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FISHERIES DIVISION

TECHNICAL REPORT

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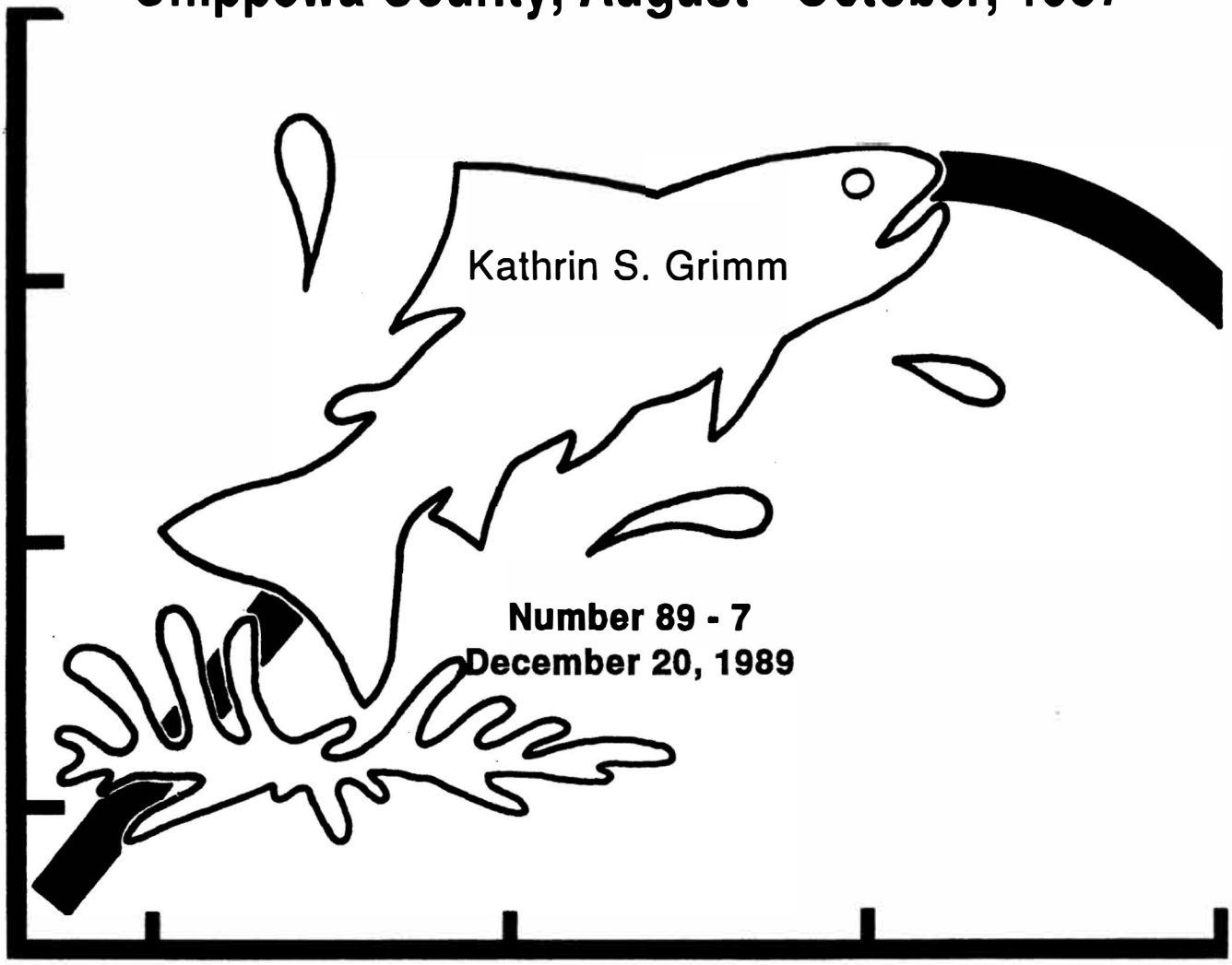

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MICHIGAN DEPARTMENT OF NATURAL RESOURCES
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Abstract.—The St. Marys River survey was conducted by the Michigan Department of Natural Resources, Fisheries Division, during August through October 1987. Twenty seven netting sites were sampled from Izaak Walton Bay to Potagannissing Bay. The objective of this report is to update the status of major sport-fish stocks and to present current management direction. Sport-fish discussed in this report include yellow perch, northern pike, walleye, smallmouth bass, lake herring, trout and salmon, lake whitefish, and lake sturgeon. The number of species of fish captured in 1987 (28) is similar to the number captured during the surveys in 1975 (26) and in 1979 (23). Fish captured in previous surveys but not in 1987 include brook trout, splake, rainbow trout, coho salmon, tiger musky, round whitefish (menominee), sculpin, and burbot. Pink salmon, bloater, freshwater drum, and channel catfish had not been captured in the previous surveys. Some changes in abundance have occurred since the surveys of 1975 and 1979. Yellow perch catch per effort (CPE) increased in all survey areas except in the upper St. Marys River, most evident in Raber Bay. Northern pike CPE changed little in Munuscong and Potagannissing Bay, but nearly doubled in Lake George and Raber Bay. Walleye CPE has remained fairly constant since 1975 and 1979, except in Raber Bay, where the CPE has increased substantially. Finally, the lake herring CPE has dropped sharply in Raber Bay and slightly in Potagannissing Bay. Growth was analyzed for yellow perch, northern pike, walleye, smallmouth bass, and lake herring. Average lengths and age distributions have remained relatively constant. Yellow perch, walleye, and lake herring are growing at rates near state average. Northern pike and smallmouth bass are growing at rates below state average. Yellow perch length-at-age increases slightly from upstream to downstream. Walleye length-at-age in Lake George is higher than for any other area in the St. Marys and the state average. Recruitment for most species appears adequate, except for the walleye in the upper river, Lake Nicolet, and Potagannissing Bay. Total annual mortality estimates of 0.57 and 0.59 were calculated for lake herring of ages 4-8 and 4-6, respectively, sampled in Potagannissing Bay. These estimates are almost identical to an estimate of 0.58 for lake herring from Keweenaw Bay. Management efforts for the St. Marys River include a fishway for northern pike in Potagannissing Bay, a 12-fish creel limit on lake herring for all Michigan waters, stocking to enhance and diversify the sport fishery, and obtaining and improving public access sites.

The St. Marys River originates from Whitefish Bay in Lake Superior. It flows southeasterly for approximately 68 miles before emptying into Lake Huron at De Tour Village (Figure 1). The river is bounded on the west and south by the Upper Peninsula of Michigan, and on the north and east by Ontario, Canada. The United States' part of the St. Marys River encompasses an area of roughly 125,000 surface acres. The river

receives the inflow of a number of small and medium sized rivers, but most of the total volume comes from Lake Superior. The land in the watershed is about 95% forested (Duffy et al. 1987). The adjacent lands include lake bed plains, rolling plateaus, low rounded ridges, or lakeshore features (remnant beach ridges, sand dunes, bluffs, and marshlands). The soils adjacent to the river are clay, loams, sand, and mineral, providing good water retention. Water currents in the river are highly variable, largely controlled by the compensating gates, weather, wind, and shipping vessels.

The St. Marys River provides an important avenue for commerce and industry (Duffy et al. 1987). The river has been used to transport goods, especially since the 1800's. The river has gone through extensive modifications (locks, navigation canals, and dredging). These alterations have stimulated trade and increased shipping activity. Hydropower, railway, and highway traffic have also developed and increased as a result. The effect of all these activities has heightened concerns for the fate of aquatic organisms and their environment in the St. Marys River.

Much research has been conducted examining the impacts of an extended navigation period on the river. For example, the drift rates of detritus, macrophytes, zooplankton, and macroinvertebrates out of the system was greatly accelerated during ice cover with vessel traffic compared to ice cover without vessel traffic, negatively impacting the food chain (Poe and Edsall 1982). Studies also showed that sedimentation and habitat destruction from scouring was increased because of the waves and current action induced by the vessels (Liston et al. 1983). The Michigan Department of Natural Resources (MDNR) position has been against extension of shipping beyond January 31.

The St. Marys River supports a very diverse fish population that is attractive to anglers. Previous fisheries surveys found more than 23 species to be present (Miller 1981; Schorfhaar, unpublished). The first creel survey of the St. Marys River (Rakoczy and Rogers 1988), conducted in 1987, estimated that roughly 750,000 angler hours were spent fishing the Michigan waters of the St. Marys. This was about one sixth of Michigan's total Great Lakes fishing effort. The St. Marys system receives an estimated six angler hours per acre (boat and shore), mostly concentrated near shore.

No commercial fishery exists in the Michigan waters of St. Marys River. There has been only a limited tribal subsistence fishery. One permit was issued in 1987 and five were issued in 1988, which harvested 42 pounds and 255 pounds (northern pike, yellow perch, and whitefish), respectively (T. Gorenflo, Intertribal Fisheries Assessment Program, personal communication). This level of exploitation probably has little impact on the fish stocks.

The objectives of this study are to provide an update of the status of the fish stocks in the St. Marys River by comparing fish abundance and growth in the 1987 survey to that reported in the surveys of 1975 (Schorfhaar 1975) and 1979 (Miller 1981) and to the state average growth, and to present management direction.

Methods

The St. Marys River fisheries survey of 1987 was conducted by the District 4 Fisheries Division personnel using the 20-foot steel survey vessel, RV *Char*. The river was surveyed at 27 of the 32 survey sites sampled in 1975 and 1979 (Figure 1, Table 1). Fish samples were collected using graded-mesh multi-filament nylon gill nets, 1,200 feet long and 6 feet deep. Each net was made of 300-foot panels of 2.0-, 2.5-, 3.0-, and 4.5-inch stretched mesh. This sampling gear was the same as that used in the 1975 and 1979 surveys.

The data recorded at each net location included date, water temperature (°F), water depth, nights fished, and compass orientation of net set (Table 1). These data will allow for more accurate replication in later surveys.

Sport fish were identified to species and individually measured for total length (inches) and round weight (pounds), and scales were taken for later analysis of age and growth. Individuals of other species were either measured and weighed, or they were measured and weighed collectively by species. Weight data are not presented in this report. For selected species, average length at age was compared to the state average length during August and September (Merna et al. 1981).

Abundance was assessed on the basis of the number caught per 1,000 feet of gill net per night (CPE or catch per effort). Total annual mortality was calculated for lake herring using the Robson-Chapman method (Robson and Chapman 1961).

Results

Fish Diversity

Twenty-eight species of fish were captured during the 1987 survey, most of which were sport fish (Table 2). Lake George and Potagannissing Bay contained the most species (21), while the upper St. Marys River (sites 1-3 in Table 1) contained the least (10). Lake George and Potagannissing Bay are large shallow areas and included the most survey sites (15 of 27 in Table 1). Yellow perch, northern pike, walleye, smallmouth bass, rock bass, brown bullhead, and white suckers were present in all areas. In addition, pumpkinseed, lake herring, and redhorse were present in five of the six areas. This diversity of sport-fish species should provide a year-round sport fishery.

Most species that were present in 1975 and 1979, were also present in the 1987 survey catch except for brook trout, splake, rainbow trout, coho salmon, tiger musky, round whitefish (menominee), sculpin, and burbot. However, 1987 was the first time pink salmon, bloater, freshwater drum, and channel catfish were collected.

The 1987 survey schedule may have influenced the presence or absence of species in the survey areas, especially fall-spawning migratory species such as pink salmon, chinook salmon, and lake herring. Many stations on the lower river, from Raber Bay to Potagannissing Bay, were sampled a couple of weeks later than in previous surveys. Pink and chinook salmon spend most of the summer in Lake Huron and return to the St. Marys to spawn; therefore, a change in schedule may show more salmon in one part of the river than another or miss the run completely. Lake herring also congregate and migrate during spawning. This may be why few herring were found in Raber Bay, but many were collected from Potagannissing Bay (Table 3).

Status of Selected Sport-Fish Species

Yellow perch.—Yellow perch were found to be numerous throughout the St. Marys River, especially in Lake George and Potagannissing Bay (Table 3). The 1,613 yellow perch captured in the survey represented 31.8% of the total survey catch. The catch per effort was 37.3 fish. The 1987 CPE for yellow perch had increased in all survey areas except the upper river where the CPE decreased. Raber Bay shows the most dramatic change, increasing from 6.0 in 1975, to 9.8 in 1979, to 41.4 in 1987. Anglers caught an estimated 316,436 yellow perch on the St. Marys River in 1987, with 220,139 of those caught in Potagannissing Bay (Rakoczy and Rogers 1988).

Most (98.6%) of the perch caught in the netting survey were 7 inches and larger, which is considered to be an acceptable size by Michigan sport anglers (Merna et al. 1981). Yellow perch were largest (9.4 inches) in Potagannissing Bay and smallest in Lake Nicolet (8.5 inches) (Table 4). The number of year classes ranged from 5 to 9 among areas in the sampled population, showing a good age distribution and consistent recruitment. The perch show a slight increase in growth (length-at-age) from upstream to downstream (Table 5). This coincides with findings of the

1979 survey. In general, yellow perch growth was slightly less than the state average. In the Upper Peninsula of Michigan fish often grow at rates less than the state average due to shorter growing seasons.

Northern pike.—Northern pike were found throughout the St. Marys River, but were most abundant in Lake George, Munuscong Bay, and Raber Bay (Table 3). The 406 northern pike captured in the survey represented 8% of the total survey catch. The catch per effort was 9.4 fish. The 1987 CPE for northern pike changed little in Potagannissing Bay, showed a slight increase in Munuscong Bay, and nearly doubled in Lake George and Raber Bay. Anglers caught an estimated 20,965 northern pike on the St. Marys River in 1987, with 14,128 of those caught in Potagannissing Bay (Rakoczy and Rogers 1988).

Nearly fifty percent (49.5%) of the pike caught in the netting survey were legal size (20 inches and larger) in the sport fishery. Northern pike in the upper river had the largest average size (21.3 inches) (Table 4). The number of year classes ranged from four to eight among sites, showing a good age distribution and fairly consistent recruitment. Northern pike showed no substantial growth differences throughout the river, agreeing with the findings from 1979 (Table 6). Northern pike growth (length-at-age) was below the state average.

In Potagannissing Bay, management efforts have been directed toward aiding the pike to reach spawning areas. During high water levels adequate spawning area exists, but during periods of low water, MDNR Fisheries personnel have had to trap and transfer pike over a 4-foot high wildlife dam to a large spawning marsh as well as transport others to another nearby marsh. In 1989, a permanent Denil fishway was constructed to allow passage to the spawning marsh. If this fishway works, it should eliminate the need for the trap and transfer effort and insure consistent recruitment for the future. A research program should be conducted to evaluate the effectiveness of the ladder.

Walleye.—Most walleye found in the survey were netted in Lake George, Munuscong, Raber, and Potagannissing bays (Table 3). The 246 walleye captured in the survey represented 4.9% of the total survey catch. The total catch per effort was 5.7 fish. The 1987 CPE for walleye remained fairly constant in most sampling areas, showing only slight increases or decreases relative to 1975 and 1979. Only Raber Bay showed a change, from 2.1 in 1975, to 5.6 in 1979, to 21.9 in 1987. Anglers caught an estimated 25,602 walleye in 1987 in the St. Marys River, with 15,530 caught in the Raber-Munuscong area (Rakoczy and Rogers 1988).

Nearly half (45.1%) of the walleye taken in the survey were legal size (15 inches and larger), with an overall walleye average length of 15.3 inches. The largest walleye average length (18.4 inches) was from Lake George (Table 4). The number of year classes ranged from 1 to 10 among sites (Table 7). Length-at-age from Lake George was usually greater than from other areas of the St. Marys River and the state average. Walleye growth in the St. Marys River has remained nearly constant since 1979, and was near the state average in most areas.

Management of walleye in the St. Marys River has consisted of annual plants of fingerlings in the upper river and in Potagannissing Bay (Table 8) to develop resident populations and to enhance present populations. It is recommended that subsequent plantings and portions of wild stocks in the St. Marys be marked to identify discreet stocks and determine movements. Of particular concern is whether or not Potagannissing Bay walleye stocks move into adjacent Canadian waters (North Channel), where a commercial gill-net fishery has increased from 8,461 pounds in 1980, to 14,998 in 1981, to 40,362 in 1982 (E. Thomas, Ontario Ministry of Natural Resources, Sault Ste. Marie, Ontario, personal communication). Walleye may also be affected by the statewide change in the fishing season closure from February 28 to March 15. Creel survey data should be analyzed to determine the

significance of the catch during this extension period (March 1-15).

Smallmouth bass.—The highest concentrations of smallmouth bass were found in Lake George, Munuscong Bay, and Potagannissing Bay (Table 3). These areas had nets located on rocky substrate in natural or in dredge-spoil areas. The 200 smallmouth bass captured in the survey represented 3.9% of the total survey catch. The total CPE was 4.6 fish. The smallmouth bass CPE in 1987 was much higher than for previous surveys in every area sampled, especially in Lake George and Munuscong Bay. The 1987 sport catch for smallmouth bass was an estimated 2,729 fish. Smallmouth bass have provided an excellent fishery, especially in rocky dredge-spoil areas.

Twenty percent of the smallmouth bass captured in the netting were legal size (12 inches and larger). Overall, bass averaged 11.0 inches; among the areas sampled, Potagannissing Bay had the largest average bass length (13.5 inches)(Table 4). The smallmouth bass were growing well below state average (Table 9); it is not possible to examine trends in growth because insufficient data are available from previous surveys.

Lake herring.—The highest concentration of lake herring captured in the survey was found in Potagannissing Bay. Few were captured in Raber Bay, contrasting with good catches in 1975 and 1979 (Table 3). The 370 lake herring represented 7.3% of the total survey catch. The CPE of lake herring was 8.6 fish in the entire river. The CPE of herring has dropped sharply in Raber Bay from 62.8 in 1975 to 1.0 in 1987. In Potagannissing Bay the CPE has decreased from 39.9 (1979) to 24.2 (1987). These changes may have been influenced by the late timing of the survey and the lake herring spawning congregations and movements between Raber and Potagannissing bays. The 1987 creel survey (Rakoczy and Rogers 1988) showed that anglers caught about 141,000 herring, mostly in July.

Lake herring captured in the survey had the largest average size (15.5 inches) in Lake Nicolet (Table 4). Eight year classes were present in the total netting catch (Table 10). Many older age-groups were present in the sampled population.

Total annual mortality estimates were calculated for ages 4-6 and ages 4-8 from Potagannissing Bay. The annual mortalities were 0.59 and 0.57, respectively. These mortality estimates are almost identical to an estimate of 0.58 (combined sexes) from an unfished population in Keweenaw Bay from 1981-1983 (Albrecht 1984). The method used to calculate annual mortality assumes equal year-class strength, which may not be a correct assumption for lake herring. To be more accurate, data should be collected for more than 1 year, providing an enlarged data base.

Management of lake herring in the St. Marys River has resulted in a 12-fish creel limit statewide. Previously there was no creel limit on herring. Since at least 1977, anglers on the St. Marys River were complaining of poor lake herring fishing (J. Schrouder, MDNR, Roscommon, Michigan, personal communication). The fishery hit an all time low in the early 80's, and many anglers quit trying for herring for several years. The lake herring abundance gradually increased in the 80's while the angler pressure was lower, and was capped by a large catch in 1987. Anglers and residents also complained about waste. Anglers not equipped with coolers and ice could not handle the large numbers of fish without spoilage. Litter barrels at the Raber Bay access site overflowed with rotten fish. In response to angler complaints and the waste issue, District 4 Fisheries personnel recommended setting a 12-fish herring creel limit. This limit was consistent with the lake whitefish limit, and should effectively reduce the harvest by 21% (31,000 fish) in June/July 1987, and affect about 18% to 19% of the anglers (J. Rakoczy, MDNR, Charlevoix, Michigan, personal communication). The 12-fish creel limit in all Michigan waters was approved by the Michigan Natural Resources Commission in August 1988.

Trout and salmon.—Trout and salmon were relatively scarce in the netting surveys. A few lake trout, brown trout, pink salmon, and chinook salmon were captured in the 1987

netting survey. The creel survey indicates that some species were fairly abundant in the river even though they were not detected in the netting survey. Rakoczy and Rogers (1988) reported that an estimated 3,000 chinook, several coho salmon, and 1,500 pink salmon were caught in Sault Ste. Marie area; and the De Tour Village area had an estimated sport catch of 2,000 chinook, 269 coho, and 7,454 pink salmon in 1987.

Management for trout and salmon has been directed toward stocking to increase diversity (Table 8). The MDNR has stocked winter-run steelhead, rainbow trout, brown trout, chinook salmon, and Atlantic salmon. The trout and salmon planting are intended to provide a fishery in the rapids. Canadians have also stocked chinook, rainbow trout, and brown trout in the St. Marys River.

The Atlantic salmon stocking program is being evaluated by the MDNR in coordination with Lake Superior State University, and support from local sportsmen's clubs. Since 1987, stocked fish were tagged with colored floy tags. Tag returns provide information on growth, survival, and migrations.

The MDNR has tagged chinook fingerlings in lakes Huron, Michigan, and Superior. This may eventually be extended to the St. Marys River. The fingerlings were tagged in the snout with magnetic coded-wire tags (CWT), which have been coded with information such as date, location stocked, and the hatchery from which the fish originated. These tagged chinook were given an adipose fin clip to indicate the presence of a CWT. Recovery of these tagged chinooks will provide the MDNR with information on age, movement, and percent return to the creel.

Lake whitefish.—Lake whitefish were not captured in any great number in the 1987 netting survey. However, the catch of whitefish in the creel survey indicated a good population in the St. Marys River. In 1987, an estimated 25,187 whitefish were caught in the river, with most (21,174) coming from that portion of the river at Sault Ste. Marie. This part of the river has strong currents and is difficult to sample with netting gear. It is recommended that the creel survey be used to gather biological data on whitefish and other fish stocks in this area of the river.

Lake sturgeon.—Three lake sturgeon were captured in the 1987 netting survey. Lake sturgeon were also captured in the previous netting surveys. The fish collected averaged 28.8 inches. Lake sturgeon are a threatened species; therefore, care should be taken to ensure that the population maintains its current level or increases.

Management

The goals of the Michigan Department of Natural Resources, Fisheries Division, for the St. Marys River include increasing the diversity of fishing opportunities through stocking and providing additional public access.

The St. Marys River has been stocked with steelhead, rainbow trout, brown trout, chinook salmon, Atlantic salmon, lake trout, and walleye. Summer steelhead may also be stocked to provide a summer fishery in the rapids, if fish become available. If purebred muskellunge (Great Lakes strain) become available, they will also be considered for release.

Public access to the approximately 68 miles of the St. Marys River between Sault Ste. Marie and Drummond Island is very limited. There are currently nine public access sites with boat ramps on the river, many of which need enlargement or improvement (Figure 1). There are several county road endings and sites which provide additional access for small trailered boats and car toppers. Some private resorts along the shoreline offer additional access, often for a fee.

Recommended Site Development

To increase fishing access, the following sites are recommended for development as

public access sites on the St. Marys River (Figure 1):

Upper St. Marys River.—One area greatly lacking access is the American side of the Sault rapids. Work needs to be coordinated with the U. S. Army Corps of Engineers to provide walk-in or boat access to the tailrace below the Sault Edison Power Plant at Sault Ste. Marie and to the rapids. Improvements, including a new boat launch facility, are scheduled for construction in 1990 for the Aune-Osborn area, southeast of the Sault Edison Plant (J. Jorgensen, MDNR, Newberry, Michigan, personal communication).

Lake Nicolet.—A boat launch facility should be developed in the vicinity of 9 Mile Road; development may be difficult, however, because land in this area is largely wetlands.

Lake George.—Better access and promotion need to be developed; however, this will be challenging due to location and land ownership. The past three fisheries surveys and the creel survey show Lake George to be a highly productive system which is still largely unexploited due to its poor accessibility.

Munuscong Bay.—Additional public access sites are recommended along the north and southeast shores to accommodate the intensive fishing pressure.

Raber Bay.—The MDNR will develop the Lime Island pathway over the next several years in an effort to increase the usage of and access to Raber Bay by anglers and boaters. The plan includes rustic camping, a system of land trails, repair of a small wooden boat dock on the island, repair of the ferry dock, and expansion of the parking facilities at the Raber access site. There may also be some rustic camping on other nearby islands. This pathway development is meant to provide a stop-over point, a place for picnicking and camping, and a general area of interest to the public.

Potagannissing Bay.—Additional improvements and enlargements have been made to the De Tour Marina. The marina now can handle 80 to 100 boats. A new boat launch is also proposed for the area north of De Tour Village.

The future of the St. Marys River depends on our efforts to understand the complexity of the system. Management and research should be coordinated with governmental agencies, citizens' clubs and universities. Changes are constantly occurring. We need to continue to monitor the fish stocks in the St. Marys River to permit us to identify and respond to undesirable changes in species composition, abundance and growth.

Acknowledgments

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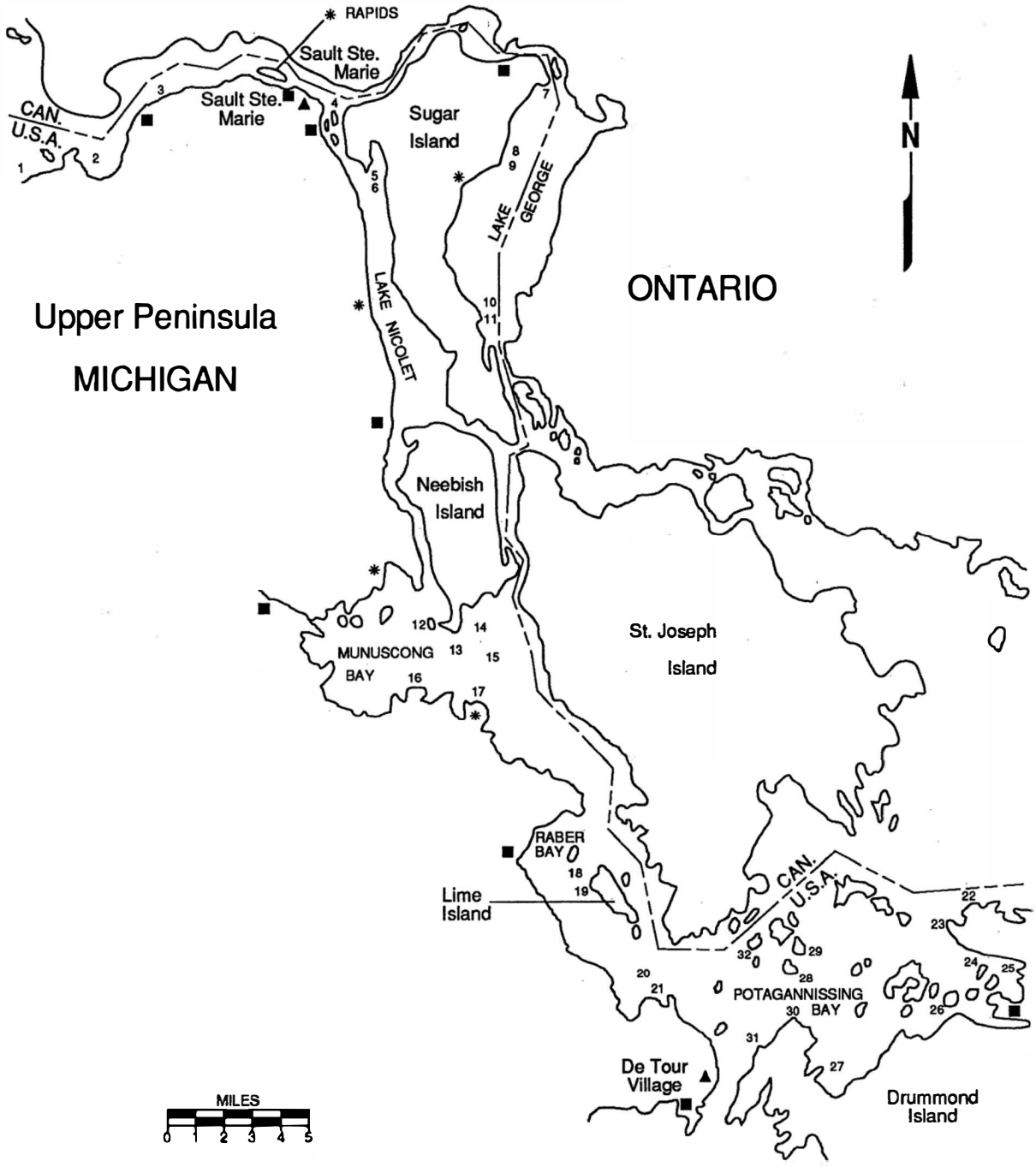

Figure 1. St. Marys River showing survey sampling stations 1-32, and existing (■), proposed and approved (▲), and additional desired locations (*) for public access sites.

Table 1. Survey sites sampled during the August-October 1987 fisheries survey of the St. Marys River, Chippewa County, Michigan.

Sampling areas and dates	Survey site Number and name	Location Town, range	Number of nets[a]	Net nights	Depth (feet)	Net orientation
Upper St. Marys River	1 Birch Point-	47N, 2W	1	1	14-17	N-S
Aug 18-21	Round Island		1	1	22-28	E-W
	2 Izaak Walton Bay	47N, 1W	1	1	7-9	SW-NE
			1	1	9-12	SW-NE
	3 Ashmum Bay (Sherman Park)	47N, 1N	4	4	12-34	---
Lake Nicolet	5 Baie de Wasai (N)	47N, 1W	1	1	6-8	N-S
Sept 11-12	6 Baie de Wasai (S)	47N, 1W	1	1	8-19	NW-SE
Lake George	7 Churchville Point	47N, 2E	1	1	6-34	N-S
Sept 1-9	8 Hay Point (Churchville)	47N, 2E	1	2	12-34	E-W
	9 Hay Point (E)	47N, 2E	1	1	71-24	E-W
	10 Advance-Rock Island	46N, 2E	1	1	6-13	N-S
	11 Duck Island (N)	46N, 2E	1	1	7-24	E-W
Munuscong Bay	12 Moon Island (W)	44N, 2E	1	1	12-14	SE-NW
Sept 16-19	13 Bouy B-5 (W)	44N, 2E	1	1	16-34	N-S
	14 Bouy R-6 (E)	44N, 2E	1	1	12-16	N-S
	16 Roach Point (N)	44N, 2E	1	1	12-24	N-S
Raber Bay	18 Round Island (N)	43N, 3E	1	1	13-16	N-S
Sept 22-24	19 Lime Island (N)	43N, 3E	1	1	17-18	SW-NE
	20 Lime Island (S)	42N, 4E	1	1	23-30	N-S
	21 Maud Bay	42N, 4E	1	1	17-23	N-S
Potagannissing Bay	22 Chippewa Point	43N, 6E	1	1	15-44	E-W
	24 Peck Island (N)	42N, 6E	1	1	14-18	N-S
Sept 29-Oct 8	25 Rutland Island (N)	42N, 6E	1	1	8-10	SE-NW
	26 Grape-Bald Island	42N, 6E	1	1	14-20	E-W
	27 Fairbank Island (SE)	42N, 6E	1	1	26-28	SE-NW
	28 Bow-Surveyers Island	42N, 5E	1	1	33-39	E-W
	29 Bow-Little Trout Is.	42N, 5E	1	1	34-75	E-W
	30 Sims Point(Bouy N-2)	42N, 5E	1	2	16-36	SE-NE
	31 De Tour Passage (N)	42N, 4E	1	1	85-116	SE-NW

[a]Multi-filament nylon graded-mesh gill net, 1,200 feet long, 6 feet deep, made up of 300-foot panels of 2.0-, 2.5-, 3.0-, and 4.5-inch stretched mesh.

Table 2. Species of fish captured (x) at areas sampled during the August-October 1987 fisheries survey of the St. Marys River, Chippewa County, Michigan.

Species	Areas sampled					
	Upper river	Lake Nicolet	Lake George	Munuscong Bay	Raber Bay	Potagannissing Bay
Yellow perch	x	x	x	x	x	x
Northern pike	x	x	x	x	x	x
Walleye	x	x	x	x	x	x
Smallmouth bass	x	x	x	x	x	x
Black crappie	-	-	x	-	-	-
Rock bass	x	x	x	x	x	x
Bluegill	-	-	x	-	-	-
Pumpkinseed	x	x	x	x	-	x
Lake trout	-	-	-	-	-	x
Brown trout	x	-	-	-	-	-
Chinook salmon	-	-	-	x	x	x
Pink salmon	-	x	x	x	-	x
Lake herring	-	x	x	x	x	x
Lake whitefish	x	-	x	x	x	x
Alewife	-	-	-	-	-	x
Bloater	-	-	-	-	-	x
Rainbow smelt	-	-	x	-	x	x
Freshwater drum	-	-	-	-	x	-
Brown bullhead	x	x	x	x	x	x
Channel catfish	-	-	x	x	x	-
Lake sturgeon	-	-	x	x	-	x
White sucker	x	x	x	x	x	x
Longnose sucker	-	-	x	x	x	x
Redhorse sp.	-	x	x	x	x	x
Common carp	-	-	x	-	-	-
Bowfin	-	-	-	-	-	x
Gizzard shad	-	-	x	-	-	-
Longnose gar	-	-	x	x	-	x

Table 3. Number of major sport fishes captured in 1,000 feet of graded-mesh[a] gill net per night (CPE) at the areas sampled during the August-October 1987 fisheries survey of the St. Marys River, Chippewa County, Michigan.

Species and year	Areas sampled					
	Upper River	Lake Nicolet	Lake George	Munuscong Bay	Raber Bay	Potagannissing Bay
Yellow perch						
1987	12.7	30.4	55.6	23.8	41.4	51.2
1979	43.1	18.9	26.2	9.2	9.8	27.3
1975	25.3	13.9	31.8	11.3	6.0	33.5
Northern pike						
1987	2.6	2.9	22.1	12.5	11.7	6.3
1979	1.9	4.7	14.3	11.8	6.0	6.5
1975	4.4	11.7	17.3	9.3	5.0	7.2
Walleye						
1987	0.4	1.3	6.7	2.5	21.9	5.4
1979	0.0	1.1	4.0	2.9	5.6	6.2
1975	0.0	4.7	5.0	2.9	2.1	6.3
Smallmouth bass						
1987	0.2	2.1	12.9	14.1	2.3	0.3
1979	0.0	0.0	0.0	0.3	0.0	0.0
1975	0.0	0.0	0.3	0.2	0.0	1.4
Lake herring						
1987	0.0	0.8	2.8	0.7	1.0	24.2
1979	0.0	0.0	0.0	3.2	62.8	39.7
1975	0.0	9.2	0.0	0.1	42.5	21.4

[a]2.0-, 2.5-, 3.0-, and 4.5-inch multi-filament nylon mesh.

Table 4. Average total length (inches) of major sport fishes captured in graded-mesh[a] gill nets fished in the areas sampled during the August-October 1987 fisheries survey of the St. Marys River, Chippewa County, Michigan.

Species and year	Areas sampled					
	Upper river	Lake Nicolet	Lake George	Munuscong Bay	Raber Bay	Potagannissing Bay
Yellow perch						
1987	9.2	8.5	8.9	9.1	9.3	9.4
1979	8.9	7.4	8.5	8.3	8.8	9.2
1975	9.0	---	8.7	9.1	8.7	9.1
Northern pike						
1987	21.3	19.9	20.1	19.1	20.1	20.6
1979	19.5	18.4	18.7	18.8	18.7	20.1
1975	18.9	15.2	18.4	19.5	17.5	19.8
Walleye						
1987	12.3	17.8	18.4	17.3	14.0	14.9
1979	---	17.0	16.0	13.8	13.8	17.4
1975	---	17.8	17.8	17.3	16.6	19.2
Smallmouth bass						
1987	10.0	10.1	11.4	10.4	11.9	13.5
1979	---	---	---	7.5	---	---
1975	---	---	11.6	12.0	---	11.1
Lake herring						
1987	---	15.5	14.1	12.3	14.9	13.5
1979	---	14.6	---	11.5	14.1	13.7
1975	---	---	---	---	13.7	13.5

[a]2.0-, 2.5-, 3.0-, and 4.5-inch multi-filament nylon mesh.

Table 5. Yellow perch age composition (number and frequency), average total length (inches), and length range from areas of the St. Marys River surveyed with graded-mesh[a] gill nets during August-October 1987, with average length from the previous survey (1979) and the state average.

Area parameters	Age 3	4	5	6	7	8	9	10	11	Mean growth index[b]
Upper river										
1987										
Number	---	19	48	40	9	2	3	2	---	
Frequency (%)	---	15	29	33	7	2	2	2	---	
Average length	---	7.9	8.5	8.8	10.0	10.4	12.0	12.3	---	-0.8
Range	---	6.3-8.5	7.1-10.7	7.7-10.4	8.5-11.3	10.1-10.6	10.7-13.6	12.1-12.5	---	
1979										
Average length	7.2	7.9	8.5	10.2	10.1	11.9	11.6	---	---	
Lake Nicolet										
1987										
Number	---	10	22	3	1	6	---	---	---	
Frequency (%)	---	24	52	7	2	14	---	---	---	
Average length	---	7.7	8.7	9.1	11.3	11.6	---	---	---	-0.3
Range	---	7.2-8.3	7.4-10.9	8.0-9.8	---	10.3-13.2	---	---	---	
1979										
Average length	6.6	7.3	8.7	8.2	9.6	---	---	---	---	
Lake George										
1987										
Number	---	4	9	8	6	1	1	---	---	
Frequency (%)	---	14	31	28	20	3	3	---	---	
Average length	---	7.8	8.5	10.1	10.4	11.9	12.7	---	---	-0.4
Range	---	7.4-8.0	7.4-10.2	9.3-10.7	10.0-11.0	---	---	---	---	
1979										
Average length	6.8	7.5	8.0	9.8	11.1	11.1	---	---	---	
Munuscong Bay										
1987										
Number	---	10	26	8	9	1	---	---	---	
Frequency (%)	---	19	48	15	17	2	---	---	---	
Average length	---	7.7	8.9	11.0	11.5	12.8	---	---	---	+0.2
Range	---	6.7-9.4	7.1-10.6	10.1-12.3	11.0-12.0	---	---	---	---	
1979										
Average length	8.0	7.6	8.5	9.4	11.2	10.0	---	---	---	

Table 5. Continued:

Area parameters	Age 3	4	5	6	7	8	9	10	11	Mean growth index[b]
Raber Bay										
1987										
Number	2	21	17	7	12	7	3	2	1	
Frequency (%)	3	30	24	10	17	10	4	3	1	
Average length	6.5	7.4	9.1	9.9	10.9	11.7	12.1	12.4	13.8	-0.3
Range	6.1-6.9	6.7-8.2	6.9-10.8	8.6-11.5	9.7-12.1	10.7-12.5	11.7-12.3	12.3-12.5	---	
1979										
Average length	7.7	8.7	10.7	10.3	---	---	---	---	---	
Potagannissing Bay										
1987										
Number	---	---	25	23	12	2	---	2	2	
Frequency (%)	---	---	38	35	18	3	---	3	3	
Average length	---	---	9.1	10.3	10.7	12.1	---	13.0	13.4	-0.2
Range	---	---	7.3-11.9	8.0-12.5	9.5-12.0	11.9-12.2	---	12.1-13.9	12.4-14.3	
1979										
Average length	7.9	8.8	9.8	10.6	11.9	12.7	11.1	---	---	
State average	7.2	8.2	9.2	10.1	10.9	11.5	11.9	---	---	

[a]2.0-, 2.5-, 3.0-, and 4.5-inch multi-filament nylon mesh.

[b]Summation of mean differences of average length at age from the state average for that age, divided by the number of age groups.

Table 6. Northern pike age composition (number and frequency), average total length (inches), and length range from areas of the St. Marys River surveyed with graded-mesh[a] gill nets during August-October 1987, with average length from the previous survey (1979) and the state average.

Area parameters	Age 1	2	3	4	5	6	7	8	Mean growth index[b]
Upper river									
1987									
Number	2	9	6	4	3	1	---	---	
Frequency (%)	5	21	14	10	7	2	---	---	
Average length	15.6	19.2	20.3	24.3	27.0	28.2	---	---	-1.5
Range	14.7-16.6	11.0-20.8	19.3-21.0	21.7-27.8	26.5-27.8	---	---	---	
1979									
Average length	---	16.1	19.5	21.5	27.7	---	---	---	
Lake Nicolet									
1987									
Number	1	1	2	---	1	---	---	2	
Frequency (%)	14	14	28	---	14	---	---	28	
Average length	9.2	12.2	19.3	---	25.1	---	---	26.5	-1.5
Range	---	---	19.0-19.5	---	---	---	---	25.1-27.3	
1979									
Average length	---	---	16.5	20.9	25.0	26.3	---	---	
Lake George									
1987									
Number	6	29	16	8	2	---	---	---	
Frequency (%)	10	48	26	13	3	---	---	---	
Average length	16.2	18.8	20.9	22.8	28.2	---	---	---	-1.5
Range	13.3-18.1	15.3-21.0	19.5-22.4	20.9-24.1	27.0-29.4	---	---	---	
1979									
Average length	12.7	15.4	17.1	19.0	22.0	23.8	24.5	---	
Munuscong Bay									
1987									
Number	12	8	7	13	1	---	---	---	
Frequency (%)	29	20	17	32	2	---	---	---	
Average length	16.7	17.8	20.8	22.0	27.4	---	---	---	-1.8
Range	14.8-18.0	16.7-20.0	17.8-25.0	20.0-23.6	---	---	---	---	
1979									
Average length	12.8	16.9	18.9	20.6	22.3	24.6	26.2	---	

Table 6. Continued:

Area parameters	Age 1	2	3	4	5	6	7	8	Mean growth index[b]
Raber Bay									
1987									
Number	---	6	31	13	1	---	---	---	
Frequency (%)	---	12	61	25	2				
Average length	---	17.9	19.6	22.0	24.8	---	---	---	-2.8
Range	---	15.8-22.9	16.6-23.1	18.5-25.3	---	---	---	---	
1979									
Average length	---	17.4	19.0	20.2	24.2	---	---	---	
Potagannissing Bay									
1987									
Number	7	22	10	9	3	2	3	1	
Frequency (%)	13	39	8	16	5	4	5	2	
Average length	15.8	18.3	21.3	23.6	25.5	28.8	29.6	36.0	-2.0
Range	13.1-16.8	15.7-21.0	19.9-23.5	21.6-26.5	24.5-26.5	28.4-29.2	28.9-30.6	---	
1979									
Average length	13.3	16.7	18.9	23.2	23.2	24.1	27.2	---	
State average	16.6	20.1	22.8	25.0	26.9	28.8	30.7	---	

[a] 2.0-, 2.5-, 3.0-, and 4.5-inch multi-filament nylon mesh.

[b] Summation of mean differences of average length at age from the state average for that age, divided by the number of age groups.

Table 7. Walleye age composition (number and frequency), average total length (inches), and length range from areas of the St. Marys River surveyed with graded-mesh[a] gill nets during August-October 1987, with average length from to the previous survey (1979) and the state average.

Area parameters	Age 1	2	3	4	5	6	7	8	9	10	11	Mean growth index[b]
Upper river												
1987												
Number	---	2	1	1	1	1	---	---	---	---	---	
Frequency (%)	---	50	25	25	---	---	---	---	---	---	---	
Average length	---	9.7	13.3	16.6	---	---	---	---	---	---	---	
Range	---	9.5-9.8	---	---	---	---	---	---	---	---	---	
1979												
Average length	---	---	---	---	---	---	---	---	---			
Lake Nicolet												
1987												
Number	---	---	---	2	---	---	---	---	---	1	---	
Frequency (%)	---	---	---	66	---	---	---	---	---	33	---	
Average length	---	---	---	14.5	---	---	---	---	---	24.5	---	
Range	---	---	---	14.3-14.8	---	---	---	---	---	---	---	
1979												
Average length	---	---	13.6	13.2	---	---	---	20.4	---	---	---	
Lake George												
1987												
Number	1	5	4	8	8	13	3	1	---	1	1	
Frequency (%)	2	11	9	18	18	29	7	2	---	2	2	
Average length	9.7	14.0	16.1	16.7	19.5	20.5	21.5	22.0	---	23.3	26.0	+0.4
Range	---	13.6-14.7	16.1-16.4	13.2-17.1	18.7-20.0	19.6-21.8	21.1-21.3	---	---	---	---	
1979												
Average length	---	11.1	14.0	15.0	18.4	20.4	18.6	---	---	---	---	
Munuscong Bay												
1987												
Number	---	2	4	4	2	---	---	---	---	---	---	
Frequency (%)	---	7	13	27	27	13	---	---	---	---	---	
Average length	---	12.6	12.7	16.6	18.8	19.9	---	---	---	---	---	
Range	---	---	11.5-13.8	14.7-19.5	16.6-20.7	19.7-20.0	---	---	---	---	---	
1979												
Average length	---	10.0	11.0	14.1	14.8	---	20.6	---	---	---	---	

Table 7. Continued:

Area parameters	Age 1	2	3	4	5	6	7	8	9	10	11	Mean growth index[b]
Raber Bay												
1987												
Number	1	17	33	16	5	4	2	---	---	---	---	
Frequency (%)	1	22	42	21	6	5	3	---	---	---	---	
Average length	8.8	10.8	13.7	16.9	18.7	19.4	21.8	---	---	---	---	-1.1
Range	---	9.3-13.0	10.4-16.9	14.9-20.3	17.5-19.4	19.0-20.6	---	---	---	---	---	
1979												
Average length	---	11.5	14.5	16.7	---	---	19.9	---	---	---	---	
Potagannissing Bay												
1987												
Number	1	10	7	13	11	7	---	4	---	---	---	
Frequency (%)	2	24	17	31	26	17	---	10	---	---	---	
Average length	9.8	11.0	12.7	14.6	17.1	19.0	---	23.3	---	---	---	-2.7
Range	---	10.2-11.7	11.1-13.9	13.3-15.7	15.5-18.7	18.2-21.6	---	4	---	---	---	
1979												
Average length	---	12.1	14.9	17.6	18.6	20.8	20.2	21.2	---	---	---	
State average	9.8	13.3	15.2	17.2	18.6	20.3	21.3	22.1	---	---	---	

[a]2.0-, 2.5-, 3.0-, and 4.5-inch multi-filament nylon mesh.

[b]Summation of mean differences of average length at age from the state average for that age, divided by the number of age groups.

Table 8. Species and number stocked from 1985 to 1988 at various locations in the St. Marys River, Chippewa County, Michigan.[a]

Species stocked	Location		Age	Year			
	Name	Town, range, and section		1985	1986	1987	1988
Brown trout	Ashmun Bay	47N, 1E, Sec. 1	Yearling	13,500	15,000	---	15,000
	Sherman Park	47N, 1E, Sec. 30	Yearling	---	---	15,000	---
Chinook salmon	De Tour	42N, 4E, Sec. 35	Spring fingerling	50,000	---	---	---
	Rapids	47N, 1E, Sec. 4	Spring fingerling	93,002	131,500	101,968	100,000
Lake trout	Drummond Island	41N, 5E, Sec. 22	Yearling	113,399	50,000	80,300	---
	Sault Ste. Marie	47N, 1E, Sec. 5	Spring fingerling	---	---	2,000	---
Rainbow trout	Rapids	47N, 1E, Sec. 4	Yearling	19,918	19,700	---	20,000
			Fall fingerling	27,751	---	---	---
	Sault Ste. Marie	47N, 1E, Sec. 5	Yearling	---	---	27,629	3,500
			Spring fingerling	2,148	---	7,000	---
Steelhead	Rapids	47N, 1E, Sec. 4	Yearling	16,012	219,000	15,000	11,500
Northern pike	Potagannissing Bay	42N, 6E, Sec. 3	Fall fingerling	13,500	---	---	---
Walleye	Ashmum Bay	47N, 1E, Sec. 4	Fall fingerling	26,567	25,334	---	20,000
	Sault Ste. Marie	47N, 1E, Sec. 5	Fall fingerling	29,982	---	---	20,651
	Rapids	47N, 1E, Sec. 4	Fall fingerling	---	25,334	---	---
	Potagannissing Bay	42N, 6E, Sec. 3	Fall fingerling	---	89,391	85,429	81,060

[a]Information from Michigan Department of Natural Resources stocking records.

Table 9. Smallmouth bass age composition (number and frequency), average total length (inches), and length range from areas of the St. Marys River surveyed with graded-mesh[a] gill nets during August-October 1987, with the state average.

Area parameters	Age 3	4	5	6	7	8	Mean growth index[b]
Upper river							
1987							
Number	---	1	1	---	---	---	
Frequency (%)	---	50	50	---	---	---	
Average length	---	9.9	10.0	---	---	---	
Range	---	---	---	---	---	---	
Lake Nicolet							
1987							
Number	1	3	1	---	---	---	
Frequency (%)	20	60	20	---	---	---	
Average length	8.6	9.7	12.1	---	---	---	
Range	---	9.4-10.2	---	---	---	---	
Lake George							
1987							
Number	---	14	8	3	---	---	
Frequency (%)	---	56	32	12			
Average length	10.2	11.5	13.9	---	---	---	-3.8
Range	---	9.4-10.2	10.6-12.7	12.1-15.2	---	---	
Munuscong Bay							
1987							
Number	6	17	7	1	---	---	
Frequency (%)	19	31	22	3	---	---	
Average length	9.3	10.1	13.0	14.6	---	---	-2.9
Range	8.7-10.0	9.4-11.2	11.0-13.8	---	---	---	
Raber Bay							
1987							
Number	---	5	2	1	3	---	
Frequency (%)	---	45	18	9	27	---	
Average length	---	9.9	11.1	13.4	14.7	---	-4.1
Range	---	9.6-10.3	10.9-11.3	---	14.5-15.0		

Table 9. Continued:

Area parameters	Age 3	4	5	6	7	8	Mean growth index[b]
Potagannissing Bay							
1987							
Number	---	1	---	1	1	---	
Frequency (%)	---	33	---	33	33	---	
Average length	---	11.0	---	13.0	14.3	---	
Range	---	---	---	---	---	---	
State average	12.0	14.0	15.2	16.0	17.1	17.8	

[a]2.0-, 2.5-, 3.0-, and 4.5-inch multi-filament nylon mesh.

[b]Summation of mean differences of average length at age from the state average for that age, divided by the number of age groups.

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