	x	x	x			x	
Semipalmated Sandpiper	x	uncommon to abundant	uncommon to abundant	x	x	x			x	
Western Sandpiper	x	rare	rare	x	x	x			x	
Buff-breasted Sandpiper	x	rare	rare	x	x	x			x	
Marbled Godwit	x	very rare	very rare	x	x	x			x	
Hudsonian Godwit	x	very rare	very rare	x	x	x			x	
Ruff	x	accidental	accidental	x	x	x			x	
Sanderling	x	rare to uncommon	rare to common	x	x	x		x	x	
American Avocet	x	very rare	very rare	x	x	x			x	
Red Phalarope	x	accidental to very rare	accidental		x	x		x	x	
Wilson's Phalarope	x	rare to uncommon	rare		x	x		x	x	
Northern Phalarope	x	rare	rare		x	x		x	x	
Pomarine Jaeger	x	accidental				x		x	x	
Parasitic Jaeger	x	very rare	very rare			x		x	x	
Glaucous Gull	x	rare	rare			x		x	x	
Iceland Gull		accidental	accidental			x		x	x	
Great Black-backed Gull	x	rare to uncommon	rare			x		x	x	
Herring Gull	x	common to abundant	common to very common	x	x	x		x	x	nests
Thayer's Gull	x	very rare	?			x		x	x	
Ring-billed Gull	x	common to very common	rare to common	x	x	x		x	x	nests

-continued-

Table 7 -continued-

Species[b]	Specimen in Museum	Abundance after 1950	Abundance before 1950	Farm	Marsh	Shore	Trees	Water	Migrant	Nests
Laughing Gull	x	accidental	accidental	x	x	x		x	x	
Franklin's Gull	x	very rare to uncommon	very rare to uncommon	x	x	x		x	x	
Bonaparte's Gull	x	common to abundant	common to abundant	x	x	x		x	x	
Little Gull	x	accidental			x	x		x	x	
Black-legged Kittiwake		accidental			x	x		x	x	
Sabine's Gull		accidental			x	x		x	x	
Forster's Tern	x	very rare to uncommon	very rare to uncommon		x	x		x	x	
Common Tern	x	endangered	common to abundant	x	x	x		x	x	nests
Least Tern	x	endangered	rare to uncommon	x	x	x		x	x	
Caspian Tern	x	rare to uncommon	uncommon to common	x	x	x		x	x	
Black Tern	x	rare to uncommon	common to abundant	x	x	x		x	x	nests
Thick-billed Murre	x	accidental	accidental			x		x	x	
Ancient Murrelet	x	accidental						x		
Rock Dove	x	common	common	x	x	x	x		x	nests
Mourning Dove	x	common	common	x	x	x	x		x	nests
Passenger Pigeon		extinct	abundant to extinct	x			x		x	nested
Yellow-billed Cuckoo	x	common	common to very common	x	x	x	x		x	nests
Black-billed Cuckoo	x	uncommon	uncommon	x	x		x		x	nests
Groove-billed Ani	x	accidental				x				
Barn Owl	x	rare	rare to uncommon	x			x			nests
Screech Owl	x	common	common	x	x		x			nests
Great Horned Owl	x	uncommon	uncommon	x	x		x		x	nests
Snowy Owl		very rare to uncommon	very rare to uncommon	x	x	x	x		x	
Hawk Owl	x	accidental			x	x	x			
Barred Owl		rare	rare to uncommon	x	x		x		x	nests
Great Gray Owl		accidental				x	x		x	
Long-eared Owl	x	rare to uncommon	rare to uncommon	x			x		x	nests
Short-eared Owl	x	rare to common	rare to common	x	x		x		x	formerly?
Saw-whet Owl	x	rare	rare	x	x		x		x	rarely nests
Whip-poor-will	x	uncommon	uncommon	x	x		x		x	nests
Common Nighthawk	x	uncommon to common	common to very common	x	x		x		x	nests
Chimney Swift	x	common	common	x	x		x		x	nests
Ruby-throated Hummingbird	x	uncommon	uncommon	x	x	x	x		x	nests
Belted Kingfisher	x	uncommon	uncommon to common	x	x	x	x	x	x	nests
Common Flicker	x	uncommon to common	common to abundant	x	x	x	x		x	nests
Pileated Woodpecker	x	accidental to rare	rare to absent	x			x			
Red-bellied Woodpecker	x	rare to uncommon	rare	x	x		x		x	nests
Red-headed Woodpecker	x	rare to uncommon	common to abundant	x			x		x	nests
Yellow-bellied Sapsucker	x	rare to uncommon	rare to uncommon	x			x		x	rarely nests
Hairy Woodpecker	x	rare to uncommon	rare to uncommon	x			x		x	nests
Downy Woodpecker	x	uncommon to common	common to abundant	x	x		x		x	nests
Black-backed Tree-toed Woodpecker		accidental	accidental				x		x	
Eastern Kingbird	x	uncommon to common	common to abundant	x	x	x	x		x	nests
Western Kingbird	x	accidental	accidental				x		x	nests
Great Crested Flycatcher	x	uncommon	uncommon to common	x	x	x	x		x	nests
Eastern Phoebe	x	uncommon	uncommon to common	x	x	x	x		x	nests
Yellow-bellied Flycatcher	x	rare to uncommon	rare to common	x	x	x	x		x	
Acadian Flycatcher	x	rare to uncommon	rare to uncommon	x	x	x	x		x	nests

-continued-

Table 7 -continued-

Species[b]	Specimen in Museum	Abundance after 1950	Abundance before 1950	Farm	Marsh	Shore	Trees	Water	Migrant	Nests
Willow Flycatcher	x	uncommon	common to abundant	x	x	x	x		x	nests
Least Flycatcher	x	common	common to abundant	x	x	x	x		x	nests
Eastern Wood Pewee	x	uncommon	common	x	x	x	x		x	nests
Olive-sided Flycatcher	x	rare	rare	x	x	x	x		x	
Horned Lark	x	uncommon to common	uncommon to abundant	x	x	x			x	nests
Tree Swallow	x	common to abundant	common to abundant	x	x	x	x	x	x	nests
Bank Swallow	x	common to abundant	common to abundant	x	x	x	x		x	nests
Rough-winged Swallow	x	common	common to abundant	x	x	x	x		x	nests
Barn Swallow	x	common to abundant	common to abundant	x	x	x	x		x	nests
Cliff Swallow	x	rare to uncommon	uncommon to common	x	x	x	x		x	nests
Purple Martin	x	uncommon to common	very common to abundant	x	x	x	x		x	nests
Blue Jay	x	common to abundant	common to abundant	x	x	x	x		x	nests
Black-billed Magpie	x	very rare	very rare		x		x	x		
Common Raven		accidental	accidental to rare			x	x	x	x	
Common Crow	x	common	common to abundant	x	x	x	x		x	nests
Black-capped Chickadee	x	uncommon to rare	uncommon to common	x	x	x	x		x	nests
Boreal Chickadee	x	very rare	very rare	x	x	x	x		x	
Tufted Titmouse	x	very uncommon to common	common	x	x		x		x	nests
White-breasted Nuthatch	x	very uncommon to common	common	x	x		x		x	nests
Red-breasted Nuthatch	x	uncommon	uncommon	x		x	x		x	
Brown Creeper	x	common	common	x	x	x	x		x	nests?
House Wren	x	common	common	x	x	x	x		x	nests
Winter Wren	x	uncommon	uncommon	x			x		x	
Bewick's Wren		extirpated	very rare	x			x		x	nested
Carolina Wren	x	rare to uncommon	absent, rare to uncommon	x	x	x	x		x	nests
Long-billed Marsh Wren	x	rare to uncommon	common to abundant		x				x	nests
Short-billed Marsh Wren	x	absent to rare	rare to uncommon		x	x			x	nests
Mockingbird	x	absent to rare	rare to uncommon	x	x	x	x		x	nests
Catbird	x	uncommon to common	common	x	x	x	x		x	nests
Brown Thrasher	x	uncommon to common	common	x	x	x	x		x	nests
Robin	x	common to abundant	common to abundant	x	x	x	x		x	nests
Wood Thrush	x	uncommon	uncommon to common	x	x		x		x	nests
Hermit Thrush	x	uncommon to common	uncommon to common	x	x		x		x	?
Swainson's Thrush	x	common to abundant	common to abundant	x	x	x	x		x	
Gray-cheeked Thrush	x	uncommon	uncommon	x	x		x		x	
Veery	x	rare to uncommon	uncommon to common	x	x		x		x	nests?
Eastern Bluebird	x	very rare to uncommon	uncommon to common	x	x	x	x		x	nests
Townsend's Solitaire	x	accidental	accidental		x	x	x			
Blue-gray Gnatcatcher	x	uncommon	uncommon	x	x		x		x	nests
Golden-crowned Kinglet	x	rare to uncommon	uncommon to common	x	x		x		x	
Ruby-crowned Kinglet	x	uncommon	uncommon	x	x		x		x	
Water Pipit	x	uncommon to common	uncommon to common	x	x	x			x	
Bohemian Waxwing		accidental	accidental				x		x	
Cedar Waxwing	x	uncommon to common	common to abundant	x	x		x		x	nests
Northern Shrike	x	absent to rare	absent to rare	x	x	x	x		x	
Loggerhead Shrike	x	accidental or very rare	uncommon to common	x	x	x	x		x	nests
Starling	x	abundant	absent to abundant	x	x	x	x		x	nests
White-eyed Vireo	x	absent to rare	absent to rare	x	x		x		x	nests
Yellow-throated Vireo	x	rare to uncommon	rare to uncommon	x	x		x		x	nests

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Table 7 -continued-

Species[b]	Specimen In Museum	Abundance after 1950	Abundance before 1950	Farm	Marsh	Shore	Trees	Water	Migrant	Nests
Solitary Vireo	x	uncommon	uncommon	x	x		x		x	
Red-eyed Vireo	x	common	common to very common	x	x	x	x		x	nests
Philadelphia Vireo	x	rare to uncommon	uncommon to common	x	x		x		x	
Warbling Vireo	x	uncommon	common to abundant	x	x	x	x		x	nests
Black and White Warbler	x	uncommon to common	uncommon to common	x	x	x	x		x	nested formerly
Prothonotary Warbler	x	rare	rare		x	x	x	x	x	nests
Worm-eating Warbler	x	rare	rare		x		x		x	
Golden-winged Warbler	x	rare	uncommon		x		x		x	nests
Blue-winged Warbler	x	rare	rare to uncommon				x		x	nests
Tennessee Warbler	x	common	common		x	x	x	x	x	
Orange-crowned Warbler	x	rare to uncommon	rare to uncommon		x	x		x	x	
Nashville Warbler	x	common	common		x	x	x	x	x	
Parula Warbler	x	rare	rare	x			x		x	
Yellow Warbler	x	common to uncommon	abundant to common		x	x	x	x	x	nests
Magnolia Warbler	x	common	common	x	x	x	x		x	
Cape May Warbler	x	common	common	x	x		x		x	
Black-throated Blue Warbler	x	rare to uncommon	rare to uncommon	x	x		x		x	
Yellow-rumped Warbler	x	common to abundant	common to abundant	x	x	x	x		x	
Black-throated Green Warbler	x	uncommon to very common	uncommon to very common	x	x	x	x		x	
Cerulean Warbler	x	usually rare	rare to uncommon		x		x		x	nests
Blackburnian Warbler	x	common	common	x	x	x	x		x	
Yellow-throated Warbler	x	absent to rare	uncommon to absent	x			x		x	
Chestnut-sided Warbler	x	common	common	x	x		x		x	
Bay-breasted Warbler	x	common	common	x	x		x		x	
Blackpoll Warbler	x	uncommon to common	uncommon to common	x	x		x		x	
Pine Warbler	x	rare	rare				x		x	
Kirtland's Warbler	x	endangered	rare to accidental	x			x		x	
Prairie Warbler	x	rare	rare	x			x		x	
Palm Warbler	x	uncommon to common	common to abundant	x	x	x	x		x	
Ovenbird	x	common	common		x		x		x	nests
Northern Waterthrush	x	uncommon to common	uncommon to common		x		x		x	
Louisiana Waterthrush		accidental to rare	accidental to rare		x		x		x	nests
Kentucky Warbler	x	rare	rare	x	x		x		x	nests?
Connecticut Warbler	x	rare to uncommon	rare to uncommon		x		x		x	
Mourning Warbler	x	rare to uncommon	rare to uncommon		x		x		x	nests?
Yellowthroat	x	uncommon to common	common to abundant	x	x	x	x		x	nests
Yellow-breasted Chat	x	uncommon to rare	uncommon	x	x		x		x	nests
Hooded Warbler	x	rare to uncommon	rare to uncommon		x		x		x	nests
Wilson's Warbler	x	uncommon to common	uncommon to common		x		x		x	
Canada Warbler	x	uncommon to common	uncommon to common		x		x		x	
American Redstart	x	common to uncommon	very common to common	x	x		x		x	nests
House Sparrow	x	common	rare to common	x	x	x	x		x	nests
Bobolink	x	common to rare	abundant to common	x	x	x			x	nests
Eastern Meadowlark	x	common to rare	very common to common	x	x		x		x	nests
Western Meadowlark	x	rare to absent	absent to rare	x	x		x		x	?
Yellow-headed Blackbird	x	absent to very rare	absent to very rare	x	x	x	x		x	nests?
Red-winged Blackbird	x	abundant	abundant	x	x	x	x		x	nests
Orchard Oriole	x	uncommon to rare	very common to uncommon	x	x		x		x	nests
Northern Oriole	x	common to uncommon	very common to common	x	x	x	x		x	nests
Rusty Blackbird	x	uncommon to common	uncommon to common	x	x	x	x		x	
Brewer's Blackbird	x	rare	rare	x			x		x	

-continued-

Table 7 -concluded-

Species[b]	Specimen in Museum	Abundance after 1950	Abundance before 1950	Farm	Marsh	Shore	Trees	Water	Migrant	Nests
Common Grackle	x	abundant	abundant	x	x	x	x	x	x	nests
Brown-headed Cowbird	x	common	common	x	x		x		x	nests
Scarlet Tanager	x	uncommon to common	uncommon to common				x		x	nests?
Summer Tanager	x	rare	rare		x		x		x	nests?
Cardinal	x	common	common	x	x	x	x		x	nests
Rose-breasted Grosbeak	x	uncommon to common	uncommon to common	x	x	x	x		x	nests
Indigo Bunting	x	very common	very common	x	x	x	x		x	nests
Dickcissel	x	absent to rare	absent to rare	x	x		x		x	nests
Evening Grosbeak	x	absent to common	absent to uncommon	x	x		x		x	
Purple Finch	x	rare to common	rare to common	x	x	x	x		x	nests
House Finch		accidental, increasing	absent	x			x		x	?
Pine Grosbeak	x	accidental to rare	accidental to rare	x	x		x		x	
Common Redpoll	x	absent to common	absent to common	x	x	x	x		x	
Pine Siskin	x	rare to uncommon	rare to uncommon	x	x		x		x	?
American Goldfinch	x	abundant to common	abundant	x	x	x	x		x	nests
Red Crossbill	x	absent to rare	absent to rare	x			x		x	
White-winged Crossbill	x	absent to rare	absent to rare				x		x	
Rufous-sided Towhee	x	uncommon to common	uncommon to common	x	x	x	x		x	nests
Savannah Sparrow	x	common to uncommon	common	x	x	x			x	nests
Grasshopper Sparrow	x	uncommon to rare	common to uncommon	x	x				x	nests
Baird's Sparrow		accidental								
Le Conte's Sparrow	x	absent to rare	absent to uncommon		x				x	
Henslow's Sparrow	x	uncommon to rare	common to uncommon	x	x				x	nests
Sharp-tailed Sparrow	x	absent to uncommon	absent to rare	x	x				x	
Vesper Sparrow	x	common to uncommon	abundant to common	x			x		x	nests
Lark Sparrow		accidental	rare to accidental	x					x	nests
Bachman's Sparrow		accidental or extirpated	accidental	x		x			x	
Dark-eyed Junco	x	common to abundant	common to abundant	x	x	x	x		x	
Tree Sparrow	x	very common to uncommon	abundant to very common	x	x	x	x		x	
Chipping Sparrow	x	common to uncommon	common	x	x		x		x	nests
Clay-colored Sparrow	x	accidental	accidental	x					x	
Field Sparrow	x	common to uncommon	common	x	x		x		x	nests
Harris Sparrow		accidental	accidental	x			x		x	
White-crowned Sparrow	x	common to uncommon	common	x	x		x		x	
White-throated Sparrow	x	abundant to common	abundant	x	x	x	x		x	nests?
Fox Sparrow	x	common to uncommon	common	x	x		x		x	
Lincoln's Sparrow	x	uncommon	uncommon to common	x	x		x		x	
Swamp Sparrow	x	uncommon to common	uncommon to common	x	x	x	x		x	nests
Song Sparrow	x	common to uncommon	abundant to common	x	x	x	x		x	nests
Lapland Longspur	x	common to uncommon	common	x	x	x			x	
Smith's Longspur		accidental	accidental	x	x				x	
Snow Bunting	x	common	common	x	x	x			x	

[a] Data obtained since 1920 from the literature and Trautman's unpublished data, especially from Ottawa and adjacent counties; also from the Trautman and Trautman's Annotated List of the Birds of Ohio (1968. Ohio Journ. Sci. 68 [5]: 257-332). Of the 333 species recorded, 293 of these are represented in accredited museum collections.

[b] Common names are those presently used by The American Ornithologists' Union. American Ornithologists' Union, 1957 (Check-list of North American birds. 5th ed., Baltimore, Md. 1-691 pp.

Mammals

The literature search indicated that site-specific information concerning mammalian fauna is available for some Lake Erie wetlands. Various literature sources, including theses and dissertations, technical journals, popular articles, management plans, pamphlets, and environmental impact statements, were consulted. The majority of the literature was related to the wetlands of southwestern Lake Erie and often provided information on key and major species, seasonal distribution and abundance, density and productivity, recreational and commercial use, life histories of key species, major food sources of key species, and the relationship of mammalian species to water level in these wetlands. Site-specific material regarding mammals in other Lake Erie wetlands usually supplied information only on the key and major species of those wetlands.

The coastal wetlands of Lake Erie are important for many mammalian species (Table 7). The Eastern cottontail (*Sylvilagus floridanus*), woodchuck (*Marmota monax*), and striped skunk (*Mephitis mephitis*) chiefly utilize the dikes of managed wetlands. Fox squirrels (*Sciurus niger*) are found most commonly in the wooded perimeter of wetlands. White-tailed deer (*Odocoileus virginianus*) are only transient members of wetland communities. Long-tailed weasels (*Mustela frenata*), mink (*M. vison*), and red fox (*Vulpes vulpes*) are uncommon on most Lake Erie wetlands. Mammalian faunas of the Lake Erie island wetlands generally have a lower diversity than those of mainland wetlands.

The wetlands of southwestern Lake Erie have a high recreational and commercial value. The most important furbearer in this region is the muskrat (*Ondatra zibethicus*). The muskrat harvest in southwestern Lake Erie wetlands ranks Ohio among the top fur-producing states. The high productivity of muskrat in this region is a direct result of management practices which maintain stable water levels in the wetlands.

Table 8. Mammalian Species Which may Utilize Wetlands of Lake Erie

Common name	Common name
Virginia opossum	Norway rat
short-tailed shrew	red fox
Eastern cottontail	raccoon
woodchuck	long-tailed weasel
fox squirrel	mink
white-footed mouse	striped skunk
meadow vole	white-tailed deer
muskrat	

Endangered Species

One threatened plant species was identified from the Lake Erie wetlands. Arrowhead (Sagittaria montevidensis) was reported by McDonald (1951) from Sandy Creek Estuary. Other threatened plants which may be in the area include Hibiscus palustris, Juncus brachycarpus, Justicia americana, Silphium perfoliatum, and Triplasis purpurea.

Seven species of rare, endangered, and threatened invertebrates have been reported from the vicinity of Sterling State Park. These species are:

Endangered mussels
- Simpsoniconcha ambigua
- Obovaria leibii

Threatened mussels
- Lampsilis fasciola

Rare mussels
- Carunculina glans
- Villosa fabilis
- Dysnomia sulcata

Threatened snails
- Amnicola binneyana

The following fishes with wetland affinities are officially listed and protected as rare, threatened, or endangered in states bordering Lake Erie: spotted gar (Lepistosteus oculatus), native Lake Erie muskellunge (Esox masquinongy), pugnose minnow (Notropis emiliae), blacknose shiner (Notropis heterolepis), lake chubsucker (Erimyzon sucetta), banded killifish (Fundulus diaphanus), and Iowa darter (________ exile). These species may occur in certain coastal wetlands of Lake Erie, although recent site-specific documentation is lacking in the literature. Unpublished records of agencies and institutions listed in the fish summary should be consulted for recent site-specific information. No fish listed on the federal register of endangered or threatened species occur or are likely to occur in Lake Erie coastal wetlands.

Several reptile and amphibian species have been listed as threatened, endangered, or rare in states bordering Lake Erie (see Appendix F-1). These include the four-toed salamander (Michigan), small-mouthed salamander (Michigan), eastern tiger salamander (Pennsylvania), Kirtland's water snake (Michigan), black rat snake (Michigan), eastern fox snake (Michigan), eastern box turtle (Michigan), eastern spiny softshell (Michigan), spotted turtle (Michigan, Ohio), Blanding's turtle (Pennsylvania), wood turtle (Michigan, Ohio), and eastern massasauga (Ohio, Pennsylvania). Several of these species are actually common in many parts of the Lake Erie coastal region, but are peripheral in range to one or more states. For example, Michigan is north and west of the principal ranges of several common Lake Erie reptiles and amphibians.

Several species of endangered birds have been recorded in the coastal wetlands of Lake Erie. Bald eagles nested successfully in 1974 within the Ottawa Wetland Complex, which is located in southwestern Lake Erie. Several nonbreeding resident pairs of bald eagles have also been observed in the region (VanCamp, 1974). King rails (Rallus elegans) have been recorded from several wetlands and are known to breed in the vicinity of West Harbor (U.S. Army Corps of Engineers, 1977). The common tern (Sterna hirundo) has been observed as an occasional visitor from nearby rookeries. In addition, migrating bald eagles and ospreys (Pandion haliaetus) use the coastal wetlands of Lake Erie as feeding and resting areas (Walton and Kasselmann, 1977).

Other birds endangered or threatened in states bordering Lake Erie and which have been recorded in the coastal zone . (Tables 6 and 7) include the Caspian tern (Sterna caspia, Michigan); piping plover (Charadrias melodus, Michigan); Cooper's hawk (Accipiter cooperii, Michigan); red-shouldered hawk (Buteo lineatus, Michigan); marsh hawk (Circus cyaneus, Michigan); and sharp-shinned hawk (Accipiter striatus velox, Ohio). Some other birds listed in Table 6, such as the common tern (Gavia immer), the black-crowned night heron (N. nycticorax), the barred owl (Strix varia), and the American bittern (Botaurus lentiginosus), are now rare in Michigan.

CULTURAL SETTING

The information necessary to prepare the population element for each wetland description was gathered from publications of several departments of the states of Michigan and Ohio, various regional planning agencies and the U.S. Census Bureau. With the exception of wetlands located near the densely populated metropolitan centers of Buffalo, Toledo, and Detroit, areas in the vicinity of coastal wetlands are moderately populated and are expected to undergo slow to moderate population growth. The metropolitan areas are expected to follow a pattern of slow growth or slow decline in population.

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, surrounded by open space or residential development. To a lesser extent, coastal wetlands exist as urban open space surrounded by residential or commercial development. Wetlands are subject to moderate or severe development pressure along the entire reach of the Lake Erie coast. Private ownership is typical. Public ownership is represented by wetlands partially or wholly within the confines of state parks or federal and state management areas. Recreation within a wetland proper is limited in scope.

Although the potential exists for sand, gravel, gas, limestone, dolomite, and gypsum extraction, as well as for utilization of forest resources, development within the limits of a coastal wetland was not noted. Wetlands are often crossed by electric and telephone transmission lines and pipelines. Point source discharges occur both within and in the near vicinity of several wetlands. The impact of these discharges on the respective wetlands was undetermined. Numerous historical and archaeological sites were documented within or near coastal wetlands. There are few ongoing wetland research efforts in the Lake Erie-Niagara River coastal wetlands.

LIST OF APPENDICES

Appendix A-1. Fish Species Known to Utilize Sheltered Areas of the Shore Zone, Creek Mouths, Sheltered Bays, and Aquatic Vegetation of the Niagara River for Cover and Spawning[a]

Family and Species	Spawning Use	Cover Use
Lepisosteidae		
longnose gar	X	X
Esocidae		
northern pike	X	X
muskellunge	X	X
Cyprinidae		
goldfish	X	X
carp	X	X
goldenshiner	X	X
emerald shiner		X
spottail shiner		X
blackchin shiner	X	
sand shiner	X	X
bluntnose minnow	X	X
Catostomidae		
quillback	X	X
white sucker		X
rednorses (at least 3 of 4 spp.)		X
Ictaluridae		
brown bullhead	X	X
black bullhead	X	X
channel catfish	X	X
stonecat	X	X
Cyprinodontidae		
banded killifish	X	X
Percopsidae		
trout-perch		X
Percichythyidae		
white bass	X	X
Centrarchidae		
rock bass	X	X
pumpkinseed	X	X
smallmouth bass	X	X
largemouth bass	X	X
crappie (probably both black and white)	X	X

-continued-

Appendix A-1. (concluded)

Family and Species	Spawning Use	Cover Use
Percidae		
Iowa darter	X	X
johnny darter	X	X
yellow perch	X	X
walleye	X	X
sauger	X	
Cottidae		
mottled sculpin		X
Sciaenidae		
freshwater drum	X	X

[a]Greeley (1929)

Appendix A-2. Fishes Found in the Vicinity of Presque Isle State Park, Pennsylvania[a]

Family and Species	Family and Species
Clupeidae	Ictaluridae
gizzard shad *	channel catfish
alewife	brown bullhead *
	stonecat
Salmonidae	
rainbow trout	Percopsidae
coho salmon	trout-perch
chinook salmon	
	Centrarchidae
Osmeridae	smallmouth bass
rainbow smelt	largemouth bass *
	rock bass
Cyprinidae	pumpkinseed *
carp *	bluegill *
goldfish *	
bluntnose minnow	Percidae
emerald shiner	walleye
spottail shiner	yellow perch *
	logperch *
Catostomidae	johnny darter *
white sucker *	
quillback	Sciaenidae
shorthead redhorse	freshwater drum

[a]Baker, Inc. (1974)
*Species using wetland habitats (Trautman, 1957)

Appendix A-3. Fish Species Associated with Wetland Habitats or Aquatic Vegetation in the Lake Erie Area of Ohio[a]

Family and Species	Habitat	Status
Lepisosteidae		
spotted gar	quiet, clear waters with abundant vegetation in bays and harbors	rare
longnose gar	similar to spotted gar, requires less vegetation and more tolerant of current	decreasing
Amiidae		
bowfin	quiet, clear waters with abundant vegetation in bays and harbors, somewhat tolerant to turbidity	decreasing
Clupeidae		
gizzard shad	low gradient waters, clear or turbid; if phytoplankton abundant, not requiring vegetation but common in bays and harbors	abundant
Esocidae		
grass pickerel	low gradient, clear waters with abundant vegetation in bays, harbors, and tributary streams	decreasing
northern pike	low gradient, clear waters with abun- vegetation in bays, harbors, and tributary streams; also spawns in these areas	decreasing
muskellunge	inhabits deeper waters of Lake Erie and tributaries, but spawns in clear, quiet waters with abundant vegetation	rare
Umbridae		
central mudminnow	low gradient, clear waters, with soft bottom of detritus, or peat, and aquatic vegetation	decreasing
Catostomidae		
white sucker	generalized in habitat preference, tolerant of low dissolved oxygen, turbidity, and other pollution, tolerant of very dense vegetation	abundant
lake chubsucker	low gradient, clear waters, with bottom of clean sand or fine gravel, most abundant in submersed aquatic vegetation	endangered

-continued-

Appendix A-3. (continued)

Family and Species	Habitat	Status
Catostomidae (cont'd)		
spotted sucker	low gradient, clear waters, with bottom of clean sand, gravel, or hard clay, often in wetlands, intolerant of turbidity	decreasing
Cyprinidae		
goldfish	same requirements as carp but less tolerant of turbidity and other pollution	common
carp	low gradient, warm waters in bays and tributaries, tolerant of turbidity and pollution; forages and deposits eggs on aquatic vegetation	abundant
goldenshiner	low gradient, clear waters in bays and tributaries with abundant aquatic vegetation	common locally
blackchin shiner	bays and harbors with very clear waters, dense beds of submersed aquatic vegetation, and bottom of clean sand, gravel, or organic debris	probably extirpated decreasing
blacknose shiner	bays and harbors with very clear waters, moderate to large amounts of vegetation, and bottom of clean sand, gravel, marl, muck, or organic debris	probably extirpated decreasing
pugnose shiner	similar to blackchin shiner, requiring profuse aquatic vegetation	decreasing probably extirpated
fathead minnow	low gradient, turbid waters, tolerant to clear water and extremes in pH, most in waters with few other fishes, such as wetlands	increasing
pugnose minnow	low gradient, clear waters with bottom of sand or organic debris and aquatic vegetation	endangered
Ictaluridae		
yellow bullhead	clear, low gradient water of bays and tributaries with some aquatic vegetation	decreasing
brown bullhead	cool, clear, deeper waters with moderate amount of aquatic vegetation and bottom of sand, gravel, and dark muck	common
black bullhead	low gradient waters, preferably silty and shallow, very tolerant of low dissolved oxygen, turbidity, and pollution	abundant
tadpole madtom	low gradient waters with low turbidity and bottom of soft muck, logs, twigs, and other organic debris	decreasing

-continued-

Appendix A-3. (continued)

Family and Species	Habitat	Status
Cyprinodontidae		
banded killifish	low gradient, clear waters with harbors and marshes with profuse aquatic vegetation and bottom of sand, marl, or organic debris	decreasing
Poeciliidae		
mosquitofish	low gradient, clear waters of tributaries with aquatic vegetation	increasing
Centrarchidae		
green sunfish	similar to warmouth but less dependent on vegetation and more tolerant of turbidity	common
pumpkinseed	low gradient, clear waters with bottoms of muck or sand covered partly by organic debris and dense beds of aquatic vegetation, especially submersed types	locally common
warmouth	low gradient waters with abundant aquatic vegetation, low turbidity, and bottom of muck or organic debris	locally common
bluegill	low gradient waters with some aquatic vegetation, relatively low turbidity, and bottom of sand, gravel, muck or organic debris	common
longear sunfish	low gradient, clear waters with bottom of sand, gravel, or muck, and some aquatic vegetation	locally common
largemouth bass	low gradient waters with abundant aquatic vegetation, low turbidity, and bottom of muck, gravel, sand, or hard clay, intolerant of excessive turbidity	common
white crappie	tolerant of many habitats, including turbid waters, often found among aquatic vegetation and in marshes	common
black crappie	clear, low gradient waters with abundant aquatic vegetation and bottom of muck or sand	locally common
Percidae		
Iowa darter	marshes, bays, and harbors with cool water, low turbidity, and bottom of sand, peat, muck or organic debris	endangered
Johnny darter	sandy beaches and bars with gravel and some silt, tolerant to silty bottoms and sometimes found among submersed aquatic vegetation	common

-continued-

Appendix A-3. (concluded)

Family and Species	Habitat	Status
Percidae (cont'd)		
yellow perch	low gradient, clear waters with abundant rooted aquatic vegetation and bottom of muck, organic debris, sand, or gravel	abundant
logperch	sandy beaches, bars, and bottoms in Lake Erie, frequently found in dense beds of submersed aquatic vegetation (particularly the young)	common

[a]based on Trautman (1957), VanMeter and Trautman (1970), Smith et al. (1973)

Appendix A-4. Composite List of Fish Species Present in Sandusky Bay[a]

Species	Population Trend[b]
Abundant	
gizzard shad*	increasing
goldfish *	
carp *	
emerald shiner	
spottail shiner	increasing
spotfin shiner	increasing
bluntnose minnow	
channel catfish	
white bass	increasing
white crappie *	
yellow perch *	
freshwater drum	
Common	
longnose gar *	decreasing
alewife	
rainbow smelt	decreasing
goldenshiner *	decreasing
mimic shiner	decreasing
white sucker *	
shorthead redhorse	decreasing
black bullhead *	
yellow bullhead *	decreasing
brown bullhead *	
stonecat	decreasing
trout-perch	decreasing
brook silverside	decreasing
rock bass	
green sunfish *	
pumpkinseed *	
orangespotted sunfish	increasing
bluegill *	
largemouth bass *	
black crappie *	decreasing
logperch *	decreasing
Uncommon	
sea lamprey	
bowfin *	decreasing
Uncommon (continued)	
coho salmon	
chinook salmon	
central mudminnow *	decreasing
grass pickerel *	decreasing
stoneroller	
common shiner	
sand shiner	
fathead minnow *	increasing
quillback	decreasing
northern hogsucker	
bigmouth buffalo	decreasing
spotted sucker *	decreasing
golden redhorse	decreasing
tadpole madtom *	decreasing
brindled madtom	decreasing
banded killifish *	decreasing
smallmouth bass	
greenside darter	
johnny darter *	decreasing
fantail darter	
walleye	increasing
Rare	
silver lamprey	decreasing
lake sturgeon	decreasing
spotted gar *	decreasing
mooneye	decreasing
lake whitefish	decreasing
cisco	decreasing
rainbow trout	decreasing
lake trout	decreasing
northern pike *	decreasing
muskellunge *	decreasing
silver chub	decreasing
blackchin shiner *	decreasing
blacknose shiner *	decreasing
lake chubsucker	decreasing
silver redhorse	decreasing
burbot	

-continued-

Appendix A-4. (concluded)

Species	Population Trend[b]	Species	Population Trend[b]
American eel		channel darter	
longear sunfish*		blackside darter	
warmouth sunfish*		sauger	decreasing
Iowa darter*	decreasing	blue walleye	decreasing
Eastern sand darter	decreasing		

[a]Hartley and Herdendorf (1975), Anon. (1939), Edmister (1940)
[b]lack of notation for a species under Population Trend indicates no trend or insufficient data to establish trend
*species associated with wetland habitats (Trautman, 1957)

Appendix A-5. Fish Species Inhabiting Maumee Bay up to 1957[a]

Species	Period found in Maumee Bay	Habitat
Lake sturgeon	Before 1916, 1916-1950	Declined because of inability of fish to reach spawning grounds. Spawns in large rivers or in the shallows of the lake.
Spotted gar	Before 1901, 1901-1950	Prefers quiet, clear water with large abundance of aquatic vegetation.
Longnose gar	Before 1901, 1901-1950	Inhabits same areas as spotted gar, but with less dependence on vegetation.
Mooneye	Before 1901, 1901-1950	Prefers clearest waters with swift current; needs large supply of small fish to feed on. Decline since 1935 directly attributed to increased turbidity.
Gizzard shad	Local records	Is tolerant of clear and turbid waters if phytoplankton population is high. Winter death rate appears to be high, especially among the young.
Lake whitefish	Local records	Experienced sharp decline in number spawning in Maumee Bay early in 1900's due to increased smothering of spawning grounds by siltation.
Northern pike	Before 1910, 1910-1950	Inhabits clear water with abundant aquatic vegetation. Large catches recorded in Maumee Bay from 1900-1910. Decline since 1910 due to inability to reach spawning grounds.
Muskellunge	Before 1900, after 1920	Was one of first species to become commercially important; declined in Maumee Bay after 1905. Spawns in clear, shallow waters with abundant aquatic vegetation.
Bigmouth buffalo	Local records	Maintained large population in Maumee River in 1942. Occupies shallow and turbid waters, and is in competition with the carp.
Silver redhorse	1885-1900	Inhabits areas where siltation and industrial pollutants are at a minimum.
Shorthead redhorse	Local records	Inhabits shallow and clear waters with clean and silt-free bottom of sand, gravel, or bedrock. More abundant before 1925. Declined with increased turbidity.
Greater redhorse	Before 1900	Prefers clear water with clean sand, gravel, or boulders. High degree of intolerance to turbidity and chemical pollutants. Before 1890-1920, species was numerous in Maumee River.

-continued-

Appendix A-5. (continued)

Species	Period found in Maumee Bay	Habitat
White sucker	Local records	Appears tolerant to increased turbidity, siltation, organic and inorganic pollutants, and low oxygen. Favors dense aquatic vegetation rich in nutrients.
Carp	After 1880	Inhabits warm stream with abundant organic matter (either contributed by sewage or by biologic conversion of inorganic fertilizers from fields, rooted aquatic vegetation, or byproducts. Inhabits either clear or turbid waters.
Goldfish	Local records	Is possible carp-goldfish hybrid. Occupies same habitat as carp, but is less tolerant to cool waters, turbidity, rapid siltation, and domestic and industrial pollutants.
Goldenshiner	Local records	Inhabits quiet and clear waters with bottom composed of organic debris and/or sand with abundant aquatic vegetation.
Silver chub	Before and after 1900	Is usually found in clear water 1-20 m deep with a gravel bottom.
Emerald shiner	Local records	Inhabits clear waters with the bottom unimportant.
Redfin shiner	Local records	Needs clear water with sandy or gravel bottom and some aquatic vegetation.
Spottail shiner	Before 1926, 1926-1952	Inhabits clear water with depth ranging from 1-20 m with bottom composed of sand or gravel. Has decreased in Maumee Bay due to increased silting and turbidity.
Spotfin shiner	Local records	Appears tolerant to many environments, such as increased turbidity, siltation, and domestic or industrial pollutants. Deposits eggs on underside of objects.
Sand shiner	Local records	Experienced a drastic decrease in numbers from 1920-1950 in the Maumee River. Inhabits bottom composed of sand and gravel with a current. Needs clear water with rooted vegetation.
Bluntnose minnow	Local records	Inhabits waters with depth ranging from 0-30 m. Appears tolerant to turbidity, inorganic and organic pollutants.
Channel catfish	Local records	Inhabits fairly clean bottoms, usually composed of sand, gravel, boulders, or siltdense. Aquatic vegetation unnecessary.
Brown bullhead	Local records	Prefers clear, cool water with moderate amounts of aquatic vegetation. Bottom composed of sand or gravel. Appears more tolerant to turbid waters than black bullhead.

-continued-

Appendix A-5. (continued)

Species	Period found in Maumee Bay	Habitat
Black bullhead	Before 1901, 1901-1950	Occurs in turbid, warm waters and is tolerant to industrial and domestic pollutants and silting.
Stonecat	1901-1950	Inhabits bottom composed of gravel, boulder, or bedrock. Appears in large streams free of silt and other pollutants with an abundance of insects, crayfish, and forage fish.
American eel	Before and after 1910	Adjusts to turbid waters by finding food by scent.
Burbot	Local records	Comes into shallow waters in winter.
Trout-perch	Local records	Inhabits bottom composed of clean sand or gravel. Appears numerous in water less than 1.5 m deep.
Brook silverside	Before 1901, 1901-1950	Inhabits clean water with sand or organic muck bottoms. Does not like turbid waters.
White bass	Local records	Inhabits clear waters with firm bottom. Occurs in depths less than 9 m. Needs abundance of small fish.
White crappie	Local records	Is one of the most sought after panfishes. Tolerant to many conditions, especially to turbidity and siltation.
Black crappie	Local records	Appears to decrease in numbers in turbid waters. Needs clear waters with abundance of submerged aquatic vegetation and a sandy bottom.
Smallmouth bass	Local records	Decreased in last 25 yr due to increased turbidity. Inhabits bottoms composed of clean gravel or boulder. Requires a maximum depth greater than 1 m.
Largemouth bass	Local records	Inhabits essentially nonflowing waters with bottoms composed of soft muck and organic debris, gravel, hard sand, or nonflocculent clays.
Green sunfish	Local records	Exhibits no preference to type of bottom. Appears more tolerant to turbidity and siltation than other sunfish.
Bluegill	Local records	Has decreased from 1920-50 despite repeated planting of fry and adults. Inhabits waters which are clear or which contain little suspended clay or silts, with bottoms composed of sand, gravel, or muck containing organic debris. Needs an abundance of aquatic vegetation.

-continued-

Appendix A-5. (concluded)

Species	Period found in Maumee Bay	Habitat
Pumpkinseed	Before 1926, 1926–1950	Inhabits clear non-flowing waters which do contain clayey silt in suspension. Needs bottom composed of muck or sand partly covered with organic debris with a dense aquatic vegetation.
Sauger	Local records	Inhabits shallow, more turbid waters with silty bottoms.
Walleye	Local records	Inhabits shallow water with bottoms composed of gravel and bedrock. Has declined in Maumee Bay due to increased turbidity.
Yellow perch	Local records	Inhabits clear, shallow water with an abundance of rooted aquatic vegetation. Bottom composition usually muck, organic debris, sand, or gravel. Has declined in turbid and siltating waters.
Channel darter	Before 1924, 1924–1952	Inhabits bottoms composed of coarse-sand with fine gravel beaches. Occurs in clear water 1 m deep in the day and in shallow water at night.
Logperch	Local records	Inhabits area with bottom composed of sandy and/or fine gravel beaches. Needs moderately dense beds of submerged aquatic vegetation, especially for the young.
Johnny darter	Local records	Appears tolerant to many organic and inorganic pollutants and increased turbidity. Eggs are deposited on the underside of stones. Inhabits bottom composed of sand or gravel. Appears less tolerant of submerged aquatic vegetation than the scaly johnny darter.
Freshwater drum	Local records	Inhabits waters ranging from 1.5–18 m deep. In warmer months, inhabits waters less than 1.5 m deep. Appears to tolerate turbid water, but likes clear water with clean bottoms.

[a]Pinsak and Meyer (1974) and Trautman (1957)

Appendix A-6. Fish Species Presently Inhabiting Maumee Bay[a]

Species	Spawning period	Spawning environment
Gizzard shad	15 May-15 Aug.	Inhabits sandy gravel area six along the channel side castings. Spawns over the longest period in Maumee Bay. Appears to fluctuate greatly from year to year.
Lake whitefish	15 Nov.-1 Dec.	Inhabits bottom composed of gravel in area seven of Maumee Bay. Had decreased after 1953, and is now considered scarce.
Muskellunge (protected list)	25 Mar.-20 Apr.	Inhabits territory similar to that inhabited by northern pike. Likes more grass and deeper waters. Presently is considered rare.
Northern pike (on game list)	25 Mar.-20 Apr.	Appears to inhabit territory similar to that inhabited by the carp. Previously went upstream, but is now affected by pesticide levels. Apparently has increased in abundance due to high water level. Inhabits weedy and shallow bays and marshes.
Bigmouth buffalo	15 June-10 July	Inhabits bottoms composed of gravel with some current. Occupies shallow and warm waters in areas one, two, and three in Maumee Bay. Appears to be in competition with carp for territory.
Quillback	10 June-10 July	Inhabits sheepshead territory. Quillback population appears to have increased over the past 20 yr and is a higher value fish than the sheepshead. Likes cooler waters with current over a sandy gravel bottom. Presently is believed to occupy area three in Maumee Bay.
Shorthead redhorse Silver redhorse Golden redhorse	1 Apr.-10 May 1 Apr.-10 May 1 Apr.-10 May	Inhabit areas with gravel bottoms and steady currents near the mouths of streams. Presently are believed to occupy area four in Maumee Bay.
Carp	1 June-10 Aug.	Inhabits shorelines, streams, and marsh creeks. Likes warm water in protected areas. Currently is believed to occupy areas one, two, three, and eight in Maumee Bay.
Goldfish	20 May-1 Aug.	Inhabits the same areas as carp, but appears less tolerant to conditions in Maumee Bay.
Channel catfish	25 May-20 July	Inhabits nearshore areas one, two, and three in Maumee Bay (with sandy gravel bottom).

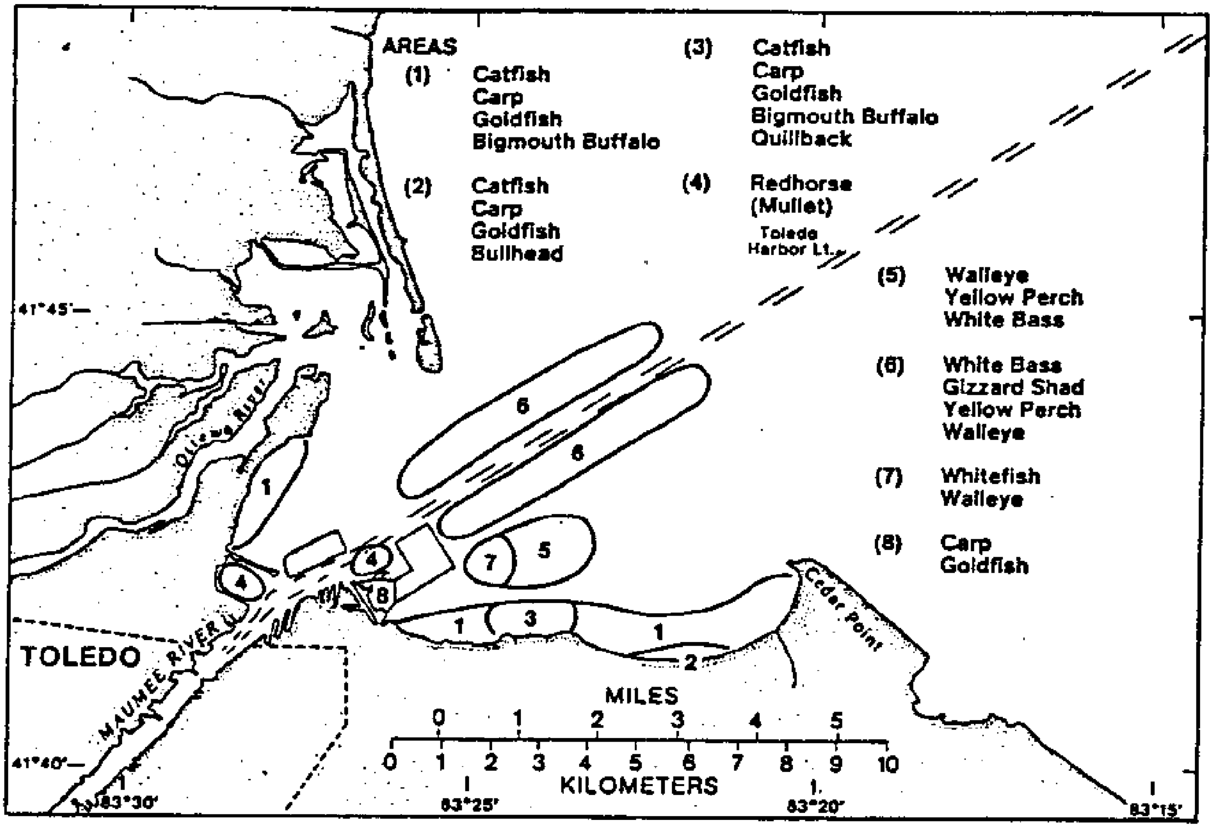
-continued-

Appendix A-6. (concluded)

Species	Spawning period	Spawning environment
Brown bullhead	1 June–15 July	Appeared abundant in 1960; has decreased since, but has made a comeback in the last 2 yr due to the high water levels which enable bullheads to reach their spawning grounds. Inhabits streams or creeks and spawns along shoreline in 1 m deep water. Presently is believed to occupy area two in Maumee Bay.
White bass	12 May–25 June	Inhabits bottom composed of sandy gravel in areas five and six. Appears to be in competition with walleye for territory in Maumee
White crappie (on game list) Black crappie (on game list)	1 May–1 June 1 May–1 June	Large populations have occurred during the last 2 yr due to increased water levels. Inhabits marshy areas and boat marinas located in quiet and shallow, but not stagnant, waters. The black crappy appears less tolerant to a decrease in vegetation or an increase in turbidity.
Yellow perch	15 Apr.–5 May	Inhabits bottoms composed of sandy gravel or clayey gravel in depth less than 2 m. Appears to be in competition with walleye along the channel sidecastings in area six, and in the middle of the southeastern section of the bay (area five).

[a]Pinsak and Meyer (1974)

Appendix A-7. Possible Fish Spawning Areas in Maumee Bay Based on Commercial Catches



Pinsak and Meyer, 1976

Appendix A-8. Fish Species Collected from Lower River Raisin at Monroe, Michigan, May 1970 to June, 1972[a]

Family and Species	No. collected	Weight
Clupeidae		
alewife	24	0.25
gizzard shad	115	0.72
Cyprinidae		
goldfish	7	0.51
carp	4	3.81
emerald shiner	45	0.27
spottail shiner	9	0.06
Catostomidae		
quillback	2	0.90
Ictaluridae		
black bullhead	1	0.21
channel catfish	1	0.12
Percichthyidae		
white bass	12	0.05
Centrarchidae		
pumpkinseed	1	0.10
Percidae		
yellow perch	10	0.29
Sciaenidae		
freshwater drum	4	0.35
Totals	243	8.78

[a]Edwards (1973)

Appendix B-1. Benthic Macroinvertebrates Collected in Sandusky Bay, 1972 to 1974[a]

- Ectoprocta
    - *Plumatella emarginata*
- Annelida
    - Oligochaeta
    - Plesiopora
        - *Branchiura sowerbyi*
        - *Limnodrilus hoffmeisteri*
        - *Peloscolex ferox*
        - *Amphichaeta* sp.
        - *Bothrioneurum vejdovskyanum*
    - Hirudinea
    - Phynchobdellidae
        - *Glossiphonia complanata*
        - *Helobdella stagnalis*
- Arthropoda
    - Insecta
    - Diptera
        - *Chaoborus* sp.
        - *Palpomyia* sp.
        - *Chironomus* *c.* *plumosus*
        - *Polypedilum* sp.
        - *Pseudochironomus* sp.
        - *Procladius culiciformis*
        - *Coelotanypus scapularis*
        - *Clinotanypus* sp.
        - *Anatopynia* sp.
    - Crustacea
    - Amphipoda
        - *Hyalella azteca*
- Mollusca
    - Gastropoda
    - Pulmonata
        - *Physa* sp.
        - *Planobula* sp.
        - *Helisoma* sp.
        - *Ferrissia* sp.
        - *Bulimnaea* sp.
    - Ctenobranchiata
        - *Amnicola* sp.
        - *Viviparus* sp.
        - *Valvata* sp.
        - *Pleurocera* sp.
        - *Goniobasis* sp.
    - Pelecypoda
        - *Pisidium* sp.
        - *Sphaerium* sp.
        - *Anodonta grandis*

[a]Taken from Herdendorf and Lindsay (1975)

Appendix B-2. Molluscs (listed in order of abundance)[a] taken from Sandusky Bay, Lake Erie in June, 1963

Gastropoda

- *Viviparus japonicus*
- *Campeloma decisum*
- *Pleurocera acuta*
- *Bulimus tentaculatus*

Pelecypoda

- Sphaeriidae
  - *Sphaerium transversum*
  - *Pisidium henslowanum*
  - *Pisidium compressum*
  - *Pisidium casertanum*
- Unionidae
  - *Lampsilis siliquoidea*
  - *Truncilla donaciformis*
  - *Carunculina parva*
  - *Proptera alata*
  - *Obliquaria reflexa*
  - *Anodonta grandis*
  - *Quadrula pustulosa*
  - *Truncilla truncata*
  - *Quadrula quadrula*
  - *Amblema costata*
  - *Leptodea fragilis*
  - *Ligumia recta latissima*
  - *Fusconaia flava*
  - *Ligumia nasuta*
  - *Pleurobema cordatum coccineum*
  - *Lampsilis ventricosa*
  - *Elliptio dilatatus*
  - *Anodonta imbecillis*

[a]Taken from Wolfert and Hiltunen (1968)

Appendix B-3. Invertebrate Taxa other than Molluscs Collected from Sandusky Bay, Lake Erie, June, 1963[a]

Nemata
Bryozoa
Hirudinea
Oligochaeta
Polychaeta
Cladocera and Copepoda
Amphipoda
Isopoda
Diptera
Ephemeroptera
Trichoptera
Hydracarina

[a]Taken from Wolfert and Hiltunen (1968)

Appendix C-1. Published Records of Reptiles and Amphibians with Wetland Affinities from Ohio Counties Bordering Lake Erie[a]

	County							
Species	Ashtabula	Lake	Cuyahoga	Lorain	Erie	Sandusky	Ottawa	Lucas
mudpuppy					X			X
Jefferson salamander				X				
red-backed salamander				X				
red-spotted newt				X				
American toad					X			
northern spring peeper				X				
green frog					X			
bullfrog	X	X	X	X	X	X	X	X
northern ringneck snake	X	X	X	X	X		X	X
eastern fox snake					X	X	X	X
eastern milk snake	X	X	X	X	X		X	X
Kirtland's water snake					X	X		X
queen snake	X	X	X	X	X	X	X	X
northern water snake	X	X	X	X	X	X	X	X
northern brown snake	X	X	X	X	X		X	X
n. red-bellied snake	X	X						
Butler's garter snake								
northern ribbon snake	X	X	X	X	X			X
eastern garter snake	X	X	X	X	X	X	X	X
stinkpot					X		X	X
snapping turtle	X	X	X	X	X		X	X
spotted turtle	X	X		X	X			X
Blanding's turtle	X	X		X	X	X	X	X
map turtle	X			X	X	X	X	X
midland painted turtle	X	X	X	X	X	X	X	X
eastern spiny softshell		X		X	X		X	X

[a]Conant, 1951; Morse, 1904

Appendix D-1. Birds of Erie, Pennsylvania, On December 18, 1971[a]

Common name	Number observed[b]
horned grebe	8
pied-billed grebe	8
double-crested cormorant	2
great blue heron	2
whistling swan	58
Canada goose	67
white-fronted goose	1
mallard	502
black duck	168
gadwall	10
pintail	11
green-winged teal	2
wood duck	3
redhead	13
ring-necked duck	2
canvasback	514
greater scaup	233
lesser scaup	10
common goldeneye	111
bufflehead	121
oldsquaw	1
ruddy duck	2
hooded merganser	1
common merganser	2
red-breasted merganser	11
goshawk	1
red-tailed hawk	2
American kestrel	9
ring-necked pheasant	1
American coot	932
common snipe	8
great black-backed gull	24
herring gull	1,631
ring-billed gull	5,227
Bonaparte's gull	451
mourning dove	17
great horned owl	1
belted kingfish	2
belted kingfisher	15
pileated woodpecker	1
red-headed woodpecker	11
hairy woodpecker	6
downy woodpecker	32
horned lark	25
blue jay	30
common crow	14
common flicher	

-continued-

Appendix D-1. (concluded)

Common name	Number observed[b]
black-capped chickadee	171
tufted titmouse	8
white-breasted nuthatch	19
red-breasted nuthatch	4
brown creeper	5
winter wren	2
mockingbird	1
golden-crowned kinglet	11
cedar waxwing	107
northern shrike	1
starling	76
myrtle warbler	35
house sparrow	275
red-winged blackbird	29
bronze-headed cowbird	2
cardinal	79
evening grosbeak	13
American goldfinch	35
rufous-sided towhee	4
slate-colored junco	56
tree sparrow	218
white-throated sparrow	6
song sparrow	15
snow bunting	32
Total number of species = 70	11,497

[a]Taken from Baker, 1974
[b]Count taken within 7.5 mile radius of southeast Erie, including Presque Isle State Park*
*Anonymous, "1972 Christmas Bird County, Item 255, Erie Pennsylvania, "American Birds XXVI, 243-244, 1972.

Appendix D-2. Avifauna Observed in Maumee Bay[a]

(1974)	3/31	4/5	4/7	4/13	4/14	4/20	4/27
great blue heron[b]				1			
great egret[b]		1	1		1		
Canada goose				2			
mallard						2	
black duck				50	25	4	
lesser scaup duck	1000	300	65	30	10	8	
greater scaup duck			3				
common goldeneye						1	
ruddy duck	90			8	6	2	
hooded merganser[b]							7
common merganser[b]				2			
red-breasted merganser[b]		2		2	10	8	
herring and ring-billed gulls[b]	4	12	15	16	13	11	12
Bonaparte's gull[b]				5	4	2	2
common tern[b]							2
swallows[c]						(present)	(present)
tree swallow							
barn swallow							
bank swallow							
purple martin							
belted kingfisher[b]				1		1	

[a]adapted from U.S. Corps of Engineers, 1976
Source: Fraleigh et al., 1974
[b]denotes fish-eating species (gulls take mostly dead or injured fishes)
[c]swallows dip preadult midges from the water surface

Appendix D-3. Food Habits of Mallards, Black Ducks and Pintails in Erie Marsh[a]

	126 Mallards			34 Black Ducks			33 Pintails		
Food items	Freq. of occurrence	Percent occurrence	Volume in ml.	Freq. of occurrence	Percent occurrence	Volume in ml.	Freq. of occurrence	Percent occurrence	Volume in ml.
Total Plant	126	100.0	1,471.3	34	100.0	405.2	33	100.0	203.2
Polygonum spp., smartweed	104	82.5	271.1	27	79.2	283.3	31	94.0	156.0
lapathifolium, nodding	85	67.5	264.0	24	70.5	275.3	30	90.9	154.8
pensylvanicum, large-seeded	52	41.3	5.1	14	41.4	6.0	12	36.3	0.6
persicaria, lady's thumb	22	17.5	0.9	9	26.4	1.9	12	36.3	0.5
coccineum, water	4	3.8	0.4	1	2.9	0.1	1	3.0	0.1
sagittatum, arrow-leaved tearthumb	3	2.4	0.1	1	2.9	tr.	-	-	-
unidentified	2	1.6	0.6	-	-	-	-	-	-
Potamogeton spp., pondweed	32	25.4	6.0	6	17.6	0.1	6	18.1	0.1
pectinatus, sago	29	23.0	5.5	6	17.6	0.1	6	18.1	0.1
foliosus, leafy	5	4.0	0.3	1	2.9	tr.	1	3.0	tr.
nodosus	1	0.8	0.2	-	-	-	-	-	-
Scirpus spp., bulrush	88	69.4	22.2	27	79.2	3.4	16	48.4	2.3
validus, soft-stem	79	62.7	21.4	18	52.9	2.8	16	48.4	2.2
fluviatilis, river	11	8.7	0.6	9	26.4	0.4	1	3.0	0.1
americanus, three-square	5	4.0	tr.	5	14.7	0.1	1	3.0	tr.
unidentified	17	13.5	0.2	7	20.5	0.1	1	3.0	tr.
Zea mays, corn	24	19.1	1,027.5	4	11.7	62.5	2	6.1	28.0
whole kernels	-	-	424.5	-	-	-	-	-	-
fragmented, cracked	-	-	603.0	-	-	-	-	-	-
Triticum aestivum, wheat	17	13.5	2.3	2	5.8	0.3	1	3.0	0.1
Avena sativa, oats	15	11.9	4.0	1	2.9	0.1	1	3.0	0.1
Phaseolus sp., beans	10	7.9	7.0	-	-	-	-	-	-
Valeriana sp., valeriana	13	10.3	3.2	6	17.6	8.3	3	9.1	0.1
Cornus sp., dogwood	14	11.1	3.1	3	8.8	0.2	2	6.1	0.2
Sparganium eurycarpum, giant burreed	7	5.6	2.6	2	5.8	0.2	1	3.0	0.1
Sparganium minimum, burreed	6	4.8	0.1	4	11.7	0.2	2	6.1	0.1
Cuscuta sp., dodder	40	31.7	2.6	12	35.2	0.4	12	36.3	0.3
Echinochloa sp., millet	18	14.3	2.6	7	20.5	0.6	7	21.2	0.1
Bidens sp., stick-tight	11	8.7	1.7	6	17.6	4.4	3	9.1	tr.
Leerzia oryzoides, rice cut-grass	26	20.6	1.3	12	35.2	2.9	5	15.1	tr.
Setaria sp., foxtail grass	8	6.3	0.7	1	2.9	tr.	3	9.1	tr.
Setaria glauca, foxtail grass	3	2.4	tr.	1	2.9	tr.	-	-	-
unidentified seeds	-	-	-	5	14.7	1.4	1	3.0	tr.
unidentified tubers	-	-	-	1	2.9	0.2	-	-	-
Amaranthus sp., pigweed	15	11.9	0.6	-	-	-	7	21.2	tr.
Brassica sp., mustard	5	4.0	0.5	1	2.9	tr.	2	6.1	tr.
Rumex sp., dock	4	3.8	0.4	1	2.9	tr.	-	-	-
Eleocharis palustris, spike rush	16	12.7	0.2	-	-	-	-	-	-
Eleocharis sp., spike rush	4	3.8	tr.	3	8.8	tr.	1	3.0	0.1
Ambrosia trifida, greater ragweed	2	1.6	0.2	-	-	-	-	-	-
Proserpinaca palustris, mermaid weed	-	-	-	1	2.9	0.1	-	-	-
Phalaris arundinacea, reed canary grass	4	3.8	tr.	1	2.9	tr.	1	3.0	tr.
Ambrosia artemisiifolia, lesser ragweed	1	0.8	tr.	-	-	-	-	-	-
Abutilon theophrasti, indian mallow	7	5.6	0.1	1	2.9	tr.	2	6.1	tr.
Bohemeria cylindrica, false nettle	3	2.4	0.1	-	-	-	-	-	-
Datura stramonium, jimson weed	4	3.8	0.1	-	-	-	1	3.0	tr.
Rhus sp., sumac	13	10.3	0.1	2	5.8	tr.	2	6.1	tr.
Vitis sp., grape	2	1.6	0.1	-	-	-	-	-	-
Aster sp., aster	1	0.8	tr.	-	-	-	1	3.0	tr.
Carex pseudocyperus, sedge	1	0.8	tr.	-	-	-	-	-	-
Fagopyrum esculentum, buckwheat	1	0.8	tr.	-	-	-	-	-	-

-continued-

Appendix D-3. (concluded)

Food items	126 Mallards			34 Black Ducks			33 Pintails		
	Freq. of occurrence	Percent occurrence	Volume in ml.	Freq. of occurrence	Percent occurrence	Volume in ml.	Freq. of occurrence	Percent occurrence	Volume in ml.
Hibiscus palustris, marsh mallow	3	2.4	tr.	-	-	-	1	3.0	tr.
Hibiscus trionum, flower-of-an-hour	-	-	-	-	-	-	1	3.0	tr.
Lobelia sp., lobelia	7	5.6	tr.	1	2.9	tr.	1	3.0	tr.
Phytolacca americana, pokeberry	1	0.8	tr.	-	-	-	-	-	-
unidentified seeds	16	12.7	2.8	-	-	-	-	-	-
Lemna minor, small-leaved duckweed	1	0.8	tr.	-	-	-	1	3.0	0.3
Miscellaneous and unidentified vegetation	69	54.8	108.1	19	55.8	36.6	14	42.4	15.3
Total Animal	7	5.6	0.6	6	17.6	0.2	0	0.0	0.0
Coleoptera, adult beetle parts	2	1.6	tr.	3	8.8	tr.	-	-	-
Annelida, segmented worms	1	0.8	tr.	-	-	-	-	-	-
Diptera, fly larvae	1	0.8	0.2	-	-	-	-	-	-
Crustacea, craw-fish parts	2	1.6	0.1	-	-	-	-	-	-
Zygoptera, damselfly nymph	-	-	-	1	2.9	tr.	-	-	-
Arachnida, spider	-	-	-	1	2.9	0.1	-	-	-
Gastropoda, snails	3	2.4	0.3	2	5.8	0.1	-	-	-
Lymnaea sp.	2	1.6	0.1	1	2.9	0.1	-	-	-
Physa sp.	1	0.8	tr.	-	-	-	-	-	-
Valvata sp.	1	0.8	tr.	-	-	-	-	-	-
Amnicolidae	-	-	-	1	2.9	tr.	-	-	-
Grit	126	100.0	209.7	34	100.0	53.2	33	100.0	45.0
Lead shot (ingested)	8	6.3	18 Shot	6	17.6	8 Shot	4	12.1	4 Shot
Total Number and Volume	152,489 ±50		1,681.6	99,770 ±50		458.6	59,490 ±50		248.2

[a]Taken from Schiller (1969)

Appendix D-4. Food Habits of Blue-winged Teal, Green-winged Teal and Shovelers in Erie Marsh[a]

Food items	14 Blue-winged Teal			32 Green-winged Teal			9 Shovelers		
	Freq. of occurrence	Percent occurrence	Volume in ml.	Freq. of occurrence	Percent occurrence	Volume in ml.	Freq. of occurrence	Percent occurrence	Volume in ml.
Total Plant	14	100.0	19.1	32	100.0	29.5	9	100.0	2.3
Polygonum spp., smartweed	13	92.8	6.0	25	78.1	17.0	7	77.7	1.1
lapathifolium, nodding	12	85.7	5.9	25	78.1	16.8	7	77.7	0.1
pensylvanicum, large seeded	2	14.2	0.1	5	15.6	tr.	2	22.2	tr.
persicaria, lady's thumb	1	7.1	tr.	2	6.2	tr.	3	33.3	tr.
coccineum, water	1	7.1	tr.	1	3.1	0.2	-	-	-
sagittatum, arrow-leaved tearthumb	-	-	-	-	-	-	-	-	-
unidentified	-	-	-	-	-	-	1	11.1	1.0
Potamogeton spp., pondweed	5	35.7	0.8	4	12.5	0.2	2	22.2	tr.
pectinatus, sago	3	21.4	0.1	2	6.2	0.1	-	-	-
foliosus, leafy	3	21.4	0.7	2	6.2	0.1	-	-	-
Scirpus spp., bulrush	8	57.1	2.7	21	65.6	2.2	7	77.7	0.1
validus, soft-stem	7	50.0	2.5	21	65.6	2.2	7	77.7	0.1
fluviatilis, river	1	7.1	tr.	-	-	-	-	-	-
americanus, three-square	-	-	-	3	9.4	tr.	-	-	-
unidentified	3	21.4	0.2	3	9.4	tr.	4	44.4	tr.
Valeriana sp., valeriana	1	7.1	tr.	2	6.2	4.1	-	-	-
Cornus sp., dogwood	1	7.1	0.2	-	-	-	-	-	-
Sparganium minimum, burreed	1	7.1	tr.	2	6.2	tr.	-	-	-
Cuscuta sp., dodder	4	28.5	tr.	4	12.5	tr.	-	-	-
Echinochloa sp., millet	3	21.4	tr.	3	9.4	0.1	-	-	-
Bidens sp., stick-tight	1	7.1	tr.	2	6.2	1.4	-	-	-
Leerzia oryzoides, rice cut-grass	5	35.7	tr.	5	15.6	tr.	1	11.1	tr.
Setaria sp., foxtail grass	2	14.2	0.1	1	3.1	0.1	-	-	-
unidentified seeds	2	14.2	0.1	2	6.2	tr.	-	-	-
Amaranthus sp., pigweed	2	14.2	tr.	1	3.1	tr.	-	-	-
Brassica sp., mustard	1	7.1	tr.	-	-	-	-	-	-
Eleocharis palustris, spike rush	-	-	-	9	28.1	0.6	-	-	-
Eleocharis sp., spike rush	4	28.5	tr.	-	-	-	4	44.4	tr.
Phalaris arundinacea, reed canary grass	2	14.2	7.0	1	3.1	tr.	-	-	-
Bohemeria cylindrica, false nettle	-	-	-	4	12.5	0.4	-	-	-
Fagopyrum esculentum, buckwheat	1	7.1	0.3	-	-	-	-	-	-
Najas flexilis, spiny naiad	-	-	-	2	6.2	0.1	-	-	-
Rubus sp., blackberry	-	-	-	1	3.1	tr.	-	-	-
Hibiscus palustris, marsh mallow	-	-	-	-	-	-	2	22.2	0.4
Hibiscus trionum, flower-of-an-hour	1	7.1	tr.	-	-	-	-	-	-
Lobelia sp., lobelia	1	7.1	tr.	6	18.7	0.3	-	-	-
Lemna minor, small-leaved duckweed	1	7.1	0.2	2	6.2	0.6	2	22.2	0.2
Miscellaneous and unidentified vegetation	2	14.2	1.7	10	31.2	2.4	6	66.6	0.5
Total Animal	3	21.4	0.7	3	9.4	1.7	1	11.1	tr.
Coleoptera, adult beetle parts	1	7.1	tr.	2	6.2	tr.	-	-	-
Diptera, fly larvae	-	-	-	1	3.1	tr.	-	-	-
Gastropoda, snails	3	21.4	0.1	1	3.1	1.7	1	11.1	tr.
Lymnaea sp.	1	7.1	tr.	1	3.1	1.6	-	-	-
Physa sp.	3	21.4	0.1	1	3.1	0.1	-	-	-
Valvata sp.	-	-	-	-	-	-	1	11.1	tr.
unidentified	2	14.2	tr.	-	-	-	-	-	-
Grit	14	100.0	10.9	32	100.0	20.1	9	100.0	8.1
Lead shot (ingested)	0	0.0	0 Shot	0	0.0	0 Shot	1	11.1	1 Shot
Total Number and Volume	6,788 ±10		30.1	13,186 ±10		51.3	444		10.4

[a]Taken from Schiller (1969)

Appendix D-5. Food Habits of Selected Ducks from Erie Marsh[a]

Food items	Freq. of occurrence	Percent occurrence	Volume in ml.
10 AMERICAN WIGEON			
Total Plant	10	100.0	9.8
Polygonum lapathifolium, nodding smartweed	5	50.0	tr.
Potamogeton spp., pondweed	4	40.0	0.1
pectinatus, sago	3	30.0	tr.
foliosus, leafy	1	10.0	0.1
Scirpus spp., bulrush	5	50.0	tr.
validus, soft-stem	4	40.0	tr.
unidentified	2	20.0	tr.
Lobelia sp., lobelia	3	30.0	6.0
Leerzia oryzoides, rice cut-grass	1	10.0	tr.
Sparganium minimum, burreed	1	10.0	tr.
unidentified seeds	1	10.0	tr.
Lemna minor, small-leaved duckweed	2	20.0	0.5
green algae	1	10.0	1.2
Miscellaneous and unidentified vegetation	3	30.0	2.0
Total Animal	0	0.0	0.0
Grit	10	100.0	11.1
Lead shot (ingested)	0	0.0	0 Shot
Total Number and Volume:	19,370 $\pm$50		20.9
2 GADWALLS			
Total Plant	2	100.0	1.3
Polygonum spp., smartweed	1	50.0	tr.
lapathifolium, nodding	1	50.0	tr.
persicaria, lady's thumb	1	50.0	tr.
Scirpus spp., bulrush	2	100.0	tr.
validus, soft-stem	2	100.0	tr.
fluviatilis, river	1	50.0	tr.
unidentified	1	50.0	tr.
Cuscuta sp., dodder	1	50.0	0.1
Bohemeria cylindrica, false nettle	1	50.0	tr.
Lobelia sp., lobelia	1	50.0	tr.
Miscellaneous and unidentified vegetation	2	100.0	1.2

-continued-

Appendix D-5. (continued)

Food items	Freq. of occurrence	Percent occurrence	Volume in ml.
Total Animal	0	0.0	0.0
Grit	2	100.0	4.5
Lead shot (ingested)	0	0.0	0 Shot
Total Number and Volume:	329		5.8
1 WOOD DUCK			
Total Plant	1	100.0	2.0
Phaseolus sp., bean	1	100.0	2.0
Total Animal	0	0.0	0.0
Grit	1	100.0	1.2
Lead shot (ingested)	0	0.0	0 Shot
Total Number and Volume:	12		3.2
2 CANVASBACKS			
Total Plant	2	100.0	2.5
Potamogeton spp., pondweed	2	100.0	0.2
nodosus	1	50.0	tr.
foliosus, leafy	1	50.0	0.2
Scirpus spp., bulrush	2	100.0	0.2
validus, soft-stem	2	100.0	tr.
fluviatilis, river	2	100.0	0.2
unidentified	1	50.0	tr.
Sparganium minimum, burreed	1	50.0	0.1
unidentified seeds	1	50.0	tr.
Miscellaneous and unidentified vegetation	1	50.0	2.0
Total Animal	0	0.0	0.0
Grit	2	100.0	3.5
Lead shot	1	50.0	1 Shot
Total Number and Volume:	113		6.0

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Appendix D-5. (continued)

Food items	Freq. of occurrence	Percent occurrence	Volume in ml.
2 REDHEADS			
Total Plant	2	100.0	4.5
Potamogeton foliosus, leafy pondweed	1	50.0	tr.
Polygonum lapathifolium, nodding smartweed	1	50.0	tr.
Scirpus validus, soft-stem bulrush	2	100.0	tr.
Miscellaneous and unidentified vegetation	2	100.0	4.5
Total Animal	0	0.0	0.0
Grit	2	100.0	10.5
Lead shot (ingested)	0	0.0	0 Shot
Total Number and Volume:	8		15.0
1 RUDDY DUCK			
Total Plant	1	100.0	tr.
Polygonum lapathifolium, nodding smartweed	1	100.0	tr.
Total Animal	0	0.0	0.0
Grit	1	100.0	2.0
Lead shot (ingested)	0	0.0	0 Shot
Total Number and Volume:	12		2.0
3 LESSER SCAUPS			
Total Plant	3	100.0	1.6
Potamogeton spp., pondweed	3	100.0	1.2
pectinatus, sago	2	66.6	0.6
foliosus, leafy	3	100.0	0.6
Scirpus spp., bulrush	1	33.3	tr.
americanus, three-square	1	33.3	tr.
fluviatilis, river	1	33.3	tr.

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Appendix D-5. (continued)

Food items	Freq. of occurrence	Percent occurrence	Volume in ml.
Brassica sp., mustard	1	33.3	0.1
Hibiscus palustris, marsh mallow	1	33.3	tr.
unidentified seeds	1	33.3	tr.
Miscellaneous and unidentified vegetation	1	33.3	0.3
Total Animal	0	0.0	0.0
Grit	3	100.0	2.8
Lead shot (ingested)	1	33.3	1 Shot
Total Number and Volume:	380		4.4
3 RING-NECKED DUCKS			
Total Plant	3	100.0	0.4
Potamogeton pectinatus, sago pondweed	1	33.3	0.1
Sparganium minimum, burreed	1	33.3	0.2
Brassica sp., mustard	1	33.3	tr.
Miscellaneous and unidentified vegetation	1	33.3	0.1
Total Animal	0	0.0	0.0
Grit	3	100.0	7.0
Lead shot (ingested)	0	0.0	0 Shot
Total Number and Volume:	42		7.4
1 BUFFLEHEAD			
Total Plant	1	100.0	0.3
Polygonum lapathifolium, nodding smartweed	1	100.0	tr.
Potamogeton pectinatus, sago pondweed	1	100.0	0.1
Potamogeton foliosus, leafy pondweed	1	100.0	tr.

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Appendix D-5. (concluded)

Food items	Freq. of occurrence	Percent occurrence	Volume in ml.
Scirpus validus, soft-stem bulrush	1	100.0	tr.
Miscellaneous and unidentified vegetation	1	100.0	0.2
Total Animal	0	0.0	0.0
Grit	1	100.0	0.6
Lead shot (ingested)	0	0.0	0 Shot
Total Number and Volume:	9		0.9
1 HOODED MERGANSER			
Total Plant	0	0.0	0.0
Total Animal	1	100.0	13.0
Pisces, fish	1	100.0	13.0
Grit	0	0.0	0.0
Lead shot (ingested)	0	0.0	0 Shot
Total Number and Volume:	1		13.0

[a]Taken from Schiller (1969)

Appendix E-1. Endangered (E) or Threatened (T) Species in the States Surrounding Lake Erie

	Ohio[a]	Pennsylvania[b]	Michigan[c]	New York[d]
MOLLUSKS				
Actinonaias ellipsiformis			T	
Anodonta subgibbosa			T	
Cyclonai tuberculata			T	
Cyprogenia stegaria	E			
Dysnomia triquetra			T	
Elliptio complanatus			T	
Epioblasma sampsoni *				
*Epioblasma sulcata delicata**[e]	E			
Epioblasma torulosa rangiana	E			
Fusconaia subrotunda[e]	E			
Lampsilis fasciola			T	
*Lampsilis o. orbiculata**	E			
Lampsilis ovata	E			
Lampsilis teres	E			
Obovaria leibii[e]			E	
Plagiola lineolata	E			
Plethobasus cyphyus	E			
Pleurobema clava	E		T	
Pleurobema cordatum	E			
Potamilus laevissimus	E			
Quadrula cylindrica	E			
Quadrula nodulata	E			
Quadrula metanevra	E			
Simpsoniconcha ambigua[e]	E		E	
Amnicola binneyana[e]			T	
Anguispira kochi[e]			T	
Discus patulus[e]			T	
Fontigens nicklineana[e]			T	
Haplotrema concaveum[e]			T	
Lymnaea megasoma			T	
Mesodon elevatus[e]			T	
Mesodon sayanus[e]			T	
Mesomphix cupreus[e]			T	
Pomatiopsis cincinnatiensis			T	
Succinea ovalis chittenangoensis				E
Triodopsis notata[e]			T	
Zoogenetes harpa			T	
CRUSTACEANS				
Orconectes obscurus	E			

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Appendix E-1. (continued)

	Ohio[a]	Pennsylvania[b]	Michigan[c]	New York[d]
INSECTS				
Lycaeides melissa samuelis				E
FISH				
Ohio lamprey (*Ichthyomyzon bdellium*)	E			
northern brook lamprey (*Ichthyomyzon fossor*)	E			
Allegheny brook lamprey (*Ichthyomyzon greeleyi*)	E			
silver lamprey (*Ichthyomyzon unicuspis*)	E			
American brook lamprey (*Lampetra lamottei*)	E			
shortnose sturgeon (*Acipenser brevirostrun*)*		E		E
lake sturgeon (*Acipenser fulvescens*)	E	E	T	
paddlefish (*Polyodon spathula*)	E			
spotted gar (*Lepisosteus oculatus*)	E			
shortnose gar (*Lepisosteus platostomus*)	E			
mooneye (*Hiodon tergisus*)	E			
longjaw cisco (*Coregonus alpenae*)*			E	E
lake herring (*Coregonus artedii*)	E		T	
bloater (*Coregonus hoyi*)			T	
deepwater cisco (*Coregonus johannae*)			E	
kiyi (*Coregonus kiyi*)			T	
blackfin cisco (*Coregonus nigripinnis*)			E	
shortnose cisco (*Coregonus reighardi*)			E	
shortjaw cisco (*Coregonus zenithicus*)			E	
Great Lakes muskellunge (*Esox m. masquinongy*)	E			
rosyside dace (*Clinostomus funuloides*)	E		T	

Appendix E-1. (continued)

	Ohio[a]	Pennsylvania[b]	Michigan[c]	New York[d]
FISH (cont'd)				
bigeye chub (Hybopsis amblops)			T	
silver chub (Hybopsis storeriana)	E			
tonguetied minnow (Exoglossum laurae)	E			
bigeye shiner (Notropis boops)	E			
ghost shiner (Notropis buchanani)	E			
bigmouth shiner (Notropis dorsalis)	E			
pugnose minnow (Notropis emiliae)	E			
blacknose shiner (Notropis heterolepis)	E			
silver shiner (Notropis photogenis)			T	
longnose sucker (Catostomus catostomus)	E			
blue sucker (Cycleptus elongatus)	E			
lake chub sucker (Erimyzon sucetta)	E			
river redhorse (Moxostoma carinatum)	E		T	
greater redhorse (Moxostoma valenciennesi)	E			
mountain madtom (Noturus eleutherus)	E			
northern madtom (Noturus stigmosus)	E		T	
Scioto madtom (Noturus trautmani)	E			
pirate perch (Aphredoderus sayanus)	E			
burbot (Lota lota)	E			
banded killifish (Fundulus diaphanus)	E			
threespine stickleback (Gasterosteous aculeatus)		E		
eastern sand darter (Ammocrypta pellucida)	E	E	T	

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Appendix E-1. (continued)

	Ohio[a]	Pennsylvania[b]	Michigan[c]	New York[d]
FISH (cont'd)				
Iowa darter (*Etheostoma exile*)	E			
spotted darter (*Etheostoma maculatum*)	E			
Tippecanoe darter (*Etheostoma tippecanoe*)	E			
channel darter (*Percina copelandi*)	E			
longhead darter (*Percina macrocephala*)	E			
slenderhead darter (*Percina phoxocephala*)	E			
river darter (*Percina shumardi*)	E			
blue pike (*Stizostedion vitreum glaucum*)*	E	E	E	E
REPTILES AND AMPHIBIANS				
blue-spotted salamander (*Ambystoma laterale*)	E			
marbled salamander (*Ambystoma opacum*)			T	
small-mouthed salamander (*Ambystoma texanum*)			T	
eastern tiger salamander (*Ambystoma t. tigrinum*)		E		
green salamander (*Aneides aeneus*)	E	T		
cave salamander (*Eurycea lucifuga*)	E			
four-toed salamander (*Hemidactylium scutatum*)	E			
Wehrle's salamander (*Plethodon wehrlei*)	E			
eastern mud salamander (*Pseudotriton m. montanis*)		E		
western lesser siren (*Siren intermedia nettingi*)			T	
New Jersey chorus frog (*Pseudtacris triseriata kalmi*)		E		
coastal plain (southern) leopard frog (*Rana utricularia*)		E		
spotted turtle (*Clemmys guttata*)	E			

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Appendix E-1. (continued)

	Ohio[a]	Pennsylvania[b]	Michigan[c]	New York[d]
REPTILES AND AMPHIBIANS (cont'd)				
bog turtle (*Clemmys muhlenbergi*)		E		E
red-bellied turtle (*Chrysemys rubriventris*)		E		
Blandings turtle (*Emydoidea blandingi*)		E		
eastern mud turtle (*Kinosternon s. subrubrum*)		E		
eastern box turtle (*Terrapene carolina carolina*)			T	
midland smooth softshell (*Trionyx m. muticus*)		E		
black rat snake (*Elaphe obsoleta obsoleta*)			T	
northern copperbelly (*Natrix erythrogaster neglecta*)	E		T	
eastern massasauga (*Sistrurus catenatus*)		E		
eastern plains garter snake (*Thamnophis r. radix*)	E			
AVIFAUNA				
double-crested cormorant (*Phalacrocorax auritus*)			T	
Cooper's hawk (*Accipiter cooperii*)			T	
sharp shinned hawk (*Accipiter striatus*)	E			
red-shouldered hawk (*Buteo lineatus*)			T	
bald eagle (*Haliaeetus leucocephalus*)**	E	E	T	E
marsh hawk (*Circus cyaneus*)			T	
osprey (*Pandion haliaetus*)			T	E
peregrine falcon (*Falco peregrinus*)*	E	E	E	E
greater prairie chicken (*Tympanuchus cupido*)*			T	
king rail (*Rallus elegans*)	E			
piping plover (*Charadius melodus*)			T	

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Appendix E-1. (continued)

	Ohio[a]	Pennsylvania[b]	Michigan[c]	New York[d]
AVIFAUNA (cont'd)				
upland sandpiper (*Bartramia longicauda*)	E			
common tern (*Sterna hirundo*)	E			
barn owl (*Tyto alba*)			T	
Kirtland's warbler (*Dendroica kirtlandii*)*	E	E	E	
loggerhead shrike (*Lanius ludovicianus*)			T	
MAMMALS				
least shrew (*Cryptotis parva*)			T	
Indiana bat (*Myotis sodalis*)*	E	E	E	E
wood rat (*Neotoma floridana magister*)	E			
pine vole (*Microptus pinetorum*)			T	
southern bog lemming (*Symatomys cooperi*)			T	
eastern timber wolf (*Canis lupus lycaon*)*			E	
pine marten (*Martes americana*)			T	
river otter (*Lutra canadensis*)	E			
bobcat (*Lynx rufus*)	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.

[a]Ohio Division of Wildlife, 1976.

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[b]Pennsylvania Fish Commission , 1978 (fish, amphibians, and reptiles only; other species with ranges including Pennsylvania as listed on federal list of endangered species).

[c]Michigan Endangered and Threatened Species Program, 1978.

[d]Berle, 1978.

[e]Scientific name equivalents for endangered and threatened mollusks: *Epioblasma sulcata delicata* inludes *E. s. perobliqua*; *Fusconaia subrotunda* =*F. maculata*; *Obovaria leibii* = *O. subrotunda*; *Simpsoniconcha* = *Simpsonaias*; *Amnicola binneyana* = *Cincinnatatia emarginata*; *Anguispira kochi* = *A. solitaria*; *Discus patulus* = *Gonyodiscus perspectivus*; *Fontigens* = *Paludestrina*; *Haplotrema* = *Cincinnaria*; *Mesodon* = *Polygyra*; *Mesomphix* = *Omphalina*; *Triodopsis notata* = *Polygyra palliata*.

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LIST OF U.S.G.S. QUADRANGLE MAPS

Ashtabula North, Ohio	1970
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Castalia, Ohio	1969
Conneaut, Ohio - Pennsylvania	1970
Erie, Michigan - Ohio	1967
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Estral Beach, Michigan - Ohio - Ontario	1967
Geneva, Ohio	1970
Gypsum, Ohio	1969
Huron, Ohio	1969
Kelleys Island, Ohio	1969
Lacarne, Ohio	1967
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Stony Point, Michigan	1973
Tonawanda West, New York	1965
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