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ATLAS OF THE SPAWNING AND NURSERY AREAS OF GREAT LAKES FISHES

Volume VII-St. Clair Lake

Great Lakes-St. Lawrence Seaway Navigation Season Extension Program



Fish and Wildlife Service

U.S. Department of the Interior

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The Biological Services Program was established within the U.S. Fish and Wildlife Service to supply scientific information and methodologies on key environmental issues that impact fish and wildlife resources and their supporting ecosystems. The mission of the program is as follows:

- To strengthen the Fish and Wildlife Service in its role as a primary source of information on national fish and wildlife resources, particularly in respect to environmental impact assessment.
- To gather, analyze, and present information that will aid decisionmakers in the identification and resolution of problems associated with major changes in land and water use.
- To provide better ecological information and evaluation for Department of the Interior development programs, such as those relating to energy development.

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ATLAS OF THE SPAWNING AND NURSERY AREAS
OF GREAT LAKES FISHES

VOLUME VII
Lake St. Clair

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PREFACE

The fish resources of the Great Lakes have changed markedly since the settlement of the Great Lakes Basin began in the late 1700s-early 1800s. Local declines in the abundance of some highly valued species that supported early fisheries were reported in the 1800s. By the late 1950s-early 1960s, a number of important native species had disappeared from the catch, most once-productive stocks were depleted, and the fisheries that persisted were supported mainly by species of low value and utility. These undesirable changes have been attributed to the overharvest of desirable species, the invasion and introduction of undesirable exotic species, lowered water quality, and the destruction of portions of the physical habitat, including spawning grounds, vital to the maintenance of the resource base.

Since the 1950s, intensive efforts have been mounted to reestablish stable, self-sustaining fish communities, mainly by reducing sea lamprey abundance, limiting the harvest of remnant native stocks, and stocking desirable native or exotic species to replace or supplement depleted populations. Many of the native species and some of the desirable, introduced species have responded favorably and are now supporting valuable, productive fisheries. These successes suggest that continued judicious exercise of established management strategies will result in further significant improvements in the fish resources and the fisheries. An emerging perspective suggests, however, that enduring, major improvements in the fish resources and the fisheries will require greater emphasis on rehabilitation efforts directed more specifically at safeguarding and improving the quality of the fish habitat in general, and on ensuring fuller utilization of the specialized habitat required by sensitive, embryonic juvenile life stages of species that are to be included in any future, self-sustaining resource base. We prepared this atlas to provide a comprehensive information base against which past changes in the condition and use of spawning and nursery habitat of Great Lakes fishes could be viewed and evaluated and the needs of the future, self-sustaining resource base could be projected.

The atlas is composed of the following 14 volumes:

- | | |
|---|---|
| I. Spawning and Nursery Areas
of Great Lakes Fishes: A
Summary by Geographic Area | VIII. Detroit River |
| II. Lake Superior | IX. Lake Erie |
| III. St. Marys River | X. Niagara River |
| IV. Lake Michigan | XI. Lake Ontario |
| V. Lake Huron | XII. St. Lawrence River |
| VI. St. Clair River | XIII. Reproductive Characteristics
of Great Lakes Fishes |
| VII. Lake St. Clair | XIV. Literature Cited |

Volume I is designed to permit the reader to determine quickly whether a particular geographic area of interest contains fish spawning or nursery areas that are described in volumes II-XII. Volumes II-XII consolidate existing information describing spawning and nursery areas used by stocks of fish, including anadromous stocks, considered to be residents of the Great Lakes and their connecting waters. The information presented for each spawning or nursery area identified in volumes II-XII includes, when known, the area's precise location, history of use, season of use, water temperatures during the season of use, major substrate type, and water depth. Pre- and post-spawning migrations of mature fish and movements of young fish are also described, insofar as this information serves to better delineate spawning or nursery areas. Volume XIII contains concise descriptions of the reproductive characteristics of species included in volumes I-XII.

In the preparation of the atlas we found that considerable information was available for most of the species that support (or supported) major recreational or commercial fishes, or that are or were major components of the forage base; conversely, relatively little information was available for many other species not included in these general categories. For most species, spawning areas were more completely described than were nursery areas. The historical information in particular provided more extensive descriptions of spawning areas than of nursery areas, because much of this information was obtained from records of fisheries that had been conducted for spawning fish. Thus, although the information available to us for compilation was relatively extensive, it was nonetheless incomplete for the reasons given above. Users of the atlas are therefore cautioned not to view the lack of explicit reference to a given area as conclusive evidence that the area is or was not used as a spawning or nursery area by Great Lakes fishes.

Sources of the information incorporated in the atlas are described in volume I. Acknowledgements are also given in volume I.

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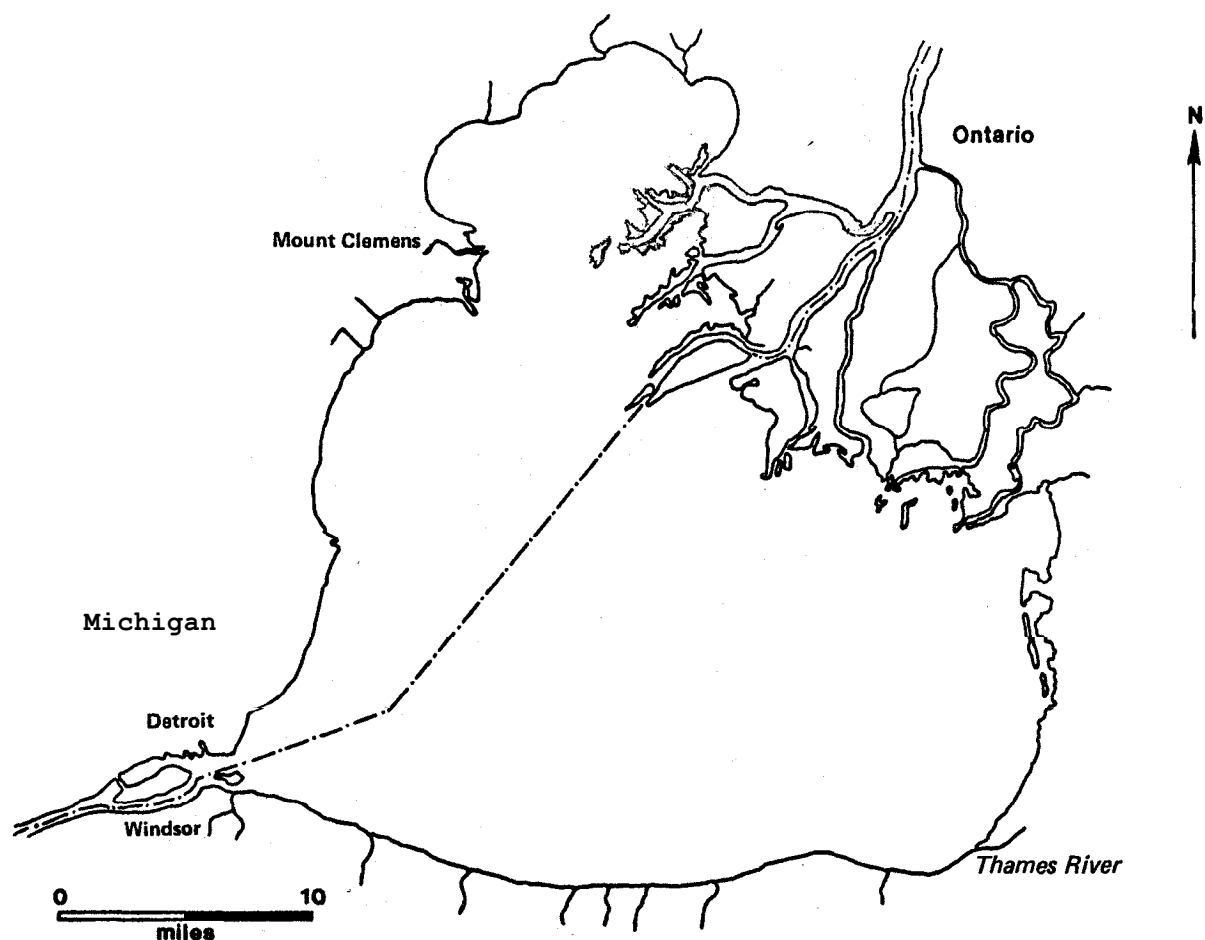
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INTRODUCTION



Lake St. Clair, together with the St. Clair River and the Detroit River, forms the connecting waterway between Lake Huron and Lake Erie. The bays and wetlands of Lake St. Clair, especially in the St. Clair Flats area at the mouth of the St. Clair River, are important spawning and nursery areas for many species that support major fisheries in the waterway and in Lake Huron and Lake Erie (Environ. Can. 1977a; FWS 1979d; Int. Great Lakes Levels Hoard 1973; Jaworski and Raphael 1978a; MDNR 1976, 1977; Scott et al. 1978).

More than 70 species of fish have been recorded as residents, or migrants, in Lake St. Clair (FWS, unpubl. data; MDNR, undated; MWRC 1975). This volume describes the reproductive habitat used by the 34 species for which information was available. Twenty-eight species treated in this volume are native to the lake. Most of these 28 species spawned (or spawn) in the shallow, productive St. Clair Flats area, along shore, or in tributaries to the lake. Muskellunge may be the only native species that spawns in deeper areas of the lake.

The six exotic species treated in this volume have been introduced by man or have immigrated into the lake from populations established elsewhere in the

Great Lakes drainage. Smelt probably spawn in tributaries to the lake; alewives, gizzard shad, carp, and goldfish spawn in the bays and marshes of the Flats and in other shoreline areas.

The information for each species treated in this volume is presented by geographic region beginning with Anchor Bay and the St. Clair Flats area at the head of the lake, followed by the remaining Canadian waters of the lake, and then the remaining U.S. waters of the lake. For the purposes of this atlas, we define Lake St. Clair as all open waters of the lake proper, all embayments thereof, and all adjacent wetlands and minor interconnecting channels in the St. Clair Flats area. Also included are the following portions of the main channels of the St. Clair River: North Channel downstream from a point (42°38'00", 82°39'15") adjacent to the south side of Bouvier Bay; Middle Channel downstream from a point (42°35'30", 82°38'30") adjacent to Big Fisher and Snooks highways; South Channel downstream from a point (42°30'15", 82°40'00") at approximately the head of the St. Clair Flats Canal; and St. Clair Cutoff downstream from the point (42°32'15", 82°37'30") where it enters Lake St. Clair proper. A line connecting Windmill Point (42°21'30", 82°55'30") and Askins Point (42°20'00", 82°53'30") is considered to separate the waters of Lake St. Clair from those of the Detroit River.

SEA LAMPREY

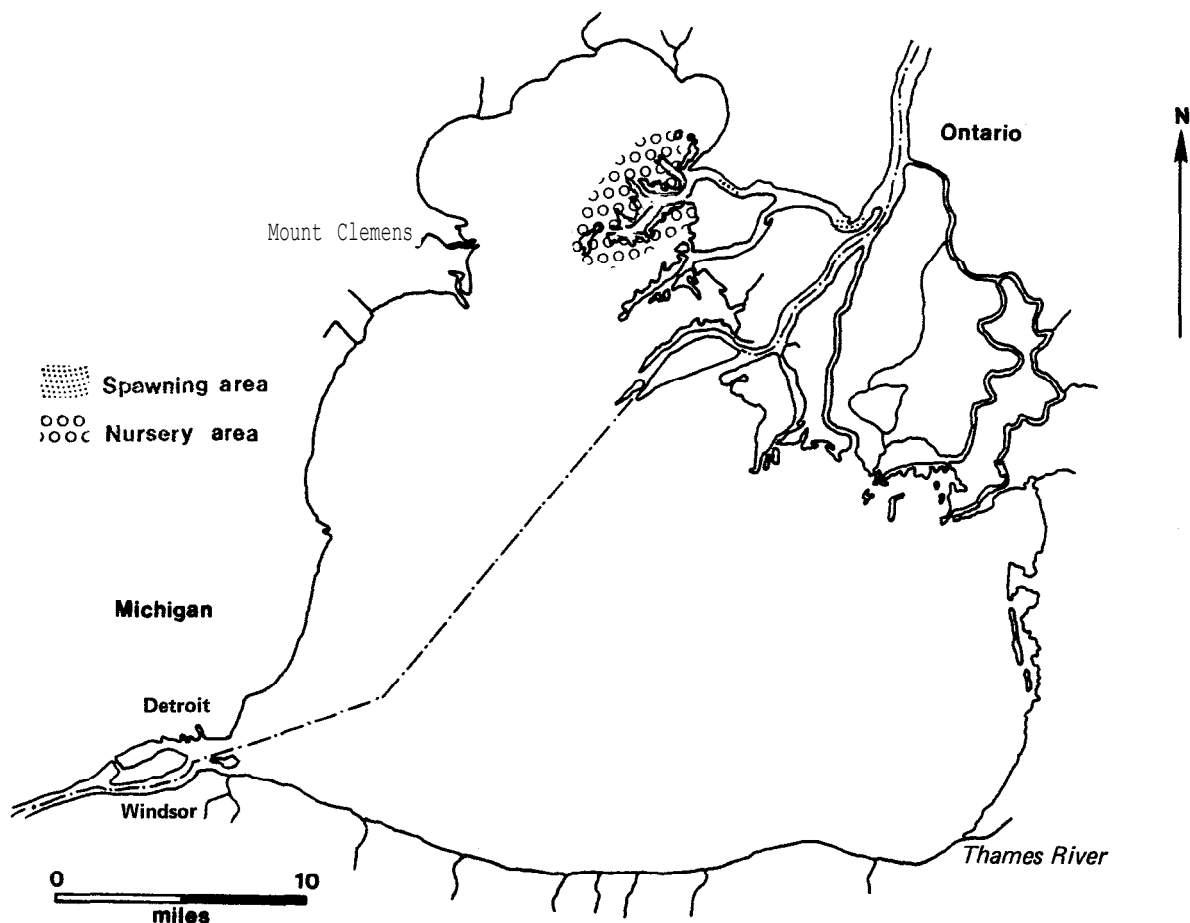
The first record of the sea lamprey in a Lake St. Clair tributary was established in 1934, in the Clinton River (42°35'30", 82°47'00") (Shetter 1949).

No ammocoetes were found in Lake St. Clair tributaries during a survey conducted in 1973, and successful lamprey production in these tributaries may be limited or prevented by insufficient stream flow and lack of spawning and nursery habitat (GLFL 1975). Spawning has been documented only in two tributaries to the lake:

Clinton River (42°35'30", 82°47'00"). Runs began in 1934, and spawning occurred in a small riffle area 1/2 mi. below a dam (Shetter 1949). Migrating adults and spawning adults on nests were observed in late May 1938 and 1939 (Deason 1939 and Trautman and Deason 1939 as cited in Applegate 1950).

Thames River (42°19'00", 82°27'00"). A spawning run apparently entered the river; ammocoetes were found in the river in 1964 (SLCC 1979a).

LAKE STURGEON



Sturgeon spawned in some portions of Lake St. Clair in early May and June (Rathhun and Wakeham 1897); these spawners may have been residents of Lake Erie (Prince 1918).

St. Clair Flats ($42^{\circ}35'00''$, $82^{\circ}40'00''$). This area is an important spawning area (Environ. Can. 1977a). The major known spawning area for Lake St. Clair sturgeon is the North Channel ($42^{\circ}37'00''$, $82^{\circ}37'00''$) of the St. Clair River (Int. Great Lakes Levels Board 1973). Sturgeon from Lake St. Clair migrate up the North, South ($42^{\circ}33'00''$, $82^{\circ}39'00''$), and Middle ($42^{\circ}35'00''$, $82^{\circ}39'00''$) channels to spawn at a site ($42^{\circ}36'30''$, $82^{\circ}32'30''$) in the North Channel; young-of-the-year sturgeon migrate from this spawning site to the marsh between Bouvier ($42^{\circ}39'30''$, $82^{\circ}39'00''$) and Goose ($42^{\circ}35'00''$, $82^{\circ}41'00''$) bays, where they are found among the rushes (Trombley, pers. comm. 1979).

LONGNOSE GAR

Little Muscamoot Bay (42°34'30", 82°38'00"). In 1980, many large adults were collected in the southeast corner of the bay during May (GLFL, unpubl. data).

Bradley Marsh (42°21'30", 82°25'30"). In 1971, longnose gars were observed spawning along shore near Bradley Marsh during May 29 to June 15, at water temperatures of about 67-84°F. Spawning occurred over a bottom of sand, silt, and decaying vegetation at water depths of about 6-12 in. Eggs were deposited on a wide variety of plant material (Dean 1972).

St. Clair Shores (42°30'00", 82°54'00"). During the early 1960s, young-of-the-year were observed in a canal (42°28'30", 82°53'00") south of Ten Mile Road (42°28'30", 82°53'00") (Moss, pers. comm. 1980).

BOWFIN

St. John's Marsh (42°38'30", 82°39'00"). The canals and marshes are spawning and nursery areas (MDNR 1977).

Mitchell Bay (42°28'00", 82°26'00"). An adult bowfin with a school of young (1 in. long) was observed in the blind end of a drainage area (location unknown) leading into Mitchell Bay, Ontario (Doan 1938).

ALEWIFE

The alewife presumably entered Lake St. Clair from Lake Erie via the Detroit River between 1931 and 1933, when alewives were first recorded for Lake Erie and Lake Buron, respectively (Miller 1957).

Bouvier Bay (42°39'30", 82°39'00"). Alewives use the canals and marshes of the St. John's Marsh area (42°38'30", 82°39'00") as spawning and nursery grounds (MDNR 1977).

Sand Island (42°39'00", 82°41'30"). In September 1979, hundreds of young-of-the-year were found on the North Channel side of Sand Island, in an area with large beds of aquatic vegetation (Myriophyllum spicatum with some Potamogeton) (Schloesser and M. Werner, pers. comm. 1979).

GIZZARD SHAD

The gizzard shad presumably entered Lake St. Clair from Lake Erie via the Detroit River between 1848 and 1877, when this species was first recorded for Lake Erie and Lake Huron respectively (Miller 1957).

St. John's Marsh (42°38'30", 82°39'00"). Gizzard shad use the canals and marshes of the St. John's Marsh area as spawning and nursery grounds (MDNR 1977).

MOONEYE

The mooneye in Lake St. Clair probably spawns in April and May (Johnson 1951).

LAKE HERRING

In the late 1890s, a small portion of the population in the western basin of Lake Erie migrated to Lake St. Clair to spawn (Rathbun and Wakeham 1897).

LAKE WHITEFISH

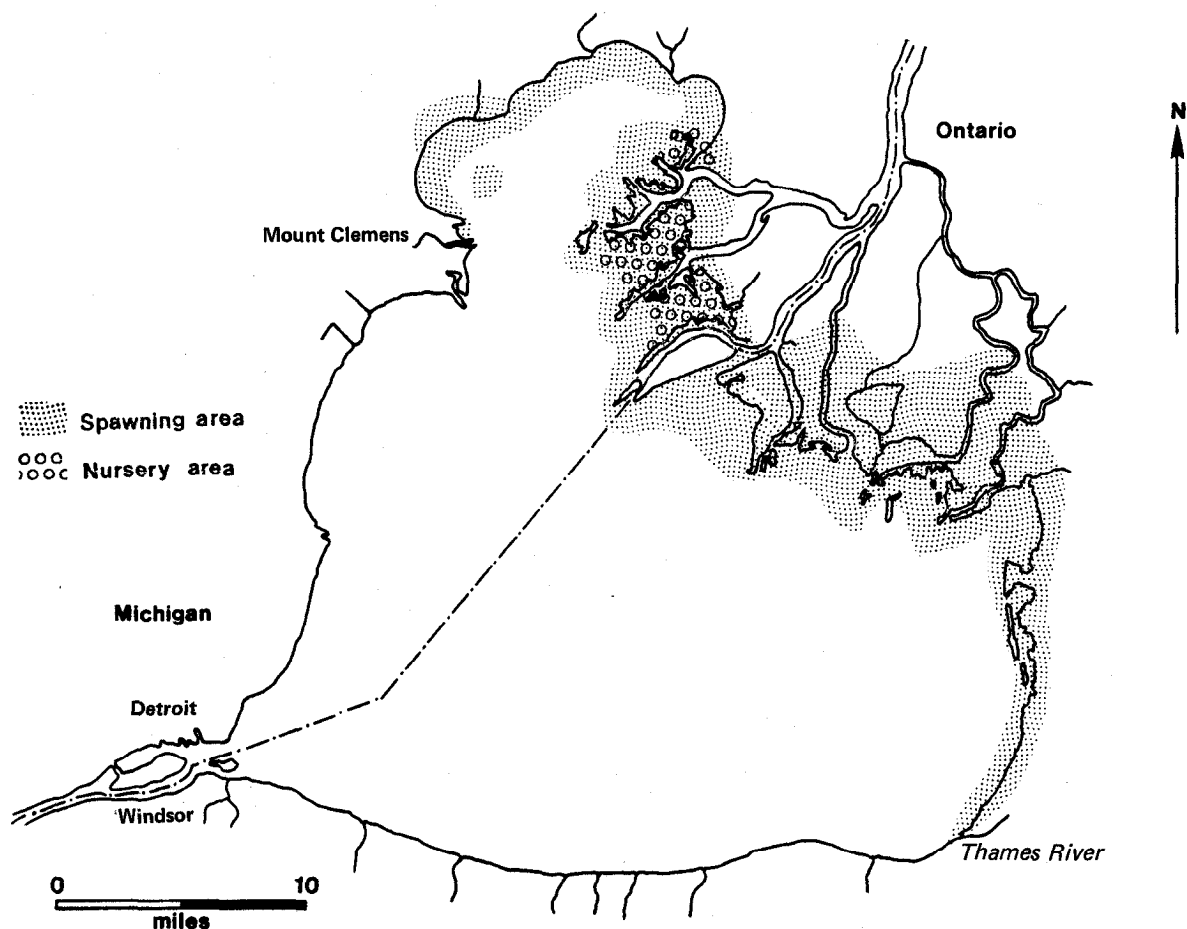
In the late 1800s, Lake St. Clair was well known as a lake whitefish spawning ground (Ward 1897). Historically, spawning runs of lake whitefish, some of which were from Lake Erie, moved up the Detroit River in mid-October to November; large numbers of these fish were caught in Lake St. Clair and in the St. Clair River (Milner 1875; MSBFC 1895; Rathbun and Wakeham 1897; Reighard 1910; Stockwell 1875; Ward 1895a; Wright 1955). By 1910, the run from Lake Erie had disappeared (Reighard 1910). These fish were believed to spawn over large beds of Chara sp. along the western shore of Lake St. Clair near the head of the Detroit River (42°21'00", 82°55'00") (Ward 1895). A few adults were taken in October and November in the area between the head of the Detroit River and Baltimore Bay (42°40'30", 82°43'30") (MSBFC 1895).

RAINBOW SMELT

Rainbow smelt eggs planted in Crystal Lake (44°40', 86°10') (Lake Michigan drainage) in 1912 are believed to be the source of rainbow smelt found in all of the Great Lakes except Lake Ontario. The first record of rainbow smelt in Lake St. Clair was established in 1932; these fish presumably entered the lake via the St. Clair River (Van Oosten 1937a). In 1951-52, spawning runs of rainbow smelt occurred in Lake St. Clair in early April through early May (Van Oosten 1953).

Sand Island (42°39'00", 82°41'30"). In 1979, young-of-the-year were collected at Sand Island during August-October (Schloesser and M. Werner, pers. comm. 1979).

NORTHERN PIKE



Northern pike spawn primarily in the sedge "meadows" of the St. Clair Flats ($42^{\circ}35'00''$, $82^{\circ}40'00''$) (FWS 1979d; Jaworski and Raphael 1978a; Trombley, pers. comm. 1979), and also along the east shore of the lake, south to the Thames River ($42^{\circ}19'00''$, $82^{\circ}27'00''$) (Trombley, pers. comm. 1979). There is a pre-spawning migration of northern pike into the marsh areas and a post-spawning migration out of these areas (Trombley, pers. comm. 1979).

Anchor Bay ($42^{\circ}38'00''$, $82^{\circ}45'00''$) (Int. Great Lakes Levels Board 1973; Tyrrell, pers. comm. 1979). Spawning occurs in most nearshore areas between Mt. Clemens ($42^{\circ}35'00''$, $82^{\circ}53'00''$) and St. John's Marsh ($42^{\circ}38'30''$, $82^{\circ}39'00''$) (FWS 1979d) and also in an area ($42^{\circ}37'00''$, $82^{\circ}46'00''$) about 2 mi E of Selfridge Air Force Base at ($42^{\circ}37'00''$, $82^{\circ}50'00''$) (Trombley, pers. comm. 1979).

Salt River ($42^{\circ}39'00''$, $82^{\circ}47'00''$). In 1979, gravid females were collected at the mouth of the Salt River in late February to early March.

The MDNR reports that the area immediately surrounding the river mouth is a staging area for northern pike that spawn in creeks in the vicinity (Schloesser and M. Werner, pers. comm. 1979).

Bouvier Bay (42°39'30", 82°39'00"). Spawning occurs in marsh areas in April over sand and gravel (Organ et al. 1978; Trombley, pers. comm. 1979). Spawning occurs off Fairhaven (42°40'30", 82°39'00") (Trombley, pers. comm. 1979) and in St. John's Marsh (42°38'30", 82°39'00"); the latter is also an important nursery area (MDNR 1976, 1977). In 1980, several ripe males and a spent female were collected east of the Baltimore Channel (42°39'00", 82°41'30") in early May (GLFL, unpubl. data).

Goose Bay (42°35'00", 82°41'00")--Fisher Bay (42°36'30", 82°39'00"). This area, including the marshes of Dickinson Island (42°37'00", 82°37'00"), is an important spawning and nursery area (Int. Great Lakes Levels Board 1973; MDNR 1975; Organ et al. 1978; Trombley, pers. comm. 1979; Tyrrell, pers. comm. 1979); since 1948, northern pike have been observed spawning in this area in April (Organ et al. 1978).

Big (42°33'30", 82°39'00") and Little (42°34'30", 82°38'00") Muscamoot Bays. This area, including the marshes of lower Harsens Island (42°35'00", 82°35'00"), is an important spawning and nursery area (Int. Great Lakes Levels Board 1973; Jaworski and Raphael 1978a; Organ et al. 1978; Trombley, pers. comm. 1979; Tyrrell, pers. comm. 1979); since 1948, northern pike have been observed spawning in this area in April (Organ et al. 1978).

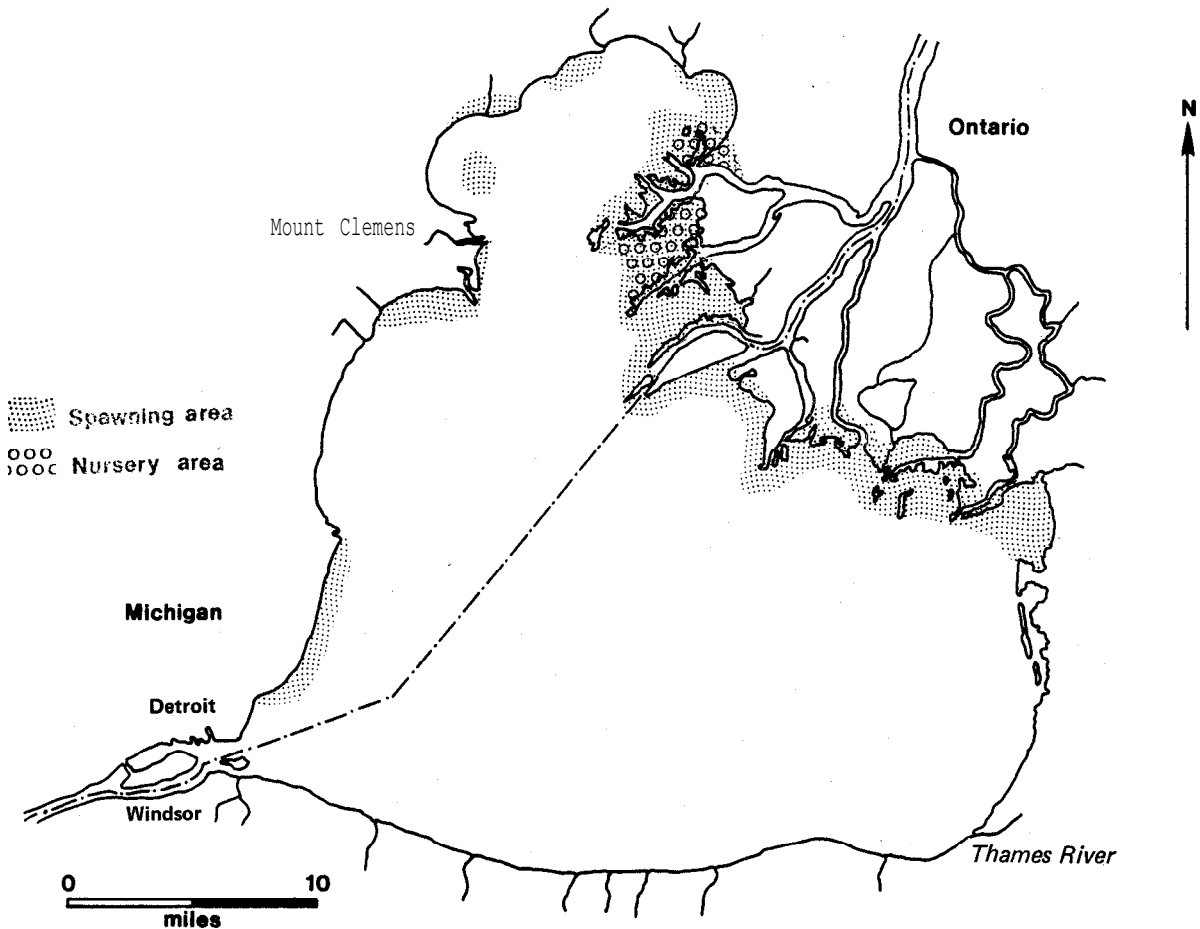
Squirrel Island (42°34'00", 82°33'30") and Walpole Island (42°34'00", 83°30'00"). Spawning occurs in the marshes (Environ. Can. 1977a).

St. Anne Bay (42°29'00", 82°30'00"). Spawning occurs in the marshes (Environ. Can. 1977a; Int. Great Lakes Levels Board 1973; Shain, pers. comm. 1979).

Mitchell Bay (42°28'00", 82°26'00") (Int. Great Lakes Levels Board 1973) 1

Mitchell Point (42°26'30", 82°26'00") and Tacky Marsh Bay (42°23'00", 82°25'00") (Environ. Can. 1977a).

MUSKELLUNGE



Muskellunge spawn primarily in Anchor Bay ($42^{\circ}38'00''$, $82^{\circ}45'00''$) and in the St. Clair Flats ($42^{\circ}35'00''$, $82^{\circ}40'00''$) area. Tagging studies have indicated that there may be one population on the western side which spawns in the northern areas of the lake and a second population on the eastern side of the lake which probably spawns along the mid-east shore (Haas 1978; Haas and Bryant, undated). Spawning occurs in weed beds at the mouths of streams during the first half of June (Westerman 1959), and is usually completed by the second week in June; in warm years spawning has been completed by mid-May (Williams 1961).

Anchor Bay ($42^{\circ}38'00''$, $82^{\circ}45'00''$). This is a major spawning area; spawning occurs here in late May to June (Bryant 1975, 1977; Haas 1973; Int. Great Lakes Levels Board 1973; Tyrrell, pers. comm. 1979). Most of the lake population spawns in the southwestern part of the bay (FWS 1979d). Tagging studies indicate rapid southward post-spawning migration into a southwest part of the lake proper, followed by a counter-clockwise movement which brings the adults back to the bay the following spring

(Bryant 1975, 1977; Haas 1973, 1978; Haas and Bryant, undated; Trombley, pers. comm. 1979). Specific spawning areas in Anchor Bay include:

St. Clair Haven (42°35'00", 82°48'00"). This former spawning area may have been destroyed by the diversion structure built at the mouth of the Clinton River (42°35'30", 82°47'00") (Trombley, pers. comm. 1979).

Selfridge Air Force Base (42°37'00", 82°50'00"). Spawning occurs in an area (42°37'00", 82°46'00") about 2 mi offshore at depths of about 3-6 ft over mud, clay, and sand in mid-May to early June (Organ et al. 1978; Trombley, pers. comm. 1979). During 1969-74, many ripe females were collected about 1 mi offshore during May and June when water temperatures were optimum for spawning (57°F). The area differs from typical spawning habitat; it is in open water and supports little or no aquatic vegetation (Haas 1978).

Salt River (42°39'00", 82°47'00"). The area immediately surrounding the river mouth is a staging area for muskellunge, that probably spawn in creeks in the vicinity (Schloesser and M. Werner, pers. comm. 1979).

New Baltimore (42°40'30", 82°44'30"). Some spent females were caught here. Historically, Baltimore Bay (42°40'30", 82°43'30") was a famous spawning ground; ripe adults were found here after mid-May (MSBFC 1890).

Bouvier Bay (42°39'30", 82°39'00"). Muskellunge spawn in the bay in early to mid-June (Organ et al. 1978). Spawning occurs in 6-9 ft of water off Fairhaven (42°40'30", 82°39'00") (Trombley, pers. comm. 1979) and in St. John's Marsh (42°38'30", 82°39'00"), the latter is also a nursery area (MDNR 1976, 1977).

St. Clair Flats (42°35'00", 82°40'00"). Ripe fish were commonly caught by anglers during the May-June spawning period (Williams 1961).

Goose Bay (42°35'00", 82°41'00")--Fisher Bay (42°36'30", 82°39'00"). This area, including the marshes of Dickinson Island (42°37'00", 82°37'00"), is an important spawning and nursery area (Int. Great Lakes Levels Board 1973; MDNR 1975; Organ et al. 1978; Trombley, pers. comm. 1979; Tyrrell, pers. comm. 1979).

Big (42°33'30", 82°39'00") and Little (42°34'30", 82°38'00") Muscamoot Bays. Muskellunge spawn in the marshy areas in early to mid-June (Int. Great Lakes Levels Board 1973; Organ et al. 1978; Trombley, pers. comm. 1979; Tyrrell, pers. comm. 1979).

St. Anne Bay (42°29'00", 82°30'00") (Int. Great Lakes Levels Board 1973; Shain, pers. comm. 1979).

Mitchell Bay (42°28'00", 82°26'00") (Int. Great Lakes Levels Board 1973).

L'Anse Creuse Bay (42°34'00", 82°49'30"). This former spawning area was destroyed by the influx of pollutants from the Clinton River cutoff canal built in 1947 (Trombley, pers. comm. 1979). Ripe fish were commonly caught by anglers near Mount Clemens (42°35'00", 82°53'00") during the May-June spawning period (Williams 1961).

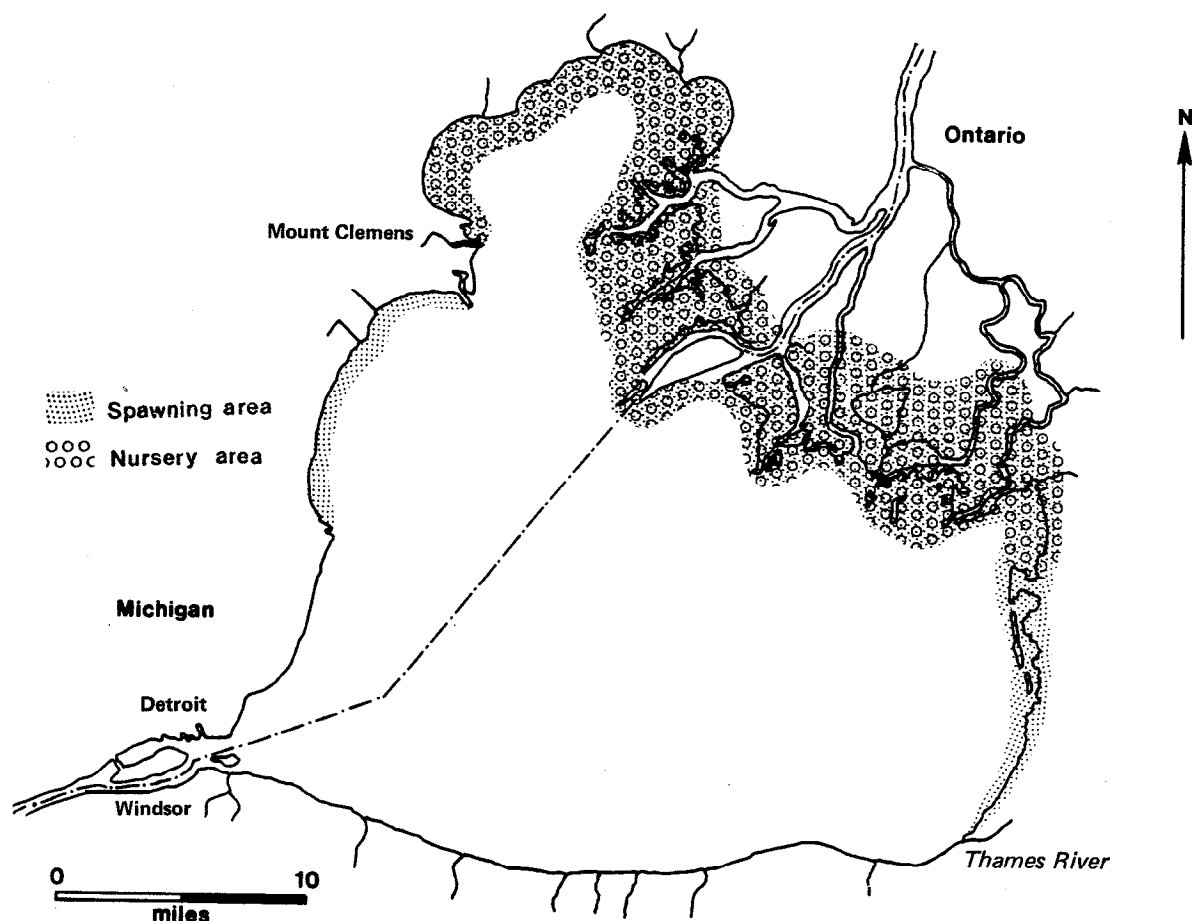
St. Clair Shores (42°30'00", 82°54'00")--Grosse Pointe (42°23'30", 82°53'30"). Since 1948, muskellunge have spawned over sand, mud, and clay in 12 ft or less of water during mid-June (Organ et al. 1978).

GOLDFISH

St. Clair Flats (42°35'00", 82°40'00"). Goldfish spawn throughout the marshy St. Clair Flats area from Bouvier Bay (42°39'30", 82°39'00") (including St. John's Marsh, 42°38'30", 82°39'00") to Mitchell Bay (42°28'00", 82°26'00") (Trombley, pers. comm. 1979; Tyrrell, pers. comm. 1979) and south to the Thames River (42°19'00", 82°27'00") (Trombley, pers. comm. 1979).

L'Anse Creuse Bay (42°34'00", 82°49'30")--St. Clair Shores (42°30'00", 82°54'00"). Spawning occurs along sea walls (Trombley, pers. comm. 1979).

CARP



Carp were abundant in Lake St. Clair in the 1880s, and a major commercial carp fishery was established in U.S. waters by 1886 (Cole 1905; Smiley 1886). The origin of these fish is unknown; presumably they originated from plantings made in inland waters of Michigan in the 1880s, or they entered the lake via the Detroit River (McCrimmon 1968). Carp spawn in the shallow marshes throughout the lake (Latta 1954).

Anchor Bay ($42^{\circ}38'00''$, $82^{\circ}45'00''$). This is an important spawning and nursery area (Int. Great Lakes Levels Board 1973).

St. Clair Flats ($42^{\circ}35'00''$, $82^{\circ}40'00''$). Carp spawn in the cattail marshes of the St. Clair Flats (Environ, Can. 1977a; Jaworski and Raphael 1978; Latta 1954). Spawning usually occurred in the St. Clair Flats in late May-early June; in the early 1900s, however, spawning was delayed by an influx of cooler than usual water from Lake Huron (Cole 1905). All of the major bays, such as Goose Bay ($42^{\circ}35'00''$, $82^{\circ}41'00''$), St. Anne Bay ($42^{\circ}29'00''$, $82^{\circ}30'00''$), Big Muscamoot Bay ($42^{\circ}33'30''$, $82^{\circ}39'00''$),

Mitchell Bay (42°28'00", 82°26'00"), and St. John's Marsh (42°38'30", 82°39'00") are 'major spawning and nursery areas (Int. Great Lakes Level Board 1973; MDNR 1977). Presently, carp spawn throughout the St. Clair Flats (42°35'00", 82°40'00") and south to the Thames River (42°19'00", 82°27'00") (Trombley, pers. comm. 1979; Tyrrell and Shell, pers. comm. 1979).

L'Anse Creuse Bay (42°34'00", 82°49'30")--St. Clair Shores (42°30'00", 82°54'00"). Carp spawn near shore throughout this area (Trombley, pers. comm. 1979).

GOLDEN SHINER

Anchor Bay (42°38'00", 82°45'00"). Spawning occurs north of Belvidere Bay at 42°36'30", 82°47'30" (Trombley, pers. comm. 1979).

St. Clair Flats (42°35'00", 82°40'00"). Golden shiners spawn throughout the marshy St. Clair Flats area from Bouvier Bay (42°39'30", 82°39'00") to Mitchell Bay (42°28'00", 82°26'00") and south to the Thames River (42°19'00", 82°27'00") (Trombley, pers. comm. 1979). St. John's Marsh (42°38'30", 82°39'00") in Bouvier Bay is an important spawning and nursery area (MDNR 1977).

EMERALD SHINER

Anchor Bay (42°38'00", 82°45'00"). Spawning occurs north of Belvidere Bay (42°36'00", 82°47'00") at 42°36'30", 82°47'30" (Trombley, pers. comm. 1979).

St. Clair Flats (42°35'00", 82°40'00"). Emerald shiners spawn in the marshy St. Clair Flats area from Bouvier Bay (42°39'30", 82°39'00"), to Mitchell Bay (42°28'00", 82°26'00") and south to the Thames River (42°19'00", 82°27'00") (Trombley, pers. comm. 1979).

L'Anse Creuse Bay (42°34'00", 82°49'30")--St. Clair Shores (42°30'00", 82°54'00"). Emerald shiners spawn nearshore in this area (Trombley, pers. comm. 1979).

COHMOM SHINER

Anchor Bay (42°38'00", 82°45'00"). Spawning occurs north of Belvidere Bay (42°36'00", 82°47'00") at 42°36'30", 82°47'30" (Trombley, pers. comm. 1979).

St. Clair Flats (42°35'00", 82°40'00"). Common shiners spawn in the marshy St. Clair Flats area from Bouvier Bay (42°39'30", 82°39'00") to Mitchell Bay (42°28'00", 82°26'00") and south to the Thames River (42°19'00", 82°27'00") (Trombley, pers. comm. 1979).

SPOTTAIL SHINER

Anchor Bay (42°38'00", 82°45'00"). Spawning occurs north of Belvidere Bay (42°36'00", 82°47'00") at 42°36'30", 82°47'30" (Trombley, pers. comm. 1979).

St. Clair Flats (42°35'00", 82°40'00"). Spawning occurs in the marshy, reedy areas from Bouvier Bay (42°39'30", 82°39'00") to Mitchell Bay (42°28'00", 82°26'00") and south to the Thames River (42°19'00", 82°27'00") (Trombley, pers. comm. 1979). St. John's Marsh (42°38'30", 82°39'00") in Bouvier Bay is an important spawning and nursery area (MDNR 1977).

Tremblay Creek (42°18'30", 82°31'00"). In 1975, young-of-the-year were collected in a littoral area near the creek over a sandy, gravel bottom in the fall (Suns and Rees 1978).

SPOTFIN SHINER

Anchor Bay (42°38'00", 82°45'00"). Spawning occurs north of Belvidere Bay (42°35'00", 82°47'00") at 42°36'30", 82°47'30" (Trombley, pers. comm. 1979).

St. Clair Flats (42°35'00", 82°40'00"). Spotfin shiners spawn in the marshy St. Clair Flats area from Bouvier Bay (42°39'30", 82°39'00") to Mitchell Bay (42°28'00", 82°26'00") and south to the Thames River (42°19'00", 82°27'00") (Trombley, pers. comm. 1979).

BLUNTNOSE MINNOW

St. John's Marsh (42°38'30", 82°39'00"). The canals and marshes of the St. John's Marsh area are spawning and nursery grounds (MDNR 1977).

FATHEAD MINNOW

St. John's Marsh (42°38'30", 82°39'00"). The canals and marshes of the St. John's Marsh area are spawning and nursery grounds (MDNR 1977).

SUCKER spp.

Clinton River (42°35'30", 82°47'00"). In 1979, a spawning run entered the Clinton River in mid-April (UPI 1979).

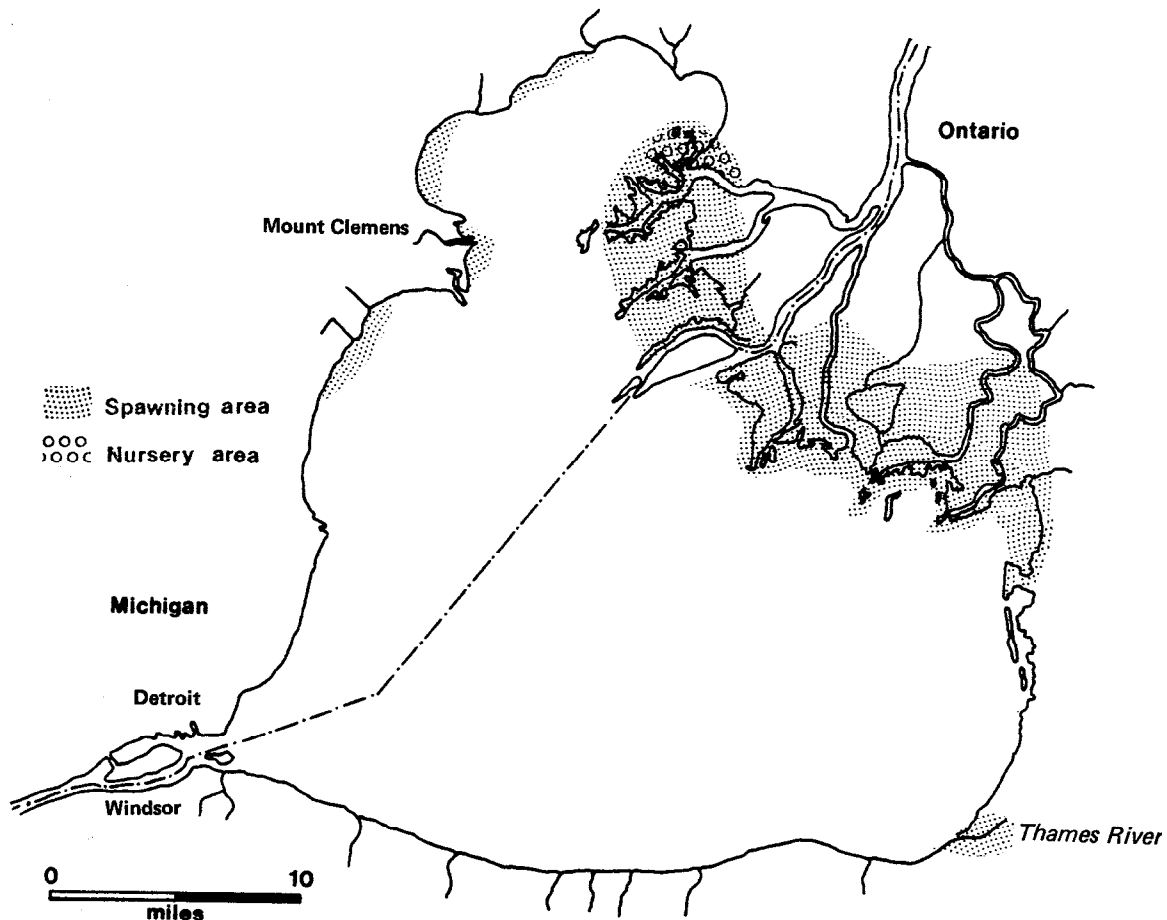
REDHORSE spp.

Clinton River (42°35'30", 82°47'00"). Good spawning runs entered the Clinton River and north branch of the Clinton River prior to the early 1950s (Kandt, pers. comm. 1979).

BROWN BULLHEAD

Anchor Bay (42°38'00", 82°45'00"). Historically, brown bullheads spawned in the bay off St. Clair Haven (42°35'00", 82°48'00"); they presently spawn north of Belvidere Bay (42°36'00", 82°48'00") at 42°36'30", 82°47'30" (Trombley, pers. comm. 1979).

CHANNEL CATFISH



Anchor Bay ($42^{\circ}38'00''$, $82^{\circ}45'00''$). Spawning occurs in most nearshore areas of the bay (FWS 19794).

New Baltimore ($42^{\circ}40'30''$, $82^{\circ}44'30''$)--Anchorville ($42^{\circ}41'30''$, $82^{\circ}41'30''$). Since 1948, spawning has occurred along the shore over clay, sand, and mud (Organ et al. 1978; Trombley, pers. comm. 1979).

Salt River ($42^{\circ}39'00''$, $82^{\circ}47'00''$)--Selfridge Air Force Base ($42^{\circ}37'00''$, $82^{\circ}50'00''$). Spawning occurs along shore (Trombley, pers. comm. 1979).

Clinton River ($42^{\circ}35'30''$, $82^{\circ}47'00''$). Spawning occurs at the river mouth (Tyrrell, pers. comm. 1979).

L'Anse Creuse Bay ($42^{\circ}34'00''$, $82^{\circ}49'30''$) (Trombley, pers. comm. 1979). Spawning occurs along shore south for about 3 mi from the Clinton Cutoff Canal ($42^{\circ}33'30''$, $82^{\circ}50'30''$) over clay and sand (Organ et al. 1978).

St. Clair Flats (42°35'00", 82°40'00"). Channel catfish spawn here (Environ. Can. 1977a). The area includes St. John's Marsh (42°38'30", 82°39'00"), which is an important nursery area (MDNR 1977).

Thames River (42°19'00", 82°27'00"). A spawning run occurs here (Shain, pers. comm. 1979).

BULLHEAD spp.

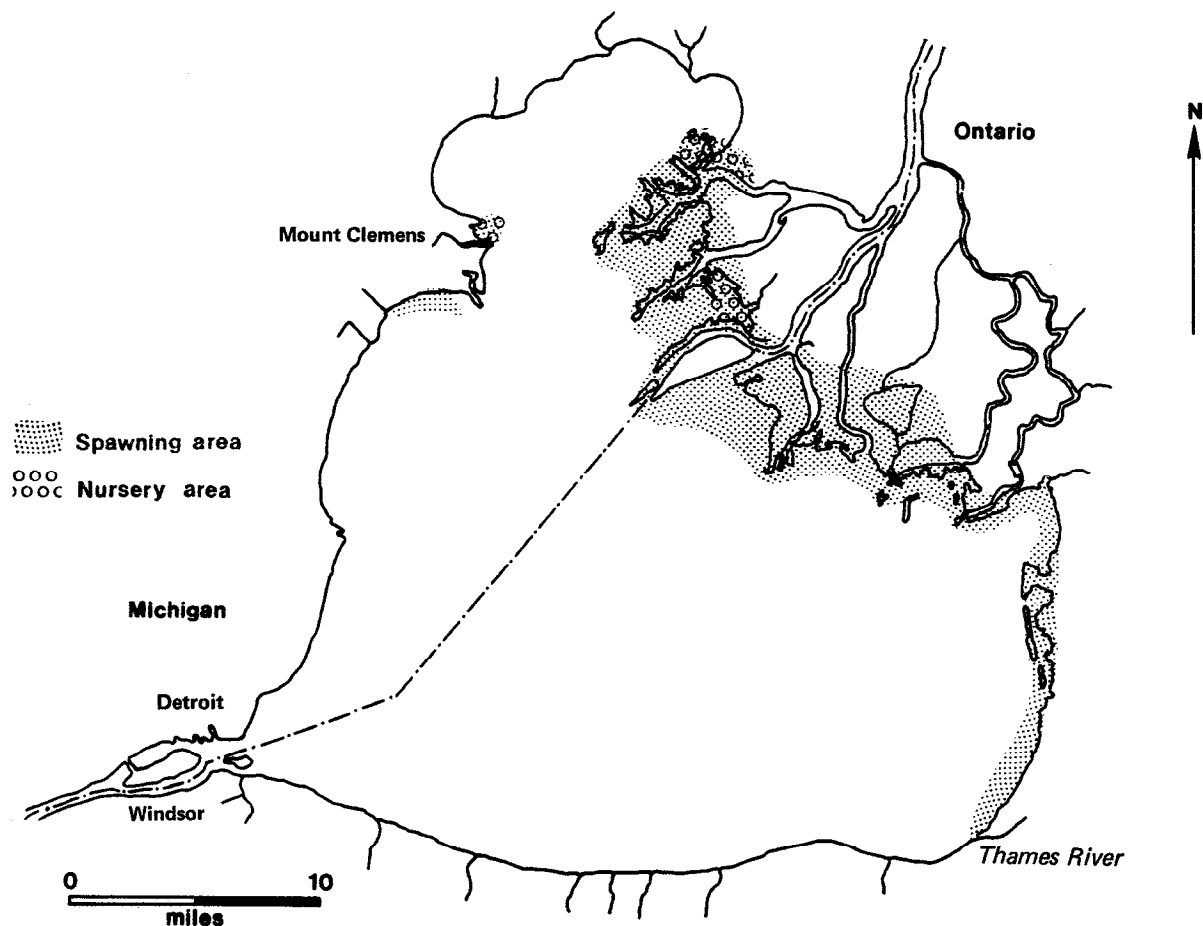
St. John's Marsh (42°38'30", 82°39'00"). This is a spawning and nursery area for bullheads (MDNR 1977).

WHITE BASS

Thames River (42°19'00", 82°27'00"). Spawning runs enter the Thames River in early May, immediately after the walleye spawning runs end (Shain, pers. comm. 1979).

Ford's Cove (42°27'30", 82°52'30"). White bass spawn in Ford's Cove at the mouth of the Milk River (42°27'30", 82°52'30") in late May to early June (Tyrrell, pers. comm. 1979).

ROCK BASS



St. Clair Flats (42°35'00", 82°40'00"). Rock bass spawn in vegetated, protected bays and channels primarily in the St. Clair Flats area from Bouvier Bay (42°39'30", 82°39'00") to Mitchell Bay (42°28'00", 82°26'00") and south to the Thames River (42°19'00", 82°27'00") (Shain, pers. comm. 1979; Trombley, pers. comm. 1979; Tyrrell, pers. comm. 1979).

St. John's Marsh (42°38'30", 82°39'00"). This is an important nursery area (MDNR 1977).

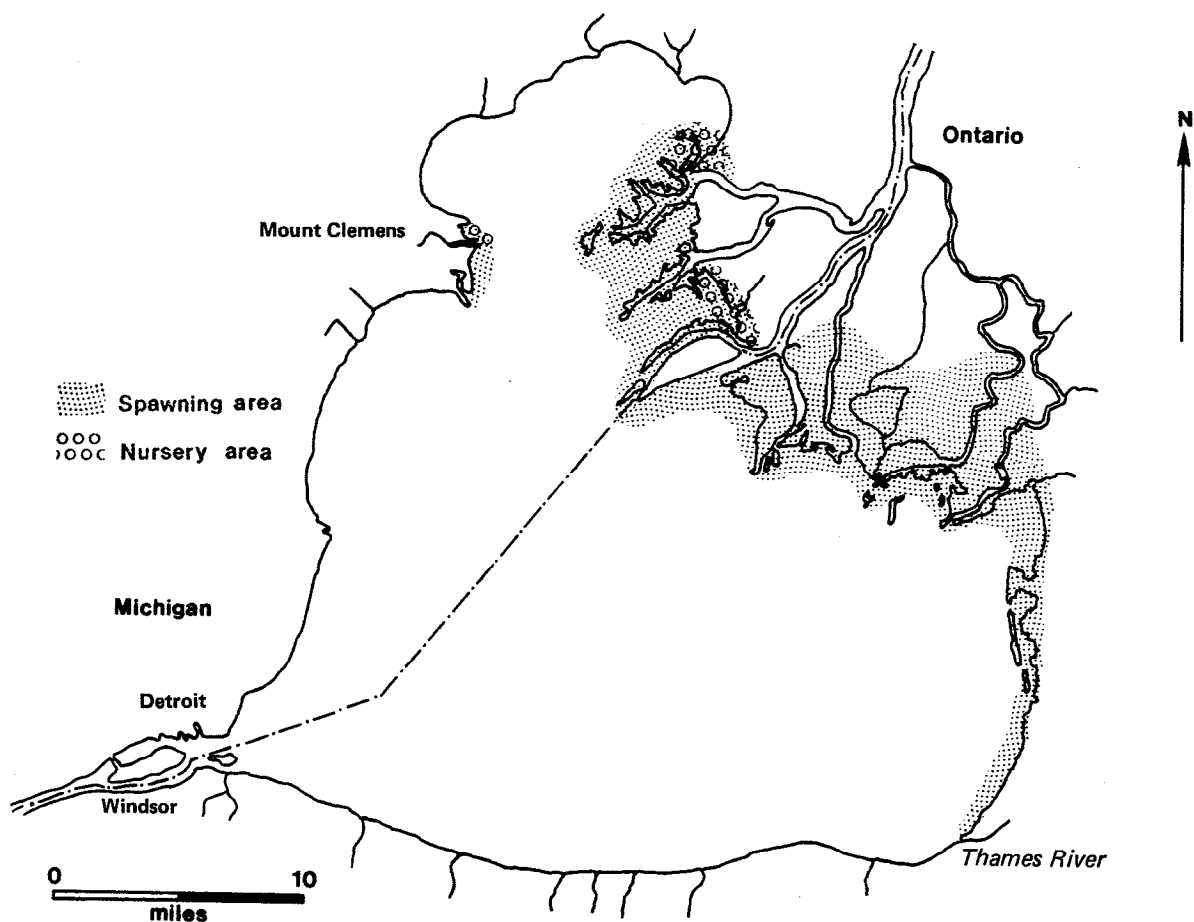
Little Muscamoot Bay (42°34'30", 82°38'00"). In 1979, some young-of-the-year (YOY) were collected here over vegetation during the summer (Schloesser and M. Werner, pers. comm. 1979).

St. Anne Bay (42°29'00", 82°30'00") and Goose Lake (42°31'30", 82°31'00"). These are spawning areas (Shain, pers. comm. 1979).

Belvidere Bay (42°36'00", 82°47'00"). Spawning occurs in the canals leading into the bay (Trombley, pers. comm. 1979). In 1979, YOY were collected in the bay from late May through fall in 5-10 ft of water over aquatic vegetation (Schloesser and M. Werner, pers. comm. 1979). In 1980, ripe females were collected in mid-June, at a water temperature of 64°F, on the lakeward side of the island located at the mouth of the bay (42°36'00", 82°46'30") (Goodyear, pers. comm. 1980).

L'Anse Creuse Bay (42°34'00", 82°49'30"). Spawning occurs in the canals leading into the bay (Trombley, pers. comm. 1979).

PUMPKINSEED



St. Clair Flats (42°35'00", 82°40'00"). Pumpkinseeds spawn in the marshy St. Clair Flats area from Bouvier Bay (42°39'30", 82°39'00") to Mitchell Bay (42°28'00", 82°26'00") and south to the Thames River (42°19'00", 82°27'00") (Trombley, pers. comm. 1979).

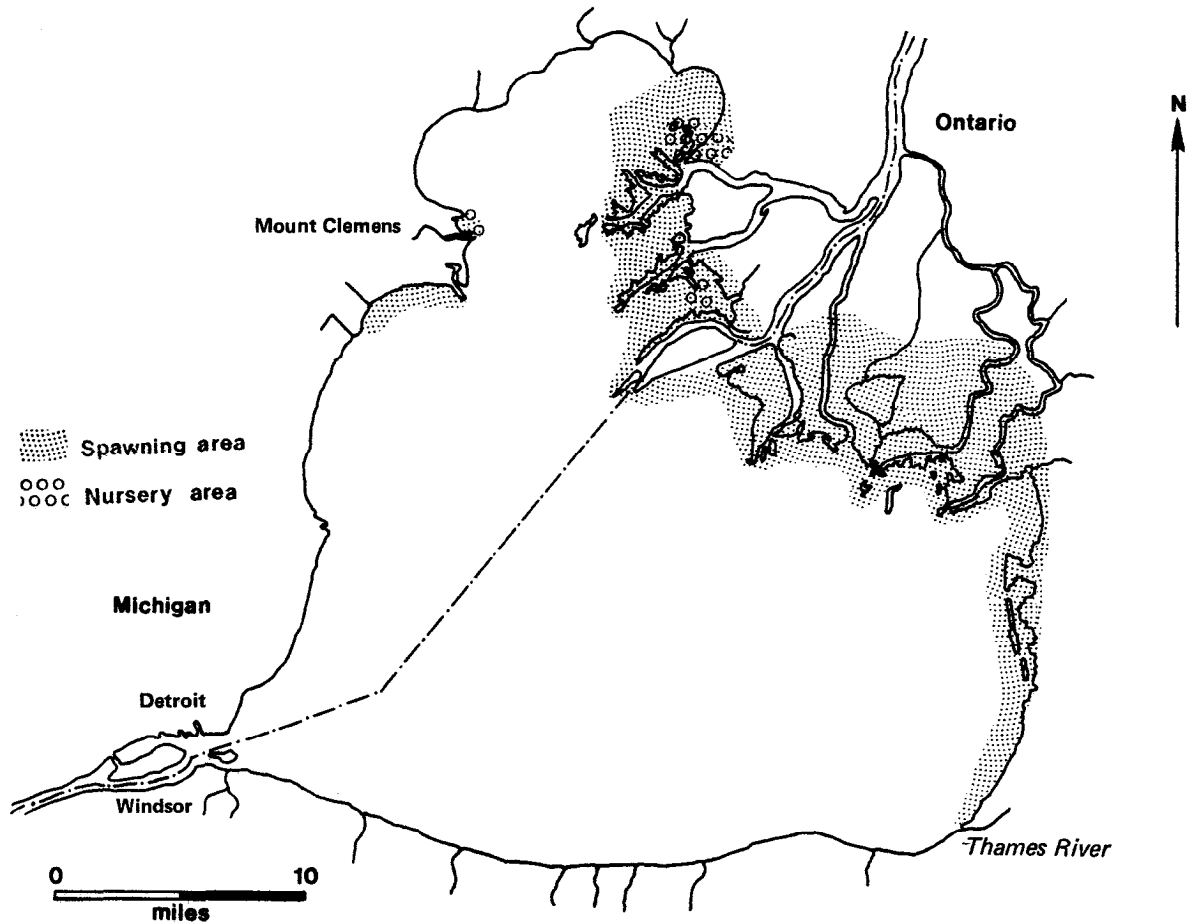
St. John's Marsh (42°38'30", 82°39'00"). This is a spawning and nursery area (MDNR 1977).

Little Muscamoot Bay (42°34'30", 82°38'00"). In 1979, a few young-of-the-year (YOY) were collected in the bay during the summer (Schloesser and M. Werner, per-s. comm. 1979).

Goose Lake (42°31'30", 82°31'00") and Mitchell Point (42°26'30", 82°26'00") --St. Luke Club (42°23'00", 82°25'00"). Spawning occurs in these areas (Shain, pers. comm. 1979).

Belvidere Bay (42°36'00", 82°47'00"). Pumpkinseeds spawn in the canals at St. Clair Haven (42°35'00", 82°48'00') and Belvidere Bay (Trombley, pers. comm. 1979). Since 1948, spawning has occurred in Belvidere Bay over mud at water depths to 7 ft (Organ et al. 1978). In 1979, YOY were found here from late May through fall (Schloesser and M. Werner, pers. comm. 1979).

BLUEGILL



St. Clair Flats ($42^{\circ}35'00''$, $82^{\circ}40'00''$). Bluegills spawn in the St. Clair Flats area; considerable spawning occurs in the cattail marshes (FWS 1979d; Jaworski and Raphael 1978) from Bouvier Bay ($42^{\circ}39'30''$, $82^{\circ}39'00''$) to Mitchell Bay ($42^{\circ}28'00''$, $82^{\circ}26'00''$) and south to the Thames River ($42^{\circ}19'00''$, $82^{\circ}27'00''$) (Trombley, pers. comm. 1979).

St. John's Marsh ($42^{\circ}38'30''$, $82^{\circ}39'00''$). This is a spawning and nursery area (MDNR 1976, 1977).

Bouvier Bay ($42^{\circ}39'30''$, $82^{\circ}39'00''$)--Big Muscamoot Bay ($42^{\circ}33'30''$, $82^{\circ}39'00''$). Since 1948, bluegills have spawned over sand and gravel in this area (Organ et al. 1978). In 1979, young-of-the-year (YOY) were collected in Little Muscamoot Bay ($42^{\circ}34'30''$, $82^{\circ}38'00''$) during the summer (Schloesser and M. Werner, pers. comm. 1979).

Goose Lake (42°31'30", 82°31'00"), St. Anne Bay (42°29'00", 82°30'00"), Mitchell Bay (42°28'00", 82°26'00"), Mud Bay (42°29'00", 82°26'00"), and Mitchell Point (42°26'30", 82°26'00")--St. Luke Club (42°23'00", 82°25'00"). Spawning occurs in shallow, vegetated areas here (Shain, pers. comm. 1979) 1

L'Anse Creuse Bay (42°34'00", 82°49'30"). Spawning occurs in the canals in this area (Trombley, pers. comm. 1979).

Belvidere Bay (42°36'00", 82°47'00"). Spawning occurs in the canals in this area (Trombley, pers. comm. 1979) and in the bay over mud bottom (Organ et al. 1978). In 1979, large numbers of YOY were collected in the bay from late May through fall (Schloesser and M. Werner, pers. comm. 1979).

SUNFISH spp.

Unidentified species of sunfish spawn in the St. Clair Flats (42°35'00", 82°40'00") and Anchor Bay (42°38'00", 82°45'00").

Anchor Bay (42°38'00", 82°45'00"). This is a spawning and nursery area (Int. Great Lakes Levels Board 1973). Since 1948, spawning has occurred at New Baltimore (42°40'30", 82°44'30") over mud, clay, and sand (Organ et al. 1978).

St. Clair Flats (42°35'00", 82°40'00"). This is a spawning area for sunfish (Environ. Can. 1977a; FWS 1979d).

Bouvier Bay (42°39'30", 82°39'00"). Since 1948, spawning has occurred here over mud, sand, and gravel (Organ et al. 1978). The St. John's Marsh (42°38'30", 82°39'00") is a spawning and nursery area (MDNR 1976).

Goose Bay (42°35'00", 82°41'00"). This is a spawning and nursery area (Int. Great Lakes Levels Board 1973).

Fisher Bay (42°36'30", 82°39'00"). Spawning occurs over mud (Organ et al. 1978).

Big Muscamoot Bay (42°33'30", 82°39'00"). This is a spawning and nursery area (Int. Great Lakes Levels Board 1973).

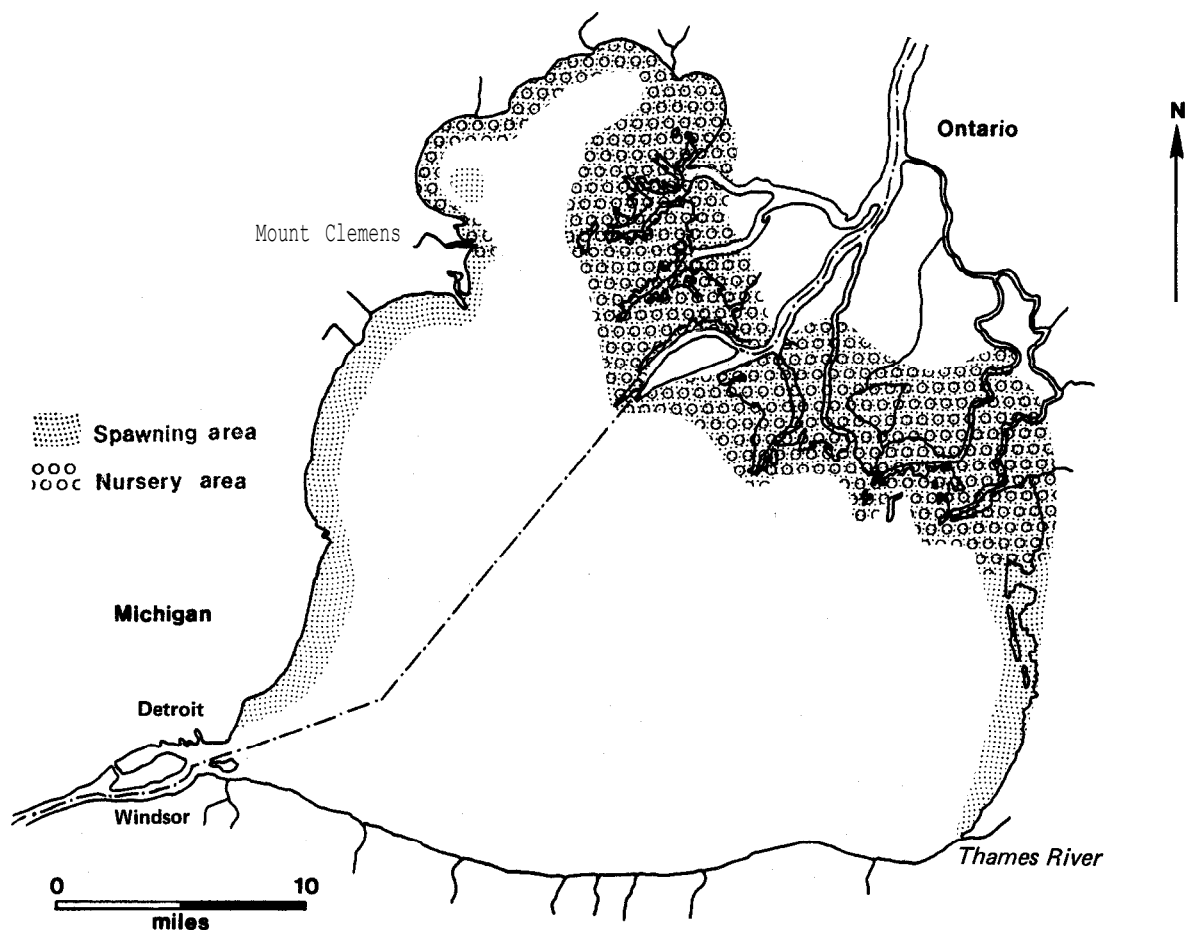
Squirrel Island (42°34'00", 82°33'30") and Walpole Island (42°34'00", 82°30'00"). Spawning occurs in the marshes (Environ. Can. 1977a).

St. Anne Bay (42°29'00", 82°30'00"). The bay and the marshes of St. Anne Island (42°32'00", 82°26'00") are spawning and nursery areas (Environ. Can. 1977a; Int. Great Lakes Levels Board 1973).

Mitchell Bay (42°28'00", 82°26'00"). This is a spawning and nursery area (Int. Great Lakes Levels Board 1973).

Mitchell Point (42°26'30", 82°26'00") and Tacky Marsh Bay (42°23'00", 82°25'00"). These are spawning areas (Environ. Can. 1977a).

SMALLMOUTH BASS



Anchor Bay ($42^{\circ}38'00''$, $82^{\circ}45'00''$). This is a valuable spawning and nursery area (Int. Great Lakes Levels Board 1973; Tyrrell and Shell, pers. comm. 1979), which has an excellent sand substrate for spawning (Korosa 1979). Spawning occurs in early summer. Spent fish subsequently move into deeper areas for the remainder of the summer (Haas 1973), but most travel only a few miles and remain in Anchor Bay (Haas and Bryant, undated).

Selfridge Air Force Base ($42^{\circ}37'00''$, $82^{\circ}50'00''$). Spawning occurs in an area ($42^{\circ}38'00''$, $82^{\circ}46'30''$), which lies about 2 mi offshore; at water depths of about 5-8 ft and has a bottom of mud and clay (Organ et al. 1978). Adults tagged at this site have moved as far as the upper St. Clair River, a distance of 30 mi (Bryant 1975). The shoreline from Vase Creek ($42^{\circ}38'30''$, $82^{\circ}48'30''$) south to Belvidere Bay ($42^{\circ}36'00''$, $82^{\circ}47'00''$) has also been used since 1948 (Organ et al. 1978).

Belvidere Bay (42°36'00", 82°47'00"). In 1979, YOY were collected in Belvidere Bay; they were taken first in late July in the middle of the bay, and later at the mouth of the bay (Schloesser and M. Werner, pers. comm. 1979).

Clinton River (42°35'30", 82°47'00"). Since 1948, smallmouth bass have spawned just off the river mouth at a depth of about 6 ft over rock (Organ et al. 1978).

St. Clair Haven (42°35'00", 82°48'00"). Spawning occurred in the bay off St. Clair Haven, until the area was modified by artificial current diversion (Trombley, pers. comm. 1979).

St. Clair Flats (42°35'00", 82°40'00"). This area is an important spawning ground; the cattail and bulrush marshes are especially important (FWS 1979d; Jaworski and Raphael 1978; Trombley, pers. comm. 1979). Spawning occurs in the Flats and south to the Thames River (42°19'00", 82°27'00") (Trombley, pers. comm. 1979). Young smallmouth bass are found throughout this area (Trombley, pers. comm. 1979).

Bouvier Bay (42°39'30", 82°39'00"). Since 1948, smallmouth bass have spawned here over sand and gravel (Organ et al. 1978). In 1953, nests containing eggs and sac fry were first seen on June 3 when the water temperature was 70°F. The nests were built among Scirpus rootlets in sand in 2-3 ft of water (Latta 1954). St. John's Marsh (42°38'30", 82°39'00") is both a spawning and nursery ground (MDNR 1976, 1977). Spawners migrate into the marsh through the canal system off the North Channel (42°37'00", 82°37'00") (Trombley, pers. comm. 1979).

Sand Island (42°39'00", 82°41'30"). In 1979, young-of-the-year (YOY) were found at Sand Island during July-September (Schloesser and M. Werner, pers. comm. 1979).

Goose Bay (42°35'00", 82°41'00"). This is a valuable spawning and nursery area (Int. Great Lakes Levels Board 1973; Tyrrell and Shell, pers. comm. 1979). In 1953, nests containing live eggs were first found in Long Point Bay (42°35'30", 82°39'00") on June 8, when the water temperature was 64°F, and they were also found along the western shore of the arm separating Long Point Bay from Goose Bay on June 11, when the water temperature was 66-68°F (Latta 1954).

Big (42°33'30", 82°39'00") and Little (42°34'30", 82°38'00") Muscamoot Bays. Big Muscamoot Bay is a valuable spawning and nursery area (Int. Great Lakes Levels Board 1973; Tyrrell and Shell, pers. comm. 1979). In 1953, nests were first seen on the northeast shore of Little Muscamoot on May 31, when the water temperature was 59°F; nesting was completed by June 12. In the Scirpus marsh (42°34'30", 82°38'00") between Big and Little Muscamoot bays, nests with fry were first observed June 11 when the water temperature was 71°F at water depths to 4 ft. Many

fry were still over the nests on June 19 (Latta 1954). In 1979, YOY were collected among aquatic vegetation in Little Muscamoot Bay in July-October, but more were found at the head of Big Muscamoot Bay over sand and silt in open water at depths of less than 6 ft (Schloesser and M. Werner, pers. comm. 1979).

Bassett Island (42°31'00", 82°35'00"). The bay between Bassett and Seaway Islands (42°33'00", 82°38'00") was historically a heavily used spawning area; limited spawning still occurs there (Trombley, pers. comm. 1979).

Chematogan Bay (42°30'00", 82°33'30") and Johnston Bay (42°30'00", 82°30'00"). Smallmouth bass from the lake migrate into the bay to spawn (Shain, pers. comm. 1979).

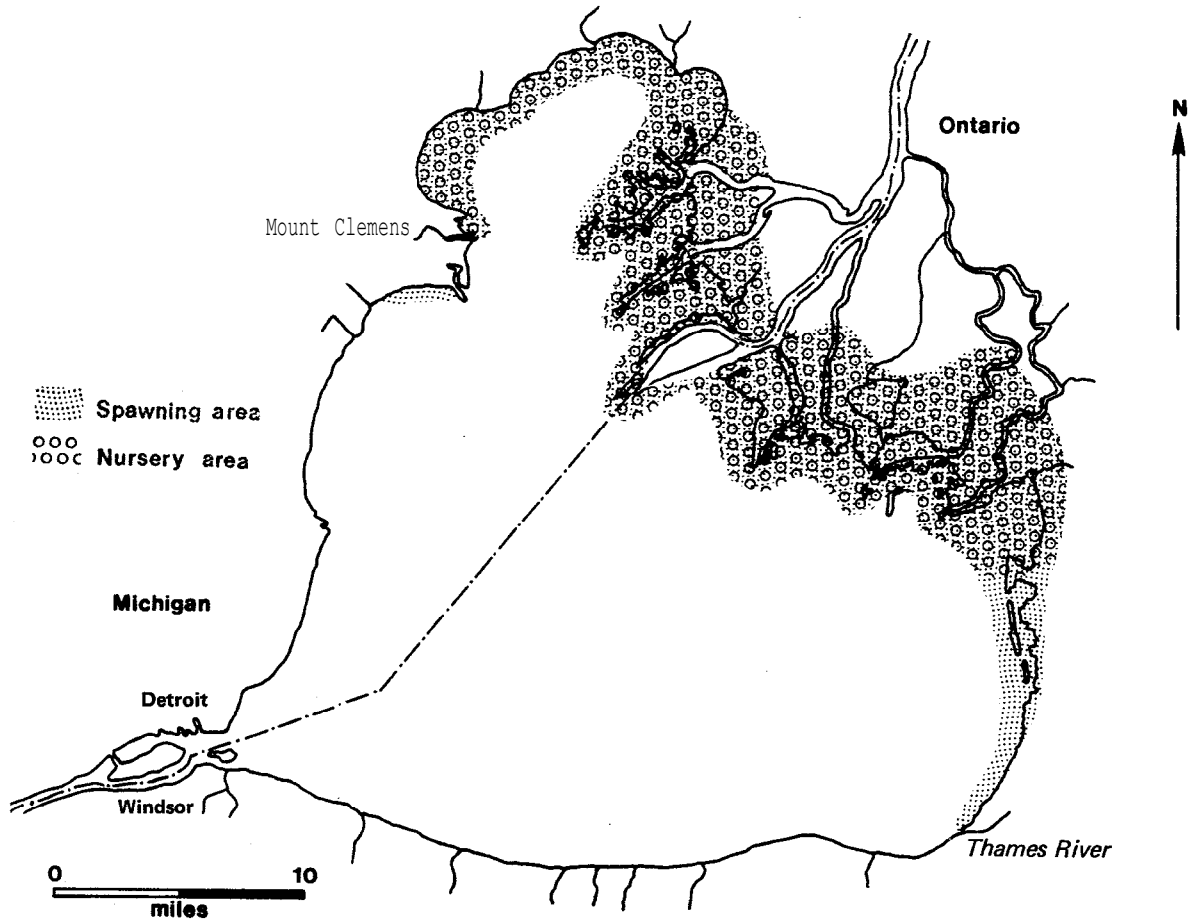
St. Anne Bay (42°29'00", 82°30'00"). Smallmouth bass migrate into the bay to spawn (Shain, pers. comm. 1979; Tyrrell and Shell, pers. comm. 1979). The bay is a valuable spawning and nursery area (Int. Great Lakes Levels Board 1973).

Mitchell Bay (42°28'00", 82°26'00"). This is a valuable spawning and nursery area (Int. Great Lakes Levels Board 1973; Tyrrell and Shell, pers. comm. 1979); the bay has an excellent sand substrate for spawning (Korosa 1979). Smallmouth bass migrate into Mud Bay (42°29'00", 82°26'00"), at the head of Mitchell Bay, to spawn (Shain, pers. comm. 1979). In the 1930s, smallmouth bass were observed building nests in the bay at depths of 2-3 ft on a sand bottom which supported little vegetation. Some nests were built as far as 1/2 mi offshore (Doan 1938b, 1939, 1940). By early July, most fry had left the nests and were concentrated in water less than 3 ft deep, along zones of vegetation (Doan 1938b).

Black Bay (42°26'00", 82°25'30"). Smallmouth bass migrate into the bay to spawn (Shain, pers. comm. 1979).

Point Huron (42°34'00", 82°47'00")--Grosse Pointe Park (42°23'00", 82°54'30"). Historically this shoreline was a major spawning area. In 1947, however, the cutoff canal (42°33'30", 82°50'30") began diverting pollutants into the area. The area south to Eleven Mile Road (42°30'00", 82°52'00") no longer supports spawning but there is still some spawning in the area from the Milk River (42°27'30", 82°52'30") south to Grosse Pointe Park (Trombley, pers. comm. 1979). In 1953, spawning occurred off the St. Clair Shores (42°30'00", 82°54'00") residential district; two partially spent females were caught 500 ft offshore from the foot of Masonic Road (42°30'30", 82°53'00") on June 4 (Latta 1954). Spawning also occurs on the sand banks off Point Huron and to the west of the point along Metropolitan Beach (42°34'00", 82°48'30") (Organ et al. 1978; Trombley, pers. comm. 1979).

LARGEMOUTH BASS



Anchor Bay ($42^{\circ}38'00''$, $82^{\circ}45'00''$). This is an important spawning and nursery area (Int. Great Lakes Levels Board 1973); spawning occurs in most nearshore areas (FWS 1979d). Since 1948, largemouth bass have spawned over mud in Belvidere Bay ($42^{\circ}36'00''$, $82^{\circ}47'00''$) and along shore north of Belvidere Bay to Vase Creek ($42^{\circ}38'30''$, $82^{\circ}48'30''$) (Organ et al. 1978; Trombley, pers. comm. 1979). In 1979, YOY were collected over aquatic vegetation in the middle of Belvidere Bay after late July and at the bulkhead on the west shore after late August (Schloesser and M. Werner, pers. comm. 1979).

St. Clair Flats ($42^{\circ}35'00''$, $82^{\circ}40'00''$). Largemouth bass spawn throughout the St. Clair Flats area, and the cattail marshes are especially good spawning areas (FWS 1979d; Jaworski and Raphael 1978); spawning extends south to the Thames River ($42^{\circ}19'00''$, $82^{\circ}27'00''$) (Trombley, pers. comm. 1979). The inshore area of the Flats is a nursery ground (Trombley, pers. comm. 1979).

Bouvier Bay (42°39'30", 82°39'00"). Since 1948, spawning has occurred here over mud, sand, and gravel out to a depth of about 10 ft (Organ et al. 1978). St. John's Marsh (42°38'30", 82°39'00") is an important spawning and nursery area (Kandt, pers. comm. 1979; MDNR 1976, 1977).

Fisher Bay (42°36'30", 82°39'00"). Spawning occurs over mud (Organ et al. 1978).

Goose Bay (42°35'00", 82°41'00"). This is an important spawning and nursery area (Int. Great Lakes Levels Board 1973; Kandt, pers. comm. 1979; Tyrrell, pers. comm. 1979).

Big Muscamoot Bay (42°33'00", 82°39'00"). This is an important spawning and nursery area (Int. Great Lakes Levels Board 1973). In 1979, a few young-of-the-year (YOY) were collected in open water in the bay at the end of July (Schloesser and M. Werner, pers. comm. 1979).

Little Muscamoot Bay (42°34'30", 82°38'00"). In 1979, a few YOY were collected over aquatic vegetation in about 6 ft of water in July-September (Schloesser and M. Werner, pers. comm. 1979).

Bassett Island (42°31'00", 82°35'00"). The marshes of lower Bassett Island were a major historical spawning area; they still support some reproduction (Trombley, pers. comm. 1979).

Johnston Bay (42°30'00", 82°30'00"). This is a spawning area (Shain, pers. comm. 1979).

St. Anne Island (42°32'00", 82°26'00"). The marshes of the lower island are important spawning and nursery areas (Int. Great Lakes Levels Board 1973; Shain, pers. comm. 1979).

Mitchell Bay (42°28'00", 82°26'00"). This is a spawning and nursery area (Int. Great Lakes Levels Board 1973).

Mitchell Point (42°26'30", 82°26'00")--St. Luke Club (42°23'00", 82°25'00"). Spawning occurs here (Shain, pers. comm. 1979).

L'Anse Creuse Bay (42°34'00", 82°49'30"). Largemouth bass spawn at Metropolitan Beach (42°34'00", 82°48'30") (Kandt, pers. comm. 1979).

BASS spp.

St. Clair Flats (42°35'00", 82°40'00"). The shallow areas, averaging less than 30 ft deep, are important spawning areas for black bass (Environ. Can. 1977a).

Squirrel Island (42°34'00", 82°33'30"). The marshes are important spawning areas (Environ. Can. 1977a).

Walpole Island (42°34'00", 82°30'00"). The marshes are important spawning areas (Environ. Can. 1977a). Historically, Indians fished on bass spawning grounds here (Ont. Game Fish 1911, 1913b).

St. Anne Island (42°32'00", 82°26'00"). The marshes are important spawning areas (Environ. Can. 1977a). Historically, Indians fished on bass spawning grounds on the St. Anne Island Indian Reserve (Ont. Game Fish 1913b).

Mitchell Point (42°26'30", 82°26'00") and Tacky Marsh Bay (42°23'00", 82°25'00"). The marshes in these areas are spawning grounds (Environ. Can. 1977a).

WHITE CRAPPIE

St. Clair Flats (42°35'00", 82°40'00"). White crappie spawn in marsh areas and canals of the St. Clair Flats from Bouvier Bay (42°39'30", 82°39'00") to Mitchell Bay (42°28'00", 82°26'00") and south to the Thames River (42°19'00", 82°27'00") (FWS 1979d; Trombley, pers. comm. 1979).

St. John's Marsh (42°38'30", 82°39'00"). This is a spawning and nursery area (MDNR 1977).

Goose Lake (42°31'30", 82°31'00"). This is a spawning area (Shain, pers. comm. 1979).

Patrick's Cove (42°27'00", 82°25'00"). Spawning occurs in vegetated areas about 4 ft deep (Shain, pers. comm. 1979).

Belvidere Bay (42°36'00", 82°47'00"). Spawning occurs in canals surrounding St. Clair Haven (42°35'00", 82°48'00") and Belvidere Bay (Trombley, pers. comm. 1979) and in Belvidere Bay, proper, over mud bottom (Organ et al. 1978).

BLACK CRAPPIE

Anchor Bay (42°38'00", 82°45'00"). Spawning occurs here in most nearshore areas (FWS 1979d).

Belvidere Bay (42°36'00", 82°47'00"). Spawning occurs in canals surrounding St. Clair Haven (42°35'00", 82°48'00") and Belvidere Bay

(Trombley, pers. comm. 1979) and Belvidere Bay, proper, over mud bottom (Organ et al. 1978).

St. Clair Flats (42°35'00", 82°40'00"). Black crappie spawn in the marsh areas and canals of the St. Clair Flats from Bouvier Bay (42°39'30", 82°39'00") to Mitchell Bay (42°28'00", 82°26'00") and south to the Thames River (42°19'00", 82°27'00") (FWS 1979d; Trombley, pers. comm. 1979).

St. John's Marsh (42°38'30", 82°39'00"). This is a spawning and nursery area (MDNR 1977).

Goose Lake (42°31'30", 82°31'00") and Patrick's Cove (42°27'00", 82°25'00"). Spawning occurs here (Shain, pers. comm. 1979).

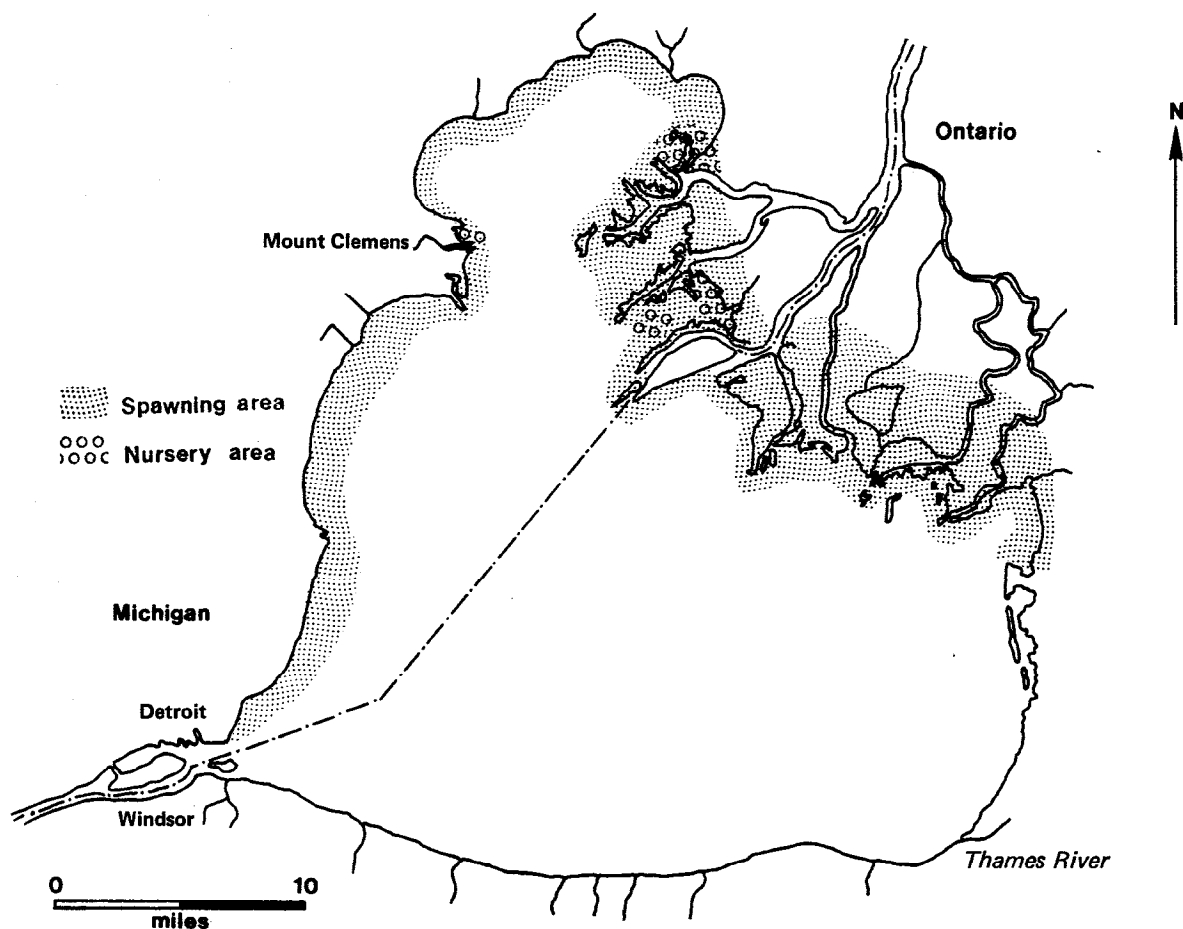
CRAPPIE spp.

Belvidere Bay (42°36'00", 82°47'00"). Since 1948, crappies have spawned in Belvidere Bay, over mud substrate in 1-7 ft of water (Organ et al. 1978). In 1979, small numbers of young-of-the-year were collected during the summer and fall in 5-10 ft of water over aquatic vegetation (Schloesser and M. Werner, pers. comm. 1979).

GREENSIDE DARTER

Little Muscamoot Bay (42°34'30", 82°38'00"). In 1979, adults in full breeding colors were collected during May and June in a vegetated area in Little Muscamoot Bay (Schloesser and M. Werner, pers. comm. 1979).

YELLOW PERCH



Yellow perch spawn in most inshore areas of Lake St. Clair (Johnston 1977). Runs begin in April, and spawning occurs over sand, gravel, and in marshes (Organ et al. 1978).

Anchor Bay ($42^{\circ}38'00''$, $82^{\circ}45'00''$). Yellow perch spawn extensively along the shoreline and in the canals on the north side of the bay (Trombley, pers. comm. 1979); spawning occurs in most nearshore areas (FWS 1979d). Since 1948, spawning has occurred along shore from Belvidere Bay ($42^{\circ}36'00''$, $82^{\circ}47'00''$) to Vase Creek ($42^{\circ}38'30''$, $82^{\circ}48'30''$) (Organ et al. 1978). In 1979, gravid and ripe adults were collected off Hall Road ($42^{\circ}38'00''$, $82^{\circ}49'00''$) in 8 ft of water over sand and Chara in April. A few YOY were also found in Belvidere Bay in late fall over aquatic vegetation (Schloesser and M. Werner, pers. comm. 1979). In 1980, males were still running ripe on May 7, and a ripe female was found June 18 when the water temperature was 63°F . Many egg masses were found on gill nets in early May (GLFL, unpubl. data).

St. Clair Flats (42°35'00", 82°40'00"). The littoral areas are important spawning grounds for yellow perch (Environ. Can. 1977a).

Bouvier Bay (42°39'30", 82°39'00")--Big Muscamoot Bay (42°33'30", 82°39'00"). Since 1948, spawning has occurred here over sand, gravel, and vegetation (Organ et al. 1978). St. John's Marsh (42°38'30", 82°39'00") is a spawning and nursery area (MDNR 1976, 1977).

Sand Island (42°39'00", 82°41'30"). In 1980, ripe males were collected around Sand Island as early as April 16 and as late as June 18, at water temperatures of 36° and 55°F, respectively (GLFL, unpubl. data).

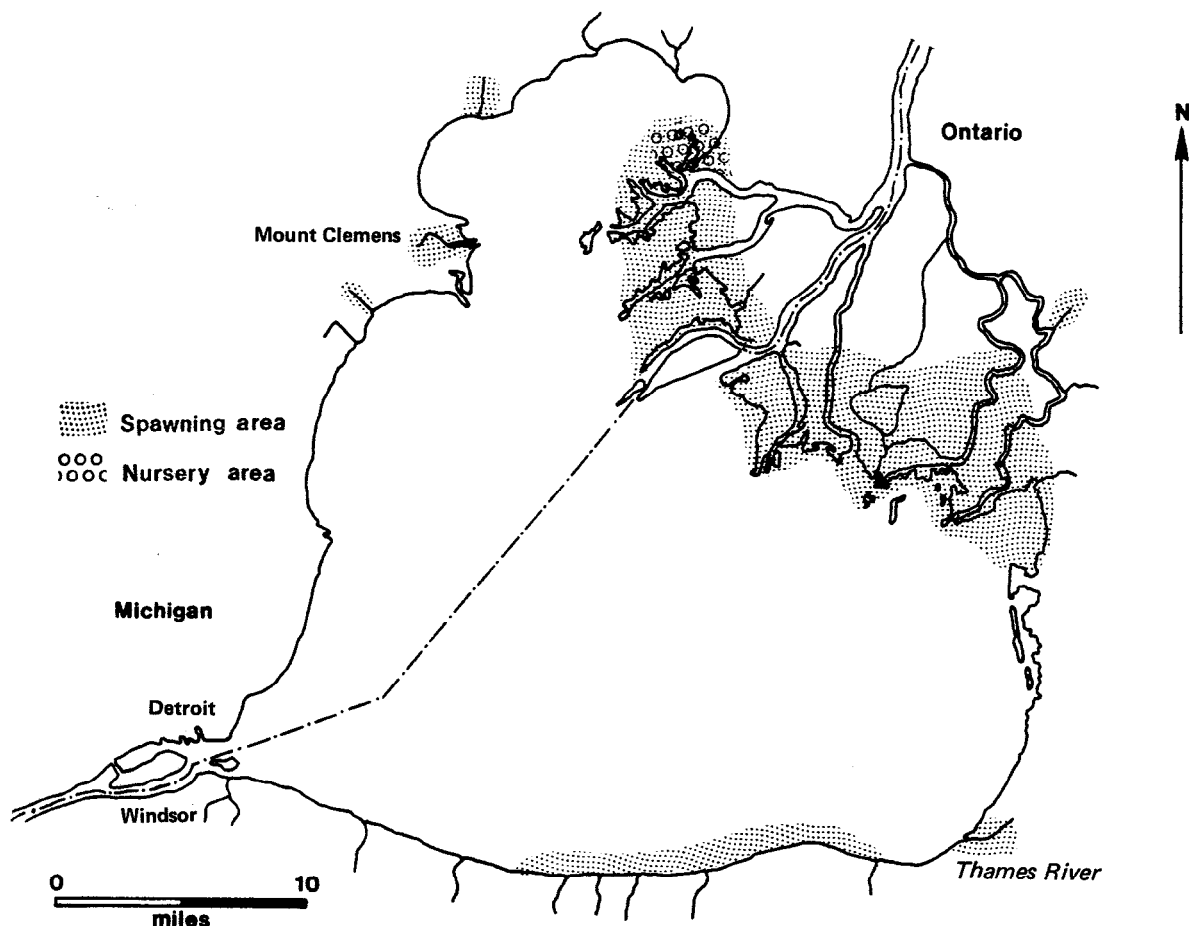
Little Muscamoot Bay (42°34'30", 82°38'00"). In 1979, larvae about 1 month old were found here over aquatic vegetation on May 11 and young-of-the-year (YOY) were found here- through mid-November (Schloesser and M. Werner, pers. comm. 1979).

Big Muscamoot Bay (42°33'30", 82°39'00"). In 1979, YOY were collected here over a substrate of sand and silt (Schloesser and M. Werner, pers. comm. 1979). In 1980, ripe males and a female were collected in mid-April when the water temperature was 40°F (GLFL, unpubl. data).

Mitchell Bay (42°28'00", 82°26'00"). Spawning occurs here over vegetation (Shain, pers. comm. 1979).

L'Anse Creuse Bay (42°34'00", 82°49'30")--Grosse Pointe (42°23'30", 82°53'30"). Limited spawning occurs in this area (Trombley, pers. comm. 1979). During the 1960s, ripe adults were collected along shore in Eagle Point Bay (42°29'00", 82°53'00") north of Ten Mile Road (42°28'30", 82°53'00") in St. Clair Shores (42°30'00", 82°54'00"), in approximately 5 ft of water, over sand and vegetation (Moss, pers. comm. 1980).

WALLEYE



Historically, walleyes spawned in Lake St. Clair from late March to early May (Rathbun and Wakeham 1897). Lake St. Clair is part of a complex migration route, in which one or several populations of walleyes move freely between the St. Clair-Detroit River system and the western basin of Lake Erie (Applegate and Van Meter 1970; Ferguson 1957). Walleyes tagged in western Lake Erie spawned in Lake St. Clair, and some tagged in Lake St. Clair moved to Lake Erie and spawned in Sandusky Bay ($41^{\circ}29'$, $82^{\circ}46'$) (Regier et al. 1969). A post-spawning migration of walleyes also occurs from the western basin of Lake Erie through Lake St. Clair and the North Channel ($42^{\circ}37'00''$, $82^{\circ}37'00''$) into the St. Clair River and Lake Huron (Olson et al. 1978; Tyrrell, pers. comm. 1979). Young-of-the-year walleyes produced in Lake St. Clair move through the Detroit River into Lake Erie (USBCF 1966; USDI 1967; Ferguson and Derkson 1971; Olson et al. 1978).

Anchor Bay (42°38'00", 82°45'00"). Historically, walleyes spawned in the tributaries to Anchor Bay; large numbers of walleyes were seined at the mouth of the Clinton River (42°35'30", 82°47'00") (MSBFC 1895; Schneider and Leach 1979). Recently, spawning runs have entered the Clinton River and the Salt River (42°39'00", 82°47'00"); it is not yet known if spawning was successful (Trombley, pers. comm. 1979).

St. Clair Flats (42°35'00", 82°40'00"). This is an important spawning area (Environ. Can. 1977a). St. John's Marsh (42°38'30", 82°39'00") is a spawning and nursery area (MDNR 1976, 1977).

Sydenham River (42°33'30", 82°24'30"). A spawning run enters this river, which is a tributary of Chenal Ecart (42°28'30", 82°27'00") (Schneider and Leach 1979; Shain, pers. comm. 1979).

Thames River (42°19'00", 82°27'00"). The Thames River is the major spawning area used historically and presently by walleyes from Lake St. Clair, lower Lake Huron, and the St. Clair River (Environ. Can. 1977a; Ferguson and Cummins 1956; Ferguson and Derkson 1971; Haas and Bryant, undated; Int. Great Lakes Levels Board 1973; Johnston 1977; Rathbun and Wakeham 1897; Schneider and Leach 1977, 1979; Shain, pers. comm. 1979; Spangler et al. 1977; Trombley, pers. comm. 1979); however, the Thames River may be a less important spawning area than the Lake Erie reefs (Applegate and Van Meter 1970; USBFC 1966; USDI 1967). Migrating adults have been collected in the Thames River in early April (Ferguson and Cummins 1956; Nepszy 1977). Walleyes spawn under the ice in February and March and move out of the river by May (Tyrrell, pers. comm. 1979). Since 1877, walleyes from Lake Huron have moved down the St. Clair River to the Thames River to spawn (Regier et al. 1969). Tagging recoveries have indicated that a post-spawning migration occurs from the Thames River back into the St. Clair River and Lake Huron (Ferguson and Derkson 1971; Olson et al. 1978; Spangler et al. 1977); these fish move through the Middle (42°35'00", 82°39'00") and South (42°33'00", 82°39'00") channels to reach the St. Clair River (Tyrrell, pers. comm. 1979). Spent fish may also move from the Thames River to the Detroit River and into Lake Erie (Ferguson and Derkson 1971). Raw sewage pollution may have caused the walleyes to cease spawning in the Thames River near London, Ontario, for a time in the 1950s (Beck 1957 as cited in Johnston 1977).

Stoney Point (42°19'00", 82°33'00"). The area between longitudes 82°30'00" and 82°45'00" is an important spawning area (Environ. Can. 1977a).

Cutoff Canal (42°33'30", 82°50'30"). Spawning runs entered the canal recently, but it is not known if spawning was successful (Trombley, pers. comm. 1979).

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16. Abstract (Limit: 200 words) This atlas is a compilation of current spawning and nursery information concerning the fishes of the Great Lakes. The complete set consists of fourteen volumes. The information may be used to support permit and project reviews, impact statement reviews, planning of baseline research, and coordination with other agencies, and identification of data gaps. The report locates spawning and nursery areas in the Great Lakes and describes spawning and nursery characteristics, timing, and habitats of major fish species of the Great Lakes area. The first volume is a summary by geographic area, volumes II through XII contain the specific areas referenced in volume I. Volume XIII contains the species spawning and nursery characteristics for the major species, and Volume XIV cites the references used in compiling this work. The titles of the volumes address'ng the spawning and nursery areas for each fish species site specifically are: II., Lake Superior; III, St. Mary's River; IV, Lake Michigan; V, Lake Huron; VI, St. Clair River; VII, St. Clair Lake; VIII, Detroit River; IX, Lake Erie X, Niagara River; XI, Lake Ontario; XII, St. Lawrence River. The title of Volume XIV is, Species Reproduction Characteristics.			
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