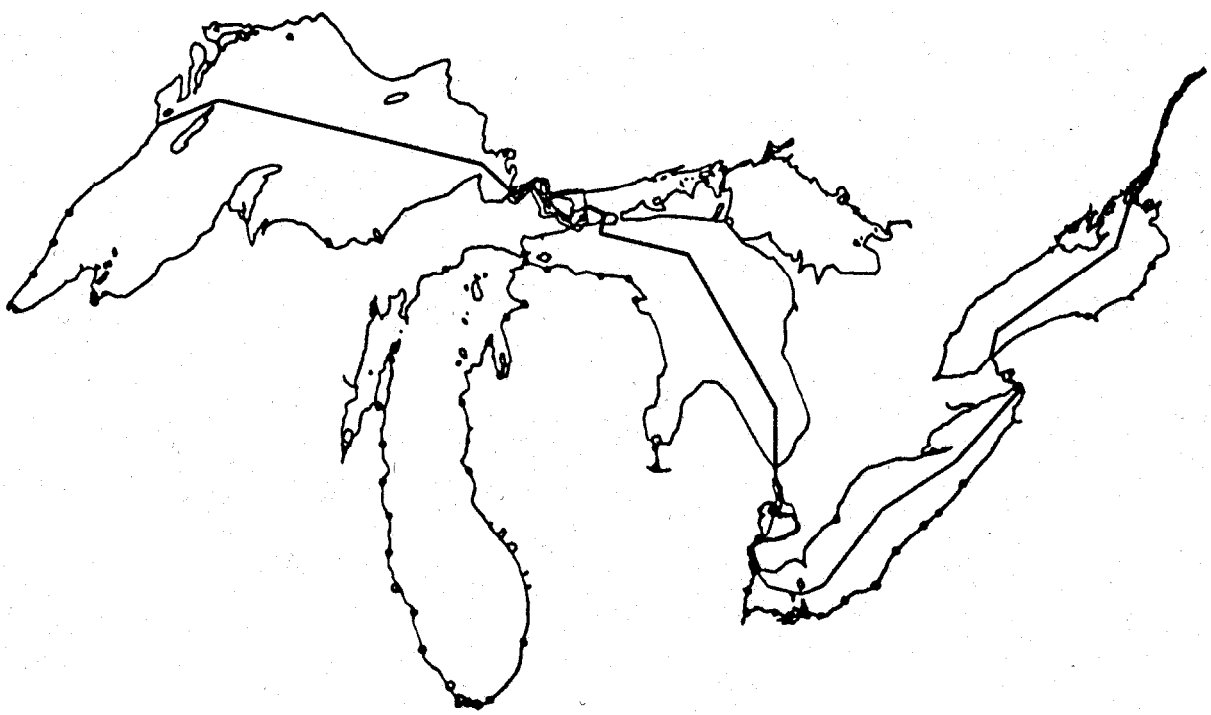
Biological Services Program

FWS/OBS-82/52
SEPTEMBER 1982

ATLAS OF THE SPAWNING AND NURSERY AREAS OF GREAT LAKES FISHES

Volume X - Niagara River

Great Lakes-St. Lawrence Seaway
Navigation Season Extension Program



Fish and Wildlife Service
U.S. Department of the Interior

Corps of Engineers
U.S. Department of the Army

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- To gather, analyze, and present information that will aid decisiomnakers 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 relatfng to energy development.

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FWS/OBS-82/52
September 1982

ATLAS OF THE SPAWNING AND NURSERY AREAS

OF GREAT LAKES FISHES

VOLUME x
Niaraga River

by

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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

II. Lake Superior

III. St. Marys River

IV. Lake Michigan

V. Lake Huron

VI. St. Clair River

VII. Lake St. Clair

VIII. Detroit River

IX. Lake Erie

X. Niagara River

XI. Lake Ontario

XII. St. Lawrence River

XIII. Reproductive Characteristics of Great Lakes Fishes

XIV. Literature Cited

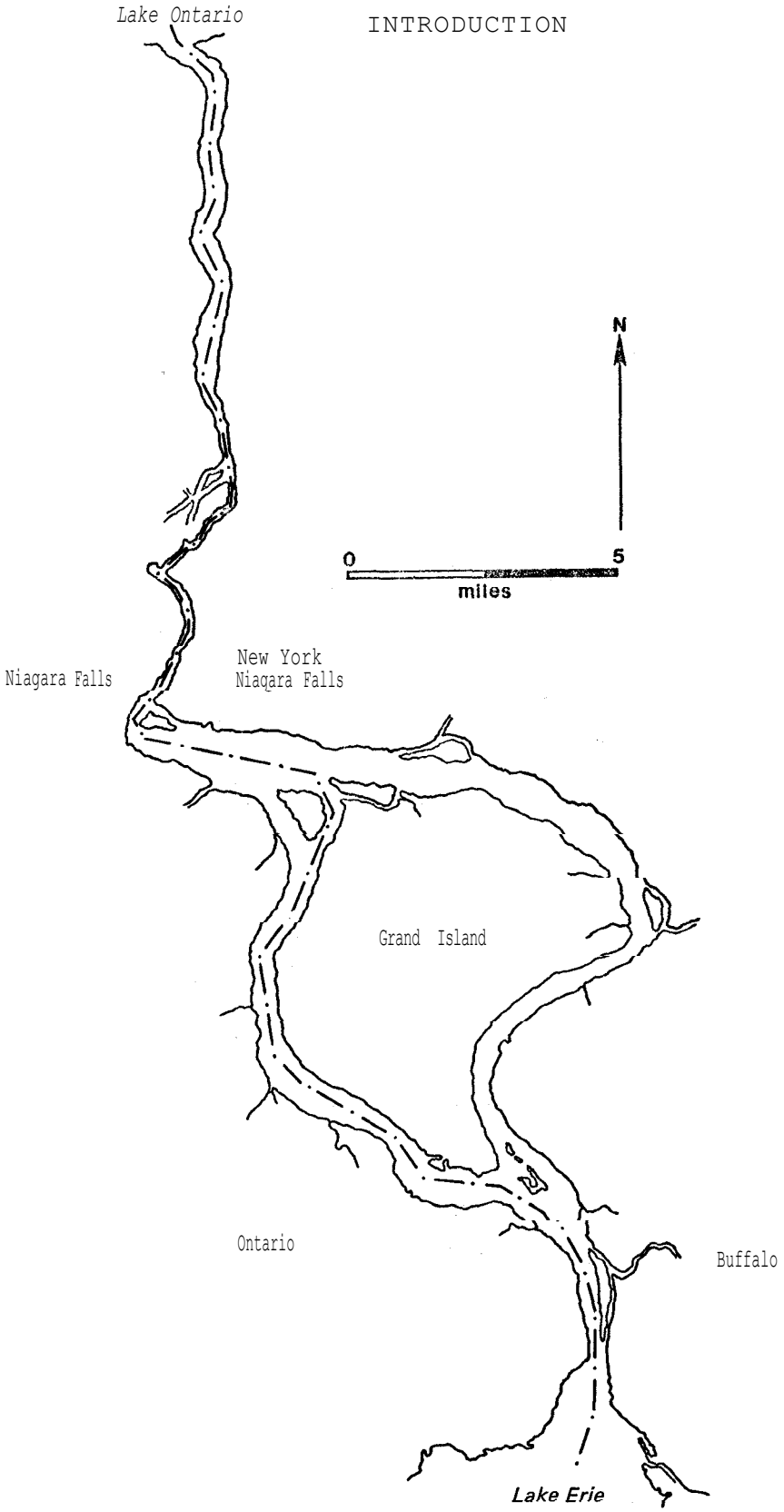
Volume I is designed to permit the reader to determine quickly whether a particular geographic area of interest contains fish spawning or nursery areas that are described in volumes II-XII. Volumes II-XII consolidate existing information describing spawning and nursery areas used by stocks of fish, including 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.

CONTENTS

Volume X. NIAGARA RIVER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Grand Island
Ontario
Buffalo
Lake Erie

The Niagara River forms the connecting waterway between Lake Erie and Lake Ontario. Niagara Falls, approximately 15 mi downstream from Lake Erie, divides the river into upper and lower sections. The lower river is deep and swift. Historically, narrow zones along each shore of the lo-wer river supported rooted aquatic vegetation, especially along the U.S. shore from the river mouth upstream to Lewiston (Muenscher 1929). In the upper river, extensive, dense beds of aquatic macrophytas were present in the shallow bays and shoal areas around Grand Island; macrophytes were especially abundant between Grand Island and Strawberry Island (Muenscher 1929). These weed beds were important areas of fish reproduction. Tributaries to the upper river also supported large spawning migrations in the spring and were important breeding areas (Kerr and Kerr 1860-1898). The abundance of young fish and low numbers of adults in the upper river indicated that the young fish moved out of the upper river and into Lake Erie (Greeley 1929).

Almost 80 species of fish have been recorded as residents, or migrants, in the Niagara River (Crossman and Hadley 1977; GLFC 1975; Greeley 1929; OMNR 1973; Shepherd, pers. comm. 1979; Spotila et al. 1979; Symons and Simpson 1939). This volume describes the reproductive habitat used by the 24 species for which information was available. Twenty species treated in this volume are native to the river. Although little information was available which identified the precise locations of spawning grounds, most of these 20 species probably spawned (or spawn) in tributaries to the river or in the shallow embayments and shoreline areas and around the islands in the upper river.

The four exotic species treated in this volume have been introduced by man or have immigrated into the river from populations established elsewhere in the Great Lakes drainage. Rainbow trout probably spawn in the tributaries or along shore. Smelt also spawn in tributaries; carp probably spawn in the tributaries and also in protected areas near shore.

The information in this volume is presented in narrative form, by species. A map accompanies each species narrative when there was sufficient information to warrant graphic summarization. Because the connecting waters have not been assigned to statistical fishing districts (Smith et al. 1971) the species narratives in this volume present the available information by geographic area beginning at the head of the river and continuing do-wnstream to the mouth. For each referenced location within the river the narrative first presents the available information for spawning areas and then for nursery areas. Historical information is presented before the more current information.

For the purposes of this atlas, we define the head of the river as that portion of the river immediately downstream from the line connecting the southern end of the Black Rock Canal (42°53'00", 78°53'30") and Fort Erie (42°53'00", 78°56'00"). The mouth of the Niagara River is that portion of the river immediately upstream from a line connecting Fort Niagara (43°15'40", 79°03'50") and Fort Mississauga (43°15'20", 79°04'40").

SEA LAMPREY

Extensive surveys of the Niagara River found no sea lamprey ammocoetes (Pearce et al. 1980), although some suitable nursery habitat was found in the lower river (Westman 1974).

LAKE STURGEON

Buffalo (42°54'00", 78°53'00"). Lake sturgeon were observed moving about in schools and depositing eggs on the seams of rocky ledges at the head of the Niagara River (42°53'00", 78°55'00") from mid-May to the beginning of July (Smith and Snell 1891). Sturgeon disappeared from the area around 1890 because of pollution from Buffalo (Kerr and Kerr 1860-1898).

LONGNOSE GAR

Tonawanda (43°01'00", 78°53′00″). In the late 1920s, young about 2-3 in. long were collected with seines in the weed beds on the east shore of the Niagara River near Tonawanda in late July (Greeley 1929).

LAKE HERRING

Queenston (43°10'00", 79°03′30″). In 1878, fishing for lake herring was very good near Queenston in late November during spawning runs, which began in late September (Kerr and Kerr 1860-1898).

RAINBOW TROUT

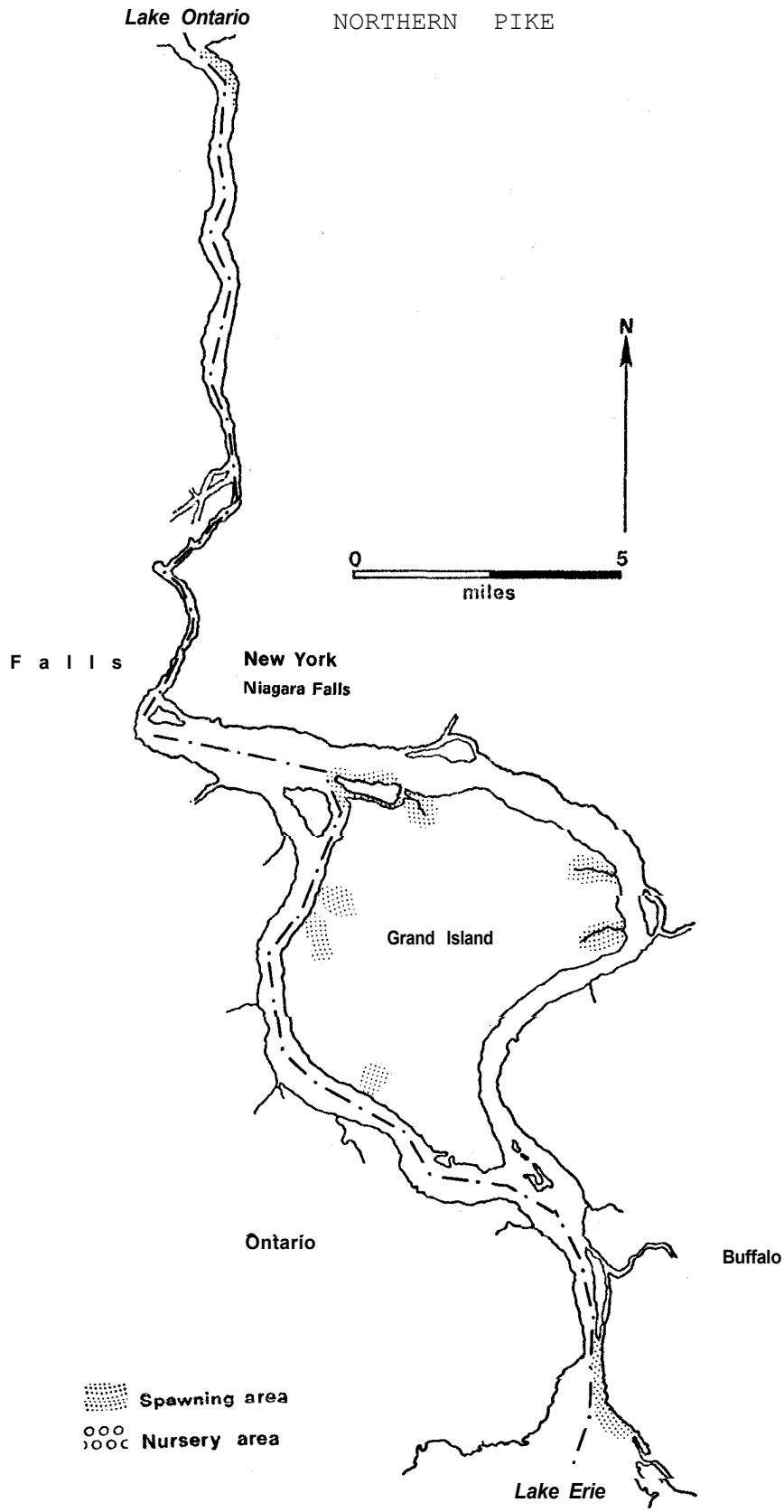
Rainbow trout migrate into the lower Niagara River from Lake Ontario to spawn in the spring (MacCrimmon and Gots 1972; OMNR 1973).

ATLANTIC SALMON

Historically, Atlantic salmon were abundant in the lower Niagara River, upstream to Niagara Falls (43°04'50", 79°04'30") (Parsons 1973). Until the late 1800s, Atlantic salmon migrated into the Niagara River from Lake Ontario to spawn (OMNR 1973).

RAINBOW SMELT

Rainbow smelt were first reported in Lake Ontario in 1929 (Greeley 1929) and in Lake Erie in 1935 (Van Oosten 1937a); there are no early records for this species in the Niagara River. In 1959, a spawning run entered the Niagara River from Lake Erie during late April or May (Roseborough 1962).


Lake Ontario
NORTHERN PIKE
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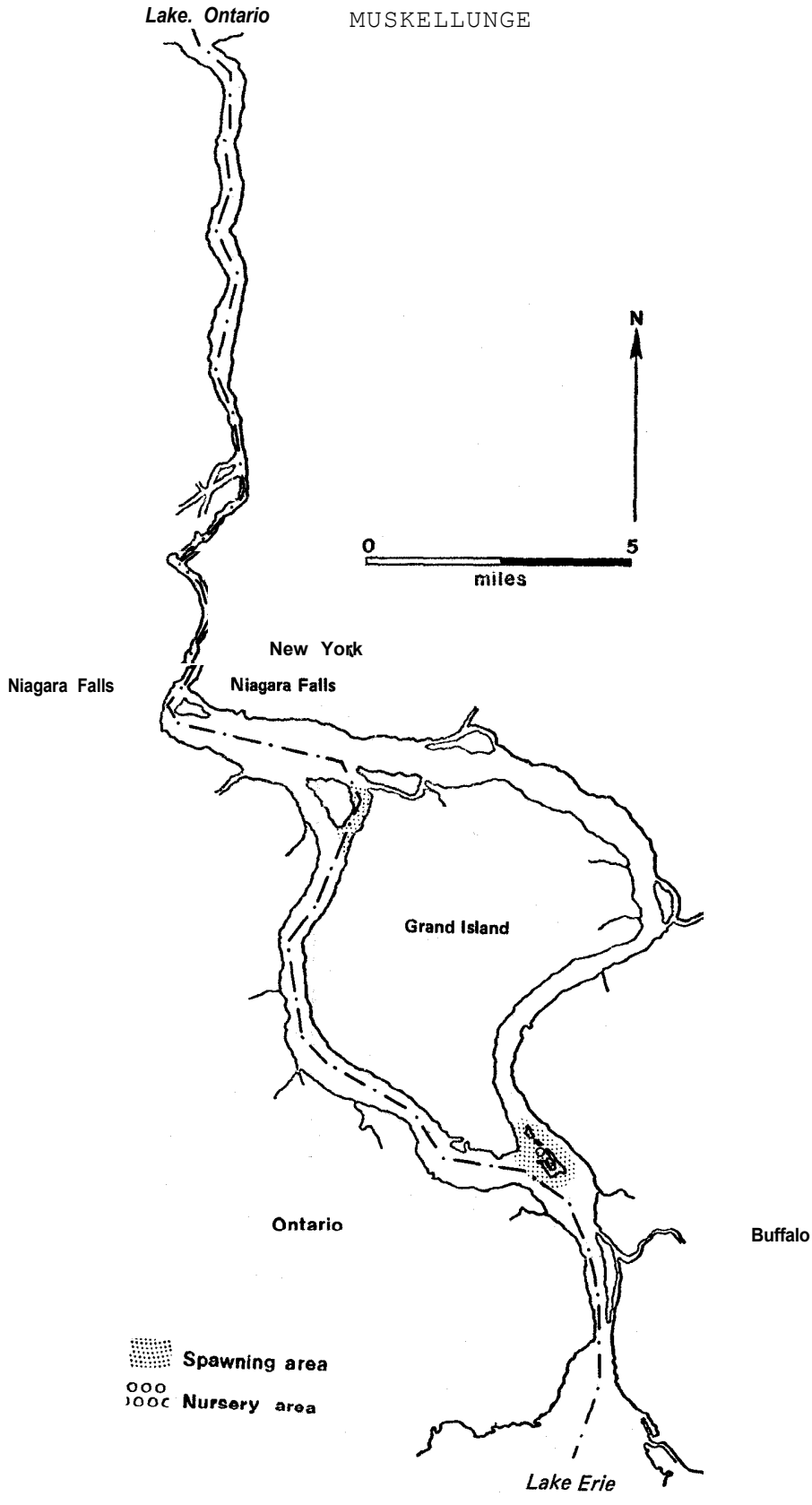
Niagara Falls
Grand Island
Ontario
Buffalo
Spawning area
Nursery area
Lake Erie

As recently as the 1960s, northern pike may have spawned in the main stem of the Niagara River, in areas such as Strawberry Island Bay (42°57′20″, 78°55′40″). The populations using these river spawning grounds may have been eliminated by recent environmental changes that altered the spring water temperature and water levels (Harrison 1978). Presently, northern pike migrate from the Niagara River into the lower reaches of tributaries in the spring and return to the river after spawning (Harrison 1978).

Grand Island (43°01'00", 78°58'00"). Northern pike spawn in most of the creeks on Grand Island, including Woods (43°03'40", 78°58'40"), Gun (43°03'00", 78°55'00"), Spicer (43°01'30", 78°53'40"), Big (43°01'40", 79°00'45") and Little (43°01′45″, 79°00'40") Six Mile creeks, an unnamed stream on the southwest side (42°58'50", 79°00'00), and Burnt Ship Creek (43°03′45″, 78°59'30"). They also spawn in the area around Buckhorn Island (43°03'40", 79°59'30") (Buffalo Waterfront Dev. Comm., undated; Harrison 1978; NYDEC 1977b; Spotila et al. 1979). In the creeks, most spawning occurs when the water temperature is 37-50°F. In Gun Creek, the major spawning period extends from late March through early April (Harrison 1978).

Black Rock Canal (42°53'00", 78°53'30"). Spawning occurs here (NYDEC 1977b).

Youngstown (43°15'00", 79°03'00"). Northern pike spawn in the lower river along the U.S. shore downstream from Youngstown. This is the only productive littoral area in the lower river (Buffalo Waterfront Dev. Comm. , undated; NYDEC 1977b).


Lake. Ontario
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Niagara Falls
Grand Island
Ontario
Buffalo
Spawning area
Nursery area
Lake Erie

Historically, muskellunge probably spawned in Niagara River tributaries. Many were caught in April in Chipewa Creek (location unknown, possibly at Chippawa, 43°03'30", 79°03'00") (Kerr and Kerr 1860-1898). A recent study found ripe adults and young only in the main river (Harrison 1978). In the Niagara River, spawning occurs in May and June at water temperatures of 61-64°F. In typical spawning areas in the river, the current velocity is approximately 0.7 ft per sec; these areas are heavily vegetated and in water 3-6 ft deep (Harrison 1978; Harrison and Hadley 1979). Two major spawning areas for muskellunge presently exist in the Niagara River.

Strawberry (42°57'45", 78°55'30"), Motor (42°57'30", 78°56'00"), and Grand (43°01'00", 78°58′00″) Islands. The shoal area bounded by Strawberry, Motor, and southern Grand islands is a major spawning area (Craig 1976; Harrison 1978; Harrison and Hadley 1978; NYDEC 1977b). Strawberry Island was recognized as an important spawning area as early as 1929, and young muskellunge, 2 in. long, were found in the weed beds in late July. The area had been degraded by dredging in 1927 (Greeley 1929). Spawning presently occurs along shore to just north of Heaver Island State Park (42°57'45", 78°57′15″) (NYDEC 1977b).

Navy Island (43°03'20", 79°00'45"). The second major spawning area is the area between Navy Island and the northwestern shore of Grand Island (Harrison 1978; Harrison and Hadley 1978).

CARP

Carp were present in the Niagara River prior to 1900 and presumably originated from populations in Lake Erie and Lake Ontario (McCrimmon 1968). Carp were caught in the river as they moved inshore for spawning (Greeley 1929).

EMERALD SHINER

In the late 1920s, young emerald shiners (no age given) were collected in the Niagara River in late summer (Greeley 1929),

BLACKCHIN SHINER

Several fish in spawning condition were collected from weed beds in the Niagara River in late July (Greeley 1929).

BLACKNOSE SHINER

In the late 1920s, females in spawning condition were collected in the upper Niagara River as late as July 26 (Greeley 1929).

SPOTTAIL SHINER

Beaver Island (42°57'40", 78°57'40"). Fry were collected in the Niagara River off the southwest shore of Beaver Island during August; the area had a sand and rock bottom with some emergent vegetation and little wave action (Griswold and Galati, pers. comm. 1979).

WHITE SUCKER

In the late 1920s, young about 1 in. long were collected in the Niagara River in late July (Greeley 1929).

Beaver Island (42°57'40", 78°57'40"). Recently, white sucker fry were collected off the southwest shore of Beaver Island over a sand and rock bottom with some emergent vegetation during June and July (Galati, pers. comm. 1980).

GREATER REDHORSE

The greater redhorse spawned in Niagara River tributaries. In the late 1920s, a few young were found in all streams, including Tonawanda Creek (43°02'00", 78°53'00") (Greeley 1929).

CATOSTOMID spp.

Chipewa Creek (location unknown, possibly at Chippawa, 43°03'30", 79°03'00"). Many suckers and "mullet" were caught here in April (Kerr and Kerr 1860-1898).

THREESPINE STICKLEBACK

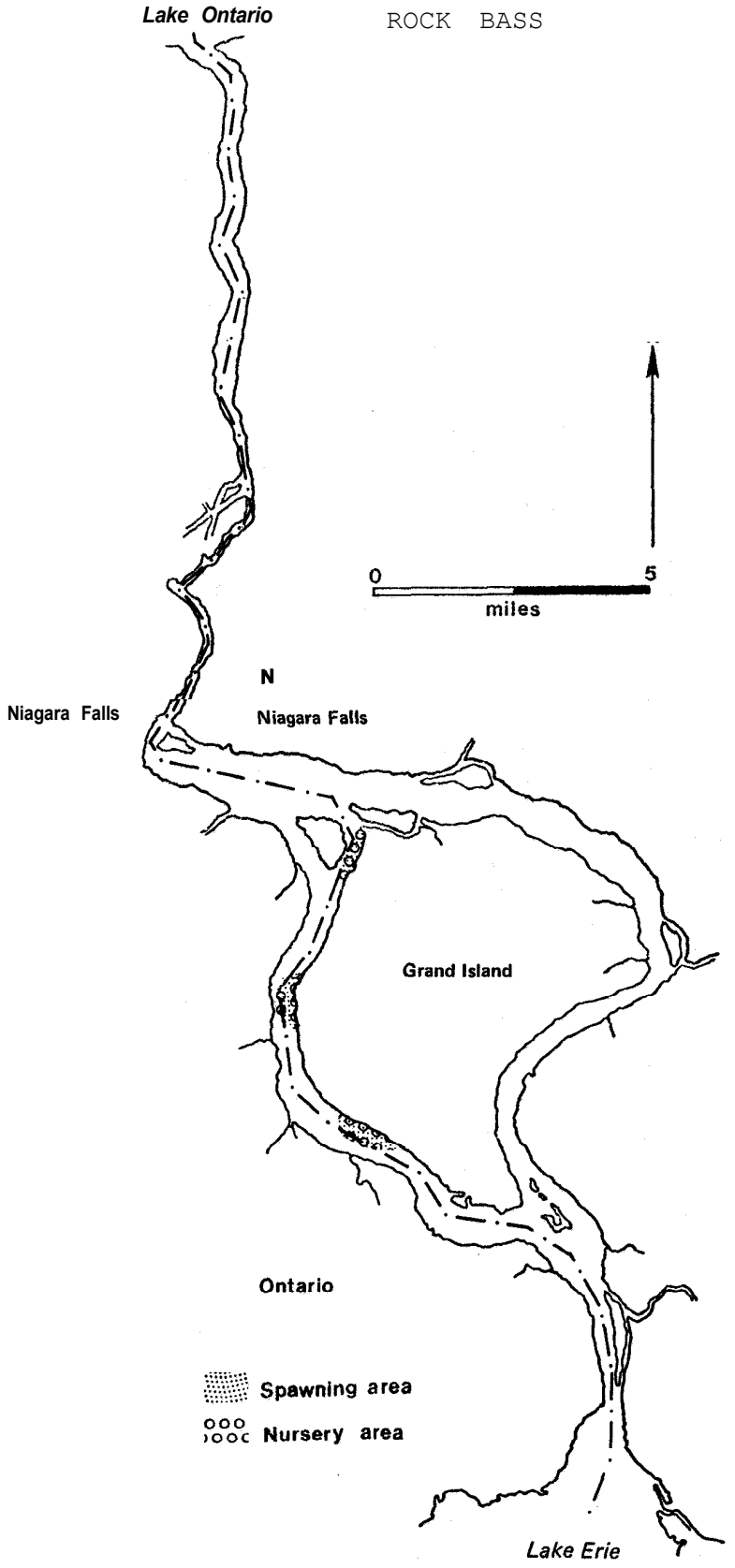
In the late 1920s, young were seined from weed beds at the mouth of the Niagara River (43°15'45', 79°04'15"); none were found above Niagara Falls (43°04'50", 79°04'30") (Greeley 1929).

TROUT-PERCH

In the late 1920s, young about 1 in. long were found close inshore in late July (Greeley 1929).

WHITE BASS

In the late 1920s, one young white bass 1 in. long was collected in the Niagara River in late July (Greeley 1929).


Lake Ontario
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Niagara Falls
Niagara Falls
Grand Island
Ontario
Spawning area
Nursery area
Lake Erie

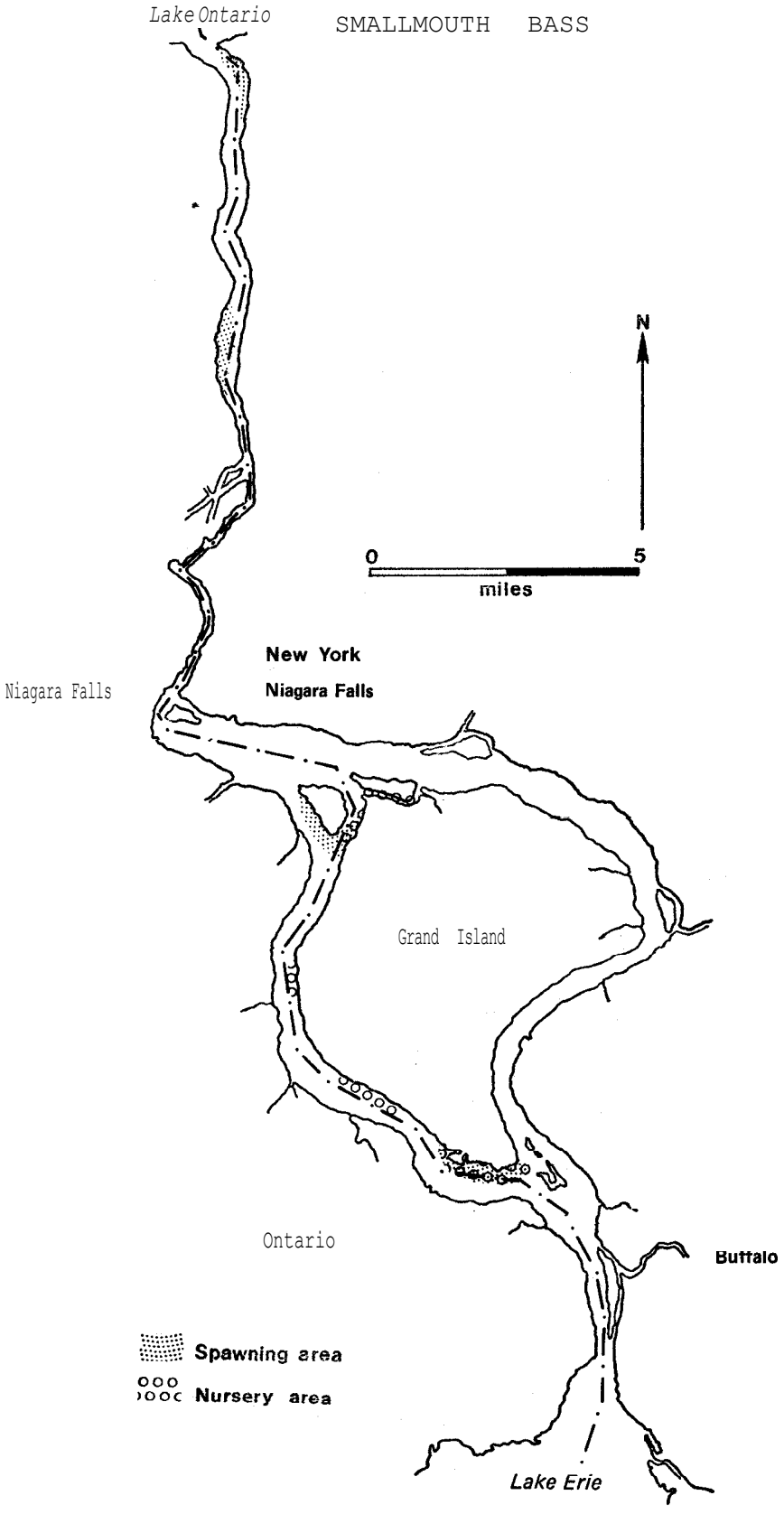
In the late 1920s, many young-of-the-year (YOY) were captured with seines in weed beds in the Niagara River from late July (Fish 1932; Greeley 1929).

Grand Island (43°01'00", 78°58'00"). Spawning occurs at water temperatures of 63-66°F during late June to early July; in 1977, spawning occurred on about June 28. Rock bass spawn at three sites along the west shore of Grand Island. Young-of-the-year rock bass were always abundant in this area during the summer among shoreline vegetation (George 1978; George and Hadley 1979).

Navy Island (43°03'20", 79°00'45"). This site is located along the west shore of Grand Island opposite the east side of Navy Island. The substrate includes bare rock and mud, but most of the area is covered with rooted macrophytes (primarily Cladophora in June and July, changing to Vallisneria and Myriophyllum in July). The current velocity at the surface averaged 0.3 ft per sec at the 3 ft depth contour (George 1978).

Cook Point (43°01'00", 79°01'15"). This site is a shoal extending from 60-100 ft offshore. The substrate here is two-thirds rock and one-third mud; about two-thirds of the area is covered by Vallisneria and Myriophyllum (George 1978).

Southwest Shore (42°58'30", 78°59'00"). This site is a shoal that extends 50 ft offshore. The substrate is rock and sand; about 40% of the site supports dense vegetation in the summer. Cladophora extends about 13 ft offshore; the vegetation then gradually changes to Vallisneria, which is the dominant vegetation at 3-50 ft from shore. The water is often turbid from frequent intense wave action. The current velocity averages 0.4 ft per sec (George 1978).


Lake Ontario
SMALLMOUTH BASS
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New York
Niagara Falls
Niagara Falls
Grand Island
Ontario
Buffalo
Spawning area
Nursery area
Lake Erie

The shoal areas 1-5 ft deep in the upper Niagara River are generally the spawning and nursery areas for smallmouth bass (Int. Great Lakes Levels Board 19731. Historically, young were common in the river (Greeley 1929).

Grand Island (43°01'00", 78°58'00"). In 1977, spawning occurred on the west shore of the island over gravelly substrate during mid- to late June, at an average water temperature of 62°F (George 1978; George and Hadley 1979). Young-of-the-year (YOY) are common over rocky bottom in the shallow shoreline areas along the west shore of the island (George and Hadley 1979).

Beaver Island State Park (42°57'45", 78°57'15). Males have been observed in late June over nests in less than 3 ft of water in the south beach area of the state park; the substrate was composed of bare rock and patchy vegetation with some sand. In 1976, many YOY were collected from the bays of Beaver Island (42°57′40″, 78°57′40″) beginning on July 24. In 1977, fry were first captured in large loose schools on July 19 (George 1978; O'Mara 1977).

Southwest Shore (42°58'30", 78°57'40"). In 1977, YOY were found along shore in early August. This area is a rock and sand shoal, mostly covered -with vegetation, extending offshore about 50 ft. The fry probably dispersed to this area from spawning areas (George 1978).

Cook Point (43°01'00", 79°01′15″). In 1977, YOY were found in late August over a rock and mud shoal, mostly covered by vegetation, extending 60-100 ft offshore. The fry probably dispersed to this area from spawning areas (George 1978).

Navy Island (43°03'20", 79°00'45"). In 1975 and 1976, nests occupied by males were observed around Navy Island on the littoral shelf at depth greater than 10 ft off the southern tip of the island, the shallow flat shoal less than 3 ft deep along the west Grand Island shoreline opposite the east shore of Navy Island, and the narrow littoral shelf 3-5 ft deep on the west shore of Navy Island (O'Mara 1977). The substrate in these areas was mainly rooted macrophytes with patches of sand and bare rock. In 1977, fry were captured along the west shore of Grand Island in late July (George 1978).

Buckhorn Island (43°03'45", 78°59'30"). In 1975, YOY were captured here and near Woods Creek (43°03'40", 78°58'40") in late July; in 1976, they were found at Buckhorn Island in September (O'Mara 1977).

Youngstown (43°15'00", 79°03'00"). Smallmouth bass spawn along the east shore for a distance of 1 mi downstream from Youngstown (Buffalo Waterfront Dev. Comm., undated).

Queenston (43°10'00", 79°03′30″). Historically, smallmouth bass spawned here (Kerr and Kerr 1860-1898).

LARGEMOUTH BASS

Strawberry Island (42°57'45", 78°55'30") and Motor Island (42°57'50", 78°56'00"). Largemouth bass spawn in the shallow shoreline areas around the islands (Spotila et al. 1979).

Grand Island (43°01'00", 78°58'00"). Largemouth bass spawn in shallow, shoreline areas, small creeks, or the swampy areas at the north end of Grand Island (Spotila et al. 1979).

BASS spp.

Grand Island (43°01'00", 78°58′00″). Black bass spawn along the east channel of the Niagara River, along the shore of Grand Island from approximately Motor Island (42°57'50", 78°56'00") to just north of Beaver Island State Park (42°57'45", 78°57′15″) (NYDEC 1977b).

Navy Island (43°03'20", 79°00'45"). Spawning beds were observed here (Kerr and Kerr 1860-1898).

Chipewa Creek (location unknown, possibly at Chippawa, 43°03'30", 79°03'00"). Many bass were caught here in April (Kerr and Kerr 1860-1898).

Queenston (43°10'00", 79°03′30″). Bass historically spawned here (Kerr and Kerr 1860-1898).

YELLOW PERCH

Spring runs of yellow perch appear in the Niagara River (USDI 1967). Young-of-the-year were historically abundant in the weed beds of the upper river in late July; as these fish grew larger, they sought deeper water and probably migrated to Lake Erie (Greeley 1929).

WALLEYE

In the late 1800s, many "pickerel" were caught in April in Chipewa Creek (location unknown, possibly at Chippawa, 43°03'30", 79°03'00") (Kerr and Kerr 1860-1898). During the late 1920s, young walleyes 2 in. long were captured in seines in the Niagara River in late July (Greeley 1929).

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15. Supplementary Notes

This document is one of a set of fourteen volumes.

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 addressing 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.

17. Document Analysis a. Descriptors

Fishes, aquatic animals, bass, carp, catfishes, minnows, perch, salmon, shiners, trout, aquatic biology, water resources, atlas, marine biology

b. Identifiers/Open-Ended Terms

Great Lakes, spawning areas, nursery areas, Niagara River

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