South Manistique (Whitefish) Lake

Mackinac County (T43N and T44N, R11W and R12W, Sections Various)
Surveyed May, June, and July, 2003

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Environment

South Manistique (Whitefish) Lake is a 4001 acre lake located in northwestern Mackinac County in Portage and Newton townships. The Village of Curtis is located on the northern shore, between South Manistique Lake and Big Manistique Lake. The surrounding land is characterized as uplands with a mixture of herbaceous and woody wetlands. Soil types in the immediate area are sand and coarse sand, loam, and loamy sand (Madison and Lockwood 2004).

Two designated trout streams, Norton Creek and Taylor Creek, enter the lake. Strom Creek and the Shoepac River also flow into South Manistique Lake. The only outlet, Portage Creek, is located on the north end of the lake in Curtis and empties into Big Manistique Lake. There is a water control structure on Portage Creek about 200 feet downstream from South Manistique Lake. A legal lake level has not been established. The boards are removed in the fall and installed after spring run-off, varying the lake level by approximately 2 feet. The substrate on the immediate shoreline of South Manistique Lake is sandy with bays composed of sand, muck, and fibrous peat.

Maximum water depth is approximately 29 feet with about 10% of the lake depth greater than 20 feet. Extensive and productive littoral zones line the margins of the lake. Aquatic vegetation consists of Chara, Potomegaton, bladderwort, flatstem pondweed, northern milfoil, lily pads, cattails, bulrushes, and common naiad. Aquatic plants are a vital part of any lake. They convert sunlight and nutrients into living plant tissue that can then be utilized by bacteria, fish, waterfowl, insects, and mammals as food. Also, rooted plants create a varied environment in which fish-food organisms reside. Aquatic plants are also associated with the reproductive activities of fish or used as nursery areas by juvenile fish.

South Manistique Lake is a popular recreational lake, both in the summer and winter. There are four public access boat launches on South Manistique Lake. The Village of Curtis owns a launch site on the north end of the lake (T44N, R12W, Section 13), and the Michigan Department of Natural Resources (MDNR) owns launches in the northwest shoreline in Wolfe Bay (T43N, R12W, Section 22) and on the southeast shoreline (T44N, R12W, Section 36). A third MDNR boat launch is located at the Michigan State Forest Campground on the west side of the lake in the bay south of Long point (T44N, R12W, Section 27). The lake receives both recreational boating and personal watercraft traffic in addition to the boating pressure from anglers. South Manistique Lake is also ice-fished regularly during the winter.

History

MDNR stocking records indicate that walleyes were stocked in South Manistique Lake from 1934 until 1941. Stocking was then ceased until 1971 and continued through 1994 (Table 1). Yellow perch were

stocked in 1936 and 1939, and northern pike in 1942, 1949, and 1950. Muskellunge (northern and tigers strains) have been stocked since 1972, but not on an annual or regular basis (Table 1).

The first record of a fish collection on South Manistique Lake was from shoreline seine and gillnet surveys in July of 1926 by J.N. Lowe. Identification was made by the Michigan Department of Conservation (MDOC), Institute of Fisheries Research, in 1953. The survey collection reported yellow perch, lake herring, common white sucker, rock bass, pumpkinseed sunfish, brown bullhead, smallmouth bass, northern pike, bluegill, mimic shiner, sand shiner, common shiner, golden shiner, bluntnose minnow, log perch, Johnny darter, Iowa darter, mottled sculpin, and brook stickleback.

The MDOC conducted a complete biological survey of South Manistique Lake in September of 1937. Alkalinity ranged from 82-85, pH ranged from 7.8-8.0, and dissolved oxygen was found to range from 7.1-7.4 ppm. No Secchi disk readings were taken. Using gillnets and seines, it was reported that the fish community consisted of northern pike, largemouth bass, smallmouth bass, walleye, lake herring, yellow perch, pumpkinseed sunfish, bluegill, rock bass, common white sucker, black bullhead, brown bullhead, bluntnose minnow, Johnny darter, golden shiner, common shiner, and lake chubsucker. An Ekman dredge that samples for bottom organisms resulted in the capture of mayflies, leeches, mussels, Chaborus (phantom midges) and Chironomids (non-biting or true midges).

Two MDNR fish surveys were conducted in 1980. The first was a July electrofishing survey. Yellow perch constituted 40% of the catch with fish ranging from 3.1-9.4 inches in length. Three walleye were captured: 22, 27, and 36 inches in length. Small numbers of panfish, suckers, and bullheads were also captured.

The second survey with trap nets and fyke nets was conducted in October of 1980. A total of 713 fish were captured representing 12 species. Yellow perch accounted for 45% of the catch with fish ranging from 4-10 inches (average of 6.3 inches). Walleye were the next most numerous species captured in the survey representing 20% of the catch (144 individuals). Walleyes ranged from 4-22 inches in length. Growth of walleye less than 17 inches was slow compared to State average while walleye over 20 inches expressed very good growth rates, up to 2.4 inches above State average. Growth rates of other species were not determined. Thirteen bluegills were caught (8-10 inches in length) along with a few individuals of smallmouth bass, largemouth bass, pumpkinseed sunfish, lake herring, and redhorse suckers. Eight northern pike ranging from 18-22 inches were also captured.

The MDNR conducted another, more intensive general fisheries survey utilizing gillnets, fyke nets, and trap nets in September of 1988. A total of 3,464 fish were captured representing 14 species. Walleye were the most numerous species with 388 individuals captured representing every age class from 0 to 10. Lengths ranged from 9-26 inches with the largest fish measuring 26 inches. Approximately 70% of the walleye were legal-sized (15 inches minimum size limit (MSL)), and growth rates were found to be near the State average. Pumpkinseed sunfish (150 captured) and bluegills (165 captured) ranged up to 8 and 9 inches, respectively, with most of the individuals in the 6- and 7-inch groups. Growth rates for both species were average. Only 6 northern pike were captured, ranging from 20 to 24 inches. Largemouth bass averaged 9.5 inches in length (55 fish ranged from 5-17 inches) while smallmouth bass averaged 9.3 inches (94 fish ranged from 6-19 inches). Both species were found to have growth rates about State average.

In 1994, MDNR personnel collected scales and spines from walleye captured during the spring egg-take. In the early 1990's, Anglers had been complaining of many small walleye in South Manistique Lake. Age analysis indicated that growth rates of walleye had fallen to almost 2-3 inches below the State average while the previous survey in 1988 had shown growth rates that were State average. After this survey, stocking of walleyes was suspended given the poor growth rates due to the high abundance of walleye.

South Manistique Lake was again the target of a MDNR fish survey in August/September of 1995. This survey was conducted to not only check the balance of the fish community, but to also to collect additional information on the walleye population. Trap nets, fyke nets, and gillnets were used. Panfish dominated the catch. Bluegill averaged 6.3 inches, accounting for 62% of the total catch by number, and over 65% of the catch was greater than 6 inches. In addition, 61% of the pumpkinseed sunfish and 58% of the yellow perch were above acceptable size (greater than 6 inches and greater than 7 inches, respectively). Largemouth bass averaged 10.1 inches (73 fish ranged from 5-19 inches) and smallmouth bass averaged 7.4 inches (33 fish ranged from 4 to 16 inches). Northern pike averaged 21.7 inches in length with the largest individual being 36 inches. Additionally, 2 muskellunge were also captured (24 and 36 inches). Growth rates of walleye continued to decline with age groups 2, 4, 5, and 7 exhibiting growth rates of almost 3 inches below State average with other age-classes displaying growth of 1.2 to 3.9 inches below State average. Mean growth rates for northern pike, yellow perch, bluegill, largemouth bass, and smallmouth bass were 2.0, 1.8, 1.4, 1.4 and 2.5 inches below State average. These results indicated a severe change from the 1988 survey when most species were growing at or slightly above State average.

Another general survey was conducted by MDNR personnel in late July of 2000. Acceptable sized bluegills had significantly declined in number. The total number of bluegills captured for the survey was 3,097, with only 34 (1%) 6 inches or larger. Growth of bluegill was slightly above average. Anglers had been complaining of poor bluegill fishing for several years. Of the 106 walleye captured, 56 (53%) were legal-sized with age classes 1-10, 12, 14, and 15 represented. Growth of walleye aged 1 to 5 were about State average while walleye aged 6 and older displayed growth below State average by at least 1 inch. Smallmouth bass were now growing 2.1 inches above State average with 31% of the 29 individuals captured legal-sized. Yellow perch averaged 5.9 inches with most fish captured in the 4-7 inch-groups. Northern pike (20 captured) averaged 19.2 inches, ranged from 15-25 inches, and were growing 1.7 inches above average. Pumpkinseed sunfish and yellow perch displayed average growth.

Several fall walleye recruitment electrofishing surveys have also been conducted on South Manistique Lake. This sampling method can allow managers to monitor success of stocking, track trends in natural reproduction, adjust stocking rates, set stocking priorities, and monitor the effects of environmental fluctuations and habitat loss/degradation on reproduction (Ziegler and Schneider 2000). Catch-per-effort (CPE) is defined as the "number of young-of the-year (yoy) walleyes captured per linear mile of shoreline." CPE data can then be converted to number of yoy/acre. Generally, capture of less than 11 yoy/acre shocked is considered a poor year-class, 11-30 yoy/acre is considered to be in the range of average, and greater than 30 yoy/acre is considered to be a strong year-class. Fall recruitment surveys were conducted in 1992 (6.9 yoy/acre=poor), 1995 (2.8=poor), 1996 (4.7=poor), 1999 (18.9=average) and 2000 (21.1=average).

Periodically, the status of the aquatic plant community has caused conflict with user groups in South Manistique Lake. In 2003, the local community at Curtis hired an environmental consulting firm to inventory the aquatic plant community in the lake and present options for weed control, if appropriate. The plant identified as the "problem" was common naiad. Naiad is torn from the lake bottom due to wind and wave action and rolled into large clumps which would then float and end up on the shoreline. This problem has been reported by riparians for over 70 years. By 2004 and 2005, the large piles of naiad were not accumulating on the shoreline as in just a few years prior, and it was determined by the lake board not to take action with any sort of management such as weed harvesting.

Current Status

Michigan has 92 inland lakes that are 1,000 acres or larger. These large lakes provide significant fishing and other recreational opportunities. The MDNR implemented a Division-wide large lake survey protocol in 2001 to obtain current information about these fish populations. The main objective of the large lake survey project is to estimate population size, annual sport harvest, growth rates, population age structure, and movement dynamics of walleye and northern pike. In addition, information is collected on other fish species present. In 2003, South Manistique Lake was surveyed as part of this project from April 22 to May 01, with effort consisting of 153 large mesh fyke net lifts and electrofishing.

The survey effort takes place in the early spring and consists of intensive netting and electrofishing operations. We attempt to capture, tag, and release about 10% of the estimated legal-size walleye (15 inches MSL), northern pike (24 inches MSL), muskellunge (42 inches MSL), and occasionally smallmouth bass (14 inches MSL). Recoveries of tagged fish were tracked with a year-long creel survey and by voluntary tag returns. Spines, fin rays, and scale samples are collected to determine fish ages. In addition to the spring survey, a summer survey was also conducted for a variety of physical, chemical and biological indicators.

The total fish catch during the 2003 survey was 7,244 fish and catch information is reported in Table 2. A total of 3,948 walleyes were captured that ranged in length from 4-29 inches. Over 73% of these were legal size fish (15 inches MSL). Eleven year classes were represented in the catch including ages 2-12. Based on South Manistique Lake's stocking history (Table 1), these fish represent both naturally reproduced and stocked fish. Growth of walleye was at State average. Legal walleye density was calculated to be 1.5 fish per acre, which is considered to be average to slightly above average. Based on the creel census from May 2003-February 2004 angler exploitation of walleye was surprisingly high at 31.8%. Walleye harvest rates calculated from the creel census were 1.4 fish per acre and 0.04 fish per hour of angling effort (Table 3 and Table 4).

A total of 276 northern pike were collected with 14% legal size (24 inches MSL). The majority of northern pike were captured in the 17-24 inch range with 2 fish just over 30 inches in length. Smallmouth bass from 6-20 inches were collected, with 84% of fish being legal size (14 inches MSL). The total survey catch included small numbers of black bullhead, brown bullhead, bluegill, common shiners, largemouth bass, mottled sculpin, pumpkinseed sunfish, rainbow trout, redhorse suckers, rock bass, common white suckers, and yellow perch. Given the early spring and cold water temperatures, it was expected that the number of fish caught from these species groups would be low. A total of 18 muskellunge (12-48 inches) were also captured.

Angler pressure on South Manistique Lake from April 2003-March 2004 was suprisingly high (as compared to other lakes surveyed in the Large Lakes program) at 31.4 hours per acre, and the number of fish harvested per acre during that time interval was estimated to be 8.8.

A second supplemental survey was conducted by MDNR personnel on South Manistique Lake from June 02-06, 2003 to complete information for the MDNR Status and Trends program. The effort consisted of 38 large-mesh fyke net lifts, 15 large-mesh trap net lifts, 9 experimental gill net lifts, and shoreline seining in 3 areas. Netting designs followed the Status and Trends sampling protocol where sampling effort is a product of lake size. A follow-up survey was made on July 29 with a pulsed direct current boomshocking boat for approximately 3 hours.

For this Status and Trends survey, a total of 4,154 fish were caught representing 21 species (Table 5). Game fish species such as walleye, northern pike, smallmouth bass, and largemouth bass comprised 56.7% of the catch by number. Bluegills, pumpkinseed sunfish, and yellow perch were also well represented in the survey totals. Only 1 muskellunge was captured.

Walleye ranged in length from 7-25 inches with 44% of 119 fish being legal size. Age analysis of scales and spines indicated that walleye were growing at State average. Nearly 13% of the pike captured were legal size. The average length of pike was 20.5 inches with fish ranging from 10-26 inches. Largemouth bass were well represented in the survey with 113 fish captured ranging from 1-19 inches. The average length was 11.0 inches and largemouth bass were growing at the State average. A large number of bluegills were captured although average size was small (Table 5). Yellow perch averaged 5.3 inches and ranged from 1-11 inches. Both bluegills and yellow perch were growing approximately 1.3 inches below the statewide average.

Water quality conditions were also surveyed on August 20, 2003 and were found to be in an acceptable range. Water temperatures from surface to the lake bottom ranged from 76 to 77 °F. The water color was clear, and the Secchi disk depth reading was 8 feet. Within the water column, conductivity ranged from 378-379 micro Siemens (µS), pH ranged from 8.3. to 8.6 and dissolved oxygen ranged from 4.4 to 9.0 parts per million (ppm). Total alkalinity and total phosphorus were measured as 98 milligrams/Liter (mg/L), and 0.013 mg/L, respectively. Current water chemistry results for dissolved oxygen and alkalinity are similar those found during the first lake survey by the MDOC in 1937 while the present pH range has changed to slightly more basic conditions from those found in 1937 (1937: pH=7.8-8.0).

Analysis and Discussion

South Manistique Lake has always supported natural reproduction of walleye, although a good year-class of fish is not produced every year. This is to be expected given the widely varying environmental conditions that can be experienced during the early spring spawning event and egg incubation period. Even given this natural variability in reproductive success, the walleye population was apparently self-sustaining for an extended period during the 1940's, 1950's, 1960's, and from the mid-1990's to present.

Walleye fry were stocked by a private club from Curtis, under the supervision of the MDNR, starting in the early 1970's and continuing through the mid 1990's (Table 1). However, contribution of the fry

stocked in South Manistique Lake to the overall population of walleye (which included naturally reproduced fish) is not known as stocked fish could not be differentiated from natural fish. In the early 1990's the Curtis club improved their rearing techniques, and nearly doubled the amount of fry stocked into South Manistique Lake. Growth of walleye from the 1988 survey as compared to the mid-1990's survey indicated a very severe decline in the average growth, up to almost 4 inches below the State average. This was a clear indication of over stocking the lake with walleye. Too many walleye were in South Manistique Lake relative to what forage was available. Growth rates of most other species also declined significantly further indicating a general lack of forage. Walleye stocking was discontinued after 1994 to allow the fish community the opportunity to recover and allow growth rates of walleye and other species to improve. After several years, growth rates of walleye and most other species recovered to acceptable levels as evidenced by the data from the 2000 and 2003 surveys. As previously noted, the density of legal walleye in South Manistique Lake is estimated to be 1.5 fish/acre, which is considered average to slightly above average. Comparing the walleye population of South Manistique Lake to other large lakes is difficult due to the infancy of the Large Lakes survey program in which not many other lakes of this size have been surveyed at this time. However, another Upper Peninsula waterbody, the Michigamme Reservoir, Iron County, was surveyed in 2001. There, legal walleye density was also estimated to be average to slightly above average at 1.5 fish/acre.

South Manistique Lake is also popular for bluegills, and the lake has traditionally provided some nice angling opportunities with large fish available. Angler complaints were received in regards to the poor bluegill fishing reported during the 1990's. Reasons for the poor fishery may include high levels of angler harvest, the effect of predation from a large population of walleye or other predators, a combination of the previous factors, or other unknown changes to the system.

Currently, creel statistics indicate that bluegill and yellow perch are the mainstays of the South Manistique fishery (Table 3 and Table 4). The smallmouth and largemouth bass populations are also providing attractive fisheries at this time. General survey and creel results (Table 3) indicate larger populations and a better fishery for largemouth bass compared to smallmouth bass. Additionally, creel data indicates that the vast majority of bass are released by anglers (Table 3 and Table 4). Rainbow trout were also captured by anglers in February of 2004, and these fish were from a private stocking for a fishing derby. Creel reports also indicated that splake were harvested by anglers (Table 4). Since records indicated that splake have never been stocked, it is suspected that these fish were actually brook trout that had migrated into the lake from tributary streams.

Muskellunge have been stocked in South Manistique Lake starting in 1972, and after 1980, stocking occurred about every 2-4 years depending on availability (Table 1). Numbers stocked during the 1980's ranged between 4,000-8,000 fish (1-2/acre) and provided an attractive fishery for anglers. During the 1990's however, availability of muskellunge fall fingerlings was insufficient to fill Fish Division requests, so South Manistique Lake experienced reduced stockings in terms of numbers stocked and stocking frequency (Table 1). Anglers noted a gradual decline in the quality of the muskellunge fishery through the 1990's. This comes as no surprise as no natural reproduction has been documented thus making the muskellunge population entirely dependent on stocking.

Overall, the current fish community in South Manistique Lake has not changed drastically since it was surveyed in the 1930's. Redhorse suckers and mottled sculpin were captured in 2003 but there is no record of them being present in 1937. Most likely they were not captured or not readily identified to

species during the original survey. Two species currently present in the fish community in 2003 but not in 1937 are rainbow trout and muskellunge. Private groups have stocked rainbow trout for winter ice fishing derbies and the MDNR has stocked muskellunge to create additional angling opportunity for a trophy fishing experience. One noted change in the fishery of South Manistique Lake is the status of the lake herring population. Anglers noted a decline in the lake herring fishery from the 1980's to present. Catch of lake herring during MDNR fishery surveys from 1980-2003 resulted in very few fish caught with the exception of the 1988 survey when 77 fish were sampled. Reasons for the decline in the population are at this time unclear and explanations are thus speculative. The lake herring population may have responded to increased predatory influence, subtle changes in the physical lake habitat, or other factors. During the 2003 Status and Trends survey, water temperatures were found to be 76-77 °F from the surface to the bottom, and lake herring would have difficulty thriving in such a warm environment. Additionally, creel results from 2003-2004 indicate some movement of walleye between Big Manistique Lake and South Manistique Lake. Perhaps lake herring mimic this tendency to migrate between the lakes as well, thus, potenitally affecting their abundance in South Mansitique Lake either seasonally or over a longer period of time.

Management Direction

The management goal for the near future is to maintain the health of the existing fish community and continue to support and enhance the muskellunge stocking program. Good numbers of predators can be found along with a diverse community of panfish species, and growth rates of most species are currently acceptable. Supplemental stockings of walleye are not needed at this time as this population is currently maintained through natural reproduction and appears to be in balance in this lake. However, angler exploitation rates of walleye are rather high, so continued monitoring of the walleye population is necessary to guard against any severe declines in the walleye sport fishery.

Most other fish populations are sustained through natural reproduction, although muskellunge are still dependent on stocking. As a result, muskellunge will be stocked at a conservative rate of 1.0 fall fingerling per acre every 3 years. There has traditionally been both very strong support for and against stocking of muskellunge, and concern has been repeatedly expressed by a segment of the pubic regarding the perceived negative effect of muskellunge predation on the overall fish community in a lake. A study of muskellunge diets in northern Wisconsin Lakes was published in 1999 (Bozek et al. 1999). It found that the fish community, season, and water body all played a role in shaping muskellunge diets, but the main forage selected by muskellunge in each season were yellow perch and white sucker. Largemouth bass, smallmouth bass, northern pike, walleye, minnows and shiners, and other species were less common in the diet. The results of that study indicated that, if readily available, suckers and yellow perch constituted a large proportion of the muskellunge diet. The fish community in South Manistique Lake is similar to those used for the muskellunge diet study in northern Wisconsin. Therefore, diet composition for muskies is expected to be similar with muskies mainly targeting perch and suckers with incidental predation on other angler-preferred species such as walleye and bluegills.

Another management goal is to maintain the health of the aquatic ecosystem and improve habitat conditions for fish when possible. It is absolutely vital that all remaining wetlands be protected from development. Such wetlands are an extremely critical component of the lake ecosystem, and they should remain in a natural state. Other goals for South Manistique Lake include working with area

residents and riparian landowners to promote and implement wise management practices for their lands and shoreline. Additionally, preservation of weed beds and other littoral vegetation is important to the overall health of the fish community. As mentioned in the history section, periodically there have been times of extensive growth of aquatic plants that have caused heightened concern among riparians. However, past and current history on South Manistique Lake has demonstrated that these periods of increased plant growth are not a permanent state but rather a short-term phenomenon likely due in part to changes in availability of sunlight and nutrients (i.e. nitrogen, phosphorus). As such, changes in the pattern of aquatic plant growth should be viewed as a natural event in an environmentally variable but generally healthy lake ecosystem.

One potential obstacle to the stated goals may be the operation of the lake-level control structure on Portage Creek. Installation and removal of the boards by township officials and others in regards to seasonal timing and lake height can be characterized as haphazard at best. Several instances are known when boards were installed when walleye were spawning in Portage Creek, thus depriving eggs and fry of water, and when boards were pulled in mid-summer to allow more flow in Portage Creek for recreational events. This disorganized approach to the operation of the dam and the un-natural fluctuations in the lake level could be a significant factor in the success or failure of year-classes of several species in the fish community. The MDNR will work with the riparians and surrounding community to develop a suitable solution in terms of operation of the lake-level control structure or complete removal of the structure and a return to a natural lake level that fluctuates with seasonal snowmelt and precipitation.

References

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Table 1. Stocking history for South Manistique (Whitefish) Lake, Mackinac County.

Year	Species	Number	Size
1934	walleye	300,000	fry
1935	walleye	300,000	fry
	walleye	7,000	fall fingerling
1936	walleye	420,000	fry
	walleye	15,000	fall fingerling
	yellow perch	10,000	adults
1937	walleye	450,000	fry
1938	walleye	320,000	fry
1939	walleye	570,000	fry
	yellow perch	8,000	fall fingerling
1940	walleye	420,000	fry
1941	walleye	270,000	fry
	northern pike	102	adults
1949	northern pike	??	adults
1950	northern pike	??	adults
1971	walleye	10,528	fingerling
1972	walleye	19,150	fingerling
	northern muskellunge	637	fingerling
	tiger muskellunge	963	fingerling
1973	walleye	300,000	fry
	walleye	990	fingerling
1974	walleye	400,000	fry
	walleye	23,665	fingerling
1975	walleye	3,000	spring fingerling
1977	walleye	20,000	fall fingerling
1979	walleye	1,066,020	fry
	tiger muskellunge	8,000	fall fingerling
1981	walleye	80,000	fry
	tiger muskellunge	8,000	fall fingerling
1982	walleye	1,000,000	fry
1983	walleye	260,000	fry
	tiger muskellunge	6,000	fall fingerling
1984	walleye	810,000	fry
1985	walleye	600,000	fry
1986	walleye	2,700,000	fry
1987	northern muskellunge	4,000	fall fingerling
1991	walleye	1,461,000	fry
	northern muskellunge	1,700	fall fingerling
1992	walleye	1,500,000	fry
1993	walleye	2,100,000	fry
1994	walleye	3,856,692	fry
1998	northern muskellunge	2,000	fall fingerling
2002	northern muskellunge	1,319	fall fingerling
2004	northern muskellunge	6,000	fall fingerling

Table 2. Species and relative abundances of fishes collected with sampling gear during the MDNR Large Lake Survey, April 22-May 01, 2003 at South Manistique Lake.

Common Name	Number Captured	% of Catch	Length Range (inches)	Average Length (inches)	% legal
Walleye	3948	66.9	4-29	17.1	73
Yellow Perch	978	13.5	4-12	5.8	
White Sucker	592	8.2	7-22	17.7	
Northern Pike	276	3.8	7-31	19.9	12
Rock Bass	169	2.3	3-11	7.6	
Bluegill	144	2.0	3-8	5.9	
Smallmouth Bass	60	0.8	6-20	16.1	84
Largemouth Bass	53	0.7	7-19	12.8	32
Rainbow Trout	42	0.6	13-18	14.9	100
Muskellunge	18	0.2	12-48	37.2	33
Brown Bullhead	15	0.2	7-13	11.3	
Redhorse Sucker	11	0.2	10-23	19.4	
Black Bullhead	7		5-14	9.9	
Mudpuppy	3				
Silver Redhorse	1		23-24	23.5	
Common Shiner	1		6-7	6.5	
Mottled Sculpin	1				

Table 3. Total angler harvest, total angler released fish, fishing pressure, and catch per hour, South Manistique Lake, in 2003. Two standard errors are given in parenthesis.

HARVEST

Species	Catch/Hour	May	June	July	August	Sept-Oct	Season
Smallmouth bass	0.00093	0	0	98	0	7	105
	(0.00175)	(0)	(0)	(196)	(0)	(14)	(196)
Walleye	0.04323	1,028	1,393	1,732	507	198	4,857
	(0.01307)	(664)	(618)	(856)	(342)	(164)	(1,304)
Yellow perch	0.076	2,277	2,554	2,442	552	714	8,538
	(0.02765)	(1,990)	(1,486)	(1,230)	(406)	(627)	(2,870)
Bluegill	0.14348	301	4,637	7,498	2,942	742	16,120
	(0.04191)	(466)	(2,059)	(3,092)	(1,692)	(510)	(4,140)
Largemouth bass	0.00238	0	0	114	96	58	268
	(0.00220)	(0)	(0)	(185)	(144)	(68)	(244)
Rock bass	0.00428	0	380	101	0	0	480
	(0.00301)	(0)	(278)	(181)	(0)	(0)	(332)
TOTAL HARVEST	0.2703	3,606	8,963	11,984	4,096	1,719	30,369
	(0.05981)	(2,149)	(2,628)	(3,451)	(1,779)	(828)	(5,223)

RELEASED

Species	Catch/Hour	May	June	July	August	Sept-Oct	Season
Smallmouth bass	0.01579	90	466	387	618	212	1,774
	(0.00690)	(121)	(387)	(466)	(361)	(166)	(735)
Largemouth bass	0.03766	513	736	908	1,393	682	4,231
	(0.01462)	(867)	(641)	(630)	(754)	(473)	(1,534)
Walleye	0.05935	593	3,810	1,144	712	408	6,668
	(0.01968)	(496)	(1,695)	(809)	(423)	(270)	(2,006)
Muskellunge	0.00039	0	44	0	0	0	44
	(0.00056)	(0)	(63)	(0)	(0)	(0)	(63)
Rock bass	0.01625	0	1,079	552	149	45	1,825
	(0.01290)	(0)	(1,295)	(568)	(182)	(61)	(1,427)
Pumpkinseed	0.02537	0	455	1,255	1,140	0	2,850
	(0.01695)	(0)	(910)	(1,414)	(802)	(0)	(1,863)
Bluegill	0.51322	409	13,919	24,036	17,882	1,415	57,660
	(0.14413)	(463)	(6,821)	(10,578)	(6,201)	(834)	(14,064)
Yellow perch	0.28678	1,598	5,399	15,692	8,317	1,214	32,220
	(0.07532)	(1,146)	(2,330)	(5,756)	(3,331)	(720)	(7,175)
TOTAL RELEASED	0.9548	3,202	25,909	43,972	30,212	3,976	107,272
	(0.19595)	(1,594)	(7,609)	(12,190)	(7,149)	(1,242)	(16,177)
TOTAL CATCH	1.2251	6,809	34,872	55,956	34,308	5,695	137,641
	(0.22798)	(2,676)	(8,050)	(12,669)	(7,367)	(1,493)	(16,999)
ANGLER HOURS		11,621	30,655	36,967	25,109	8,000	112,351
		(6,262)	(7,087)	(10,112)	(6,584)	(3,093)	(15,640)
ANGLER TRIPS		0	5,368	18,483	10,205	4,889	38,946
		(0)	(1,772)	(5,056)	(3,066)	(2,076)	(6,512)

Table 4. Total angler harvest, total angler released fish, fishing pressure, and catch per hour, South Manistique Lake, in the winter of 2003 and 2004. Two standard errors are given in parenthesis.

HARVEST

Species	catch/hour	Dec03-Jan04	February	March	Season
Rainbow trout	0.00228	0	40	0	40
	(0.00275)	(0)	(47)	(0)	(47)
Splake	0.00228	0	40	0	40
	(0.00275)	(0)	(47)	(0)	(47)
Lake herring	0.00204	35	0	0	35
	(0.00409)	(71)	(0)	(0)	(71)
Walleye	0.04768	628	172	26	826
	(0.02176)	(320)	(107)	(47)	(340)
Yellow perch	0.28229	3522	1261	107	4890
	(0.14186)	(2,142)	(721)	(99)	(2,262)
Bluegill	0.01942	0	0	336	336
	(0.02256)	(0)	(0)	(385)	(385)
TOTAL HARVEST	0.35599	4185	1512	470	6167
	(0.15115)	(2,167)	(732)	(400)	(2,322)

RELEASED

Species	catch/hour	Dec03-Jan04	February	March	Season
Smallmouth bass	0.0015	0	26	0	26
	(0.00205)	(0)	(35)	(0)	(35)
Largemouth bass	0.00251	0	8	36	44
	(0.00398)	(0)	(15)	(67)	(68)
Walleye	0.12633	1,262	591	336	2,188
	(0.04717)	(511)	(354)	(311)	(695)
Pumpkinseed	0.00208	0	0	36	36
	(0.00419)	(0)	(0)	(72)	(72)
Yellow perch	0.10216	1,443	244	83	1,770
	(0.09242)	(1,548)	(166)	(135)	(1,563)
TOTAL RELEASED	0.23457	2,704	868	491	4,064
	(0.10912)	(1,630)	(393)	(353)	(1,714)
TOTAL CATCH	0.59057	6,890	2,381	960	10,231
	(0.20294)	(2,712)	(831)	(534)	(2,886)
ANGLER HOURS		10,304	5,576	1,444	17,323
		(2,311)	(2,179)	(1,213)	(3,400)
ANGLER TRIPS		3,199	1,687	689	5,575
		(1,633)	(651)	(602)	(1,858)

Table 5. Species and relative abundances of fishes collected with sampling gear during the MDNR Status and Trends Survey, July 02-06 and July 29,2003 at South Manistique Lake.

Common Name	Number Captured	% of Catch	Length Range (inches)	Average Length (inches)	% legal
Bluegill	2043	49.2	1-8	4.9	
Rock Bass	586	14.1	2-11	6.8	
Pumpkinseed Sunfish	469	11.3	1-8	4.6	
Yellow Perch	325	7.8	1-11	5.3	
Spottail Shiner	145	0.1	1-3	2.4	
Walleye	119	2.9	7-25	14.6	44
Largemouth Bass	113	2.7	1-19	11	18
Northern Pike	97	13.4	10-26	20.5	13
Brown Bullhead	91	2.2	3-15	12.1	
White Sucker	56	1.4	4-22	17.8	
Smallmouth Bass	43	1.0	3-18	10.6	33
Logperch	21	0.5	2-4	3.1	
Bluntnose Minnow	15	0.4	2-3	2.5	
Redhorse Sucker	9	0.2	13-23	18.3	
Lake Herring	7	0.2	5-7	6.6	
Blackchin Shiner	7		2-3	2.5	
Common Shiner	3		1-2	1.5	
Black Bullhead	2		9-11	11	
Creek Chub	1		7-8	7.5	
Muskellunge	1		23-24	23.5	0
Rainbow Trout	1		15-16	15.5	100