Hubbard Lake

Alcona County (T27N, R7E, T28N, R7E)
Surveyed 2006

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Environment

Hubbard Lake, at 8,850 acres, is Michigan's twelve largest inland natural lake. It is located in northern Alcona County in the northern Lower Peninsula. The lake drains approximately 93,440 acres and has a flush rate of nearly four years. Maximum depth is near 90 feet with approximately 25% of the surface acreage less than 20 feet deep. Hubbard Lake stratifies thermally and may be considered a mesotrophic-oligotrophic lake. Five streams enter the lake including the West Branch River, Sucker, Stevens, and Holcomb Creek. These streams add productivity to the lake in varying amounts by depositing organic sediment. Lake bottom substrates consist of sand, marl, and gravel in the shoals with marl and pulpy peat in the deeper water. A dam over 6 feet high is located on the north shore which releases water into the Lower South Branch, Thunder Bay River. The original dam was constructed in the early lumbering days to provide enough water to float logs out from the tributaries and across the lake proper. Three boat access sites are located on Hubbard Lake, including two State of Michigan public boat launches. The MDNR recently revitalized both concrete ramps. One ramp is located in East Bay along the northeast shore while the other is located near the confluence of the West Branch River on the southeast shore. Each ramp has adequate parking for trailers. A township owned ramp is located in North Bay along the northwest shore and provides space for 20 trailers. Zebra mussels were reported in Hubbard Lake for the first time in 1999. These organisms anchor to the stable bottom substrates in the lake which include cobble, gravel and even woody debris which is prevalent along the undisturbed west shore. Rusty crayfish is another invasive species which are common in Hubbard Lake and may be more detrimental to the lake system. This species is known to remove vast amounts of aquatic vegetation in lakes and can reduce the amount available for fish cover and spawning. Since 1990, 122 Master Angler awards have been documented from Hubbard Lake. This includes catches for yellow perch (65), rock bass (30), bullhead species (14), northern pike (5), smallmouth bass (3), lake whitefish (2), brook trout (2), and channel catfish (1).

History

Fishery management practices have varied through the last century in Hubbard Lake. This is reflected in the amount and type of fish stocking efforts that have occurred in this time frame. Many of the initial stocking efforts in Hubbard Lake focused on cold water species. Early lake managers viewed it as a cold water lake due to the presence of trout and lake whitefish, yet it was really a lake with intermediate temperatures. As riparian development grew in the middle of the twentieth century, the lake became more fertile and the amount of suitable cold water habitat declined. Management began a slow shift towards cool water species such as walleye, smallmouth bass, pike, and muskellunge. Despite this, species which prefer cold water can still be found in Hubbard Lake today.

From 1895-1982, a wide array of fish were stocked at various sizes including: yellow perch; walleye fry and small fingerlings; fry, fingerling, and adult lake trout; adult emerald shiners; adult northern pike; brown trout; and legal-size rainbow trout. Most of these stocking efforts were done in the first

half of the twentieth-century. An additional 17,181 fingerling northern pike were stocked in three years including 1983, 1999, and 2001 while nearly a half-million pike fry have been stocked from 2002 through 2006 in the Holcomb Creek marsh adjacent to East Bay, as well as in the West Branch River. Tiger muskellunge were planted in Hubbard Lake in 1980, 1982, and 1985 (a total of 57,070 fall fingerlings). Approximately 139,420 yellow perch were also stocked from 1987-2001. Small fingerling walleye were stocked from 1980-1991 at rates varying from 1-30 fingerlings per acre (Table 1).

Fish management practices at Hubbard Lake date back to the first half of the twentieth century when early fish surveys were conducted in the 1920s and 1930s. In 1942, more extensive fish sampling was conducted with seines, and fyke-, and gill-nets. This effort resulted in 24 species of fish collected in Hubbard Lake. An abundance of minnow species were noted along with good numbers of white suckers, yellow perch, rock bass, and smallmouth bass. Vegetation surveys were completed in August of the same year, identifying 24 species of aquatic plants in the lake. Oxygen levels suitable for fish were found to water depths approximately 43 feet. The next fish collection was conducted in 1946. Already at that time anglers were referring to "the good old days" of Hubbard Lake fishing, and believed walleye and bass stocking efforts should commence. In 1947, commercial netting of rough fishes was initiated in effort to reduce their abundance. Fish shelters have been installed in the lake in different years as a cooperative effort between local anglers and the state of Michigan.

A measure of fishing pressure and angler success has been obtained from the general creel census records (1940-64) and from mail surveys in 1970 and 1973 (Laarman 1976). The general creel census was designed only to measure success of those anglers actually interviewed. The mail survey measured total fishing pressure. Yellow perch comprised 75-80% of the total fish harvest at Hubbard Lake from 1939 through 1964. Catch rates for all fish from this period were 2.2/hour from 1939-50, and 1.3/hour from 1951-64 (Laarman 1976). Catch rates of fish during the winter of 1935-36 were 0.3/hour. Estimated angler effort from mail surveys was 28,180 angler days in 1970, and 35,550 in 1973.

During the 1960s, pike spawning marshes were constructed to enhance the predator base in the lake. Netting surveys were conducted in the late 1960s documenting good numbers of northern pike, rock bass, yellow perch, smallmouth bass, bullhead, and white sucker. Also observed were cisco and largemouth bass. Average size yellow perch were noted.

Yearling rainbow trout were stocked at a rate of 7 fish/acre in 1969; however, a winter gill-netting survey the following year collected no trout. Trout have not been stocked since in Hubbard Lake. Modern walleye stocking efforts began in 1977 by the State of Michigan (Table 1). This practice was initiated to create a walleye fishery, and to reduce the number of stunted yellow perch in Hubbard Lake through increased predation. It was believed that a reduction in perch abundance would also stimulate the growth of the remaining perch population. In 1979, the first walleye stocking abundance were conducted; no walleye were collected with the nighttime electrofishing gear, however, angler catches were documented.

A fish survey was completed in mid-May 1986, with the purpose of determining survival and growth of stocked walleye and tiger muskellunge, and to evaluate the yellow perch population. Effort consisted of 206 total lifts of fyke-, trap-, and gill-nets. Fourteen species of fish were collected. Good numbers of walleye (403) were collected, representing age groups 2-8. Eighty-six percent of the total

walleye catch were fish 15-inches and larger. Growth of this species was similar to the statewide average for walleye growth. Only one large tiger muskellunge was collected during the survey. Nearly 700 yellow perch were collected with good numbers of 11-14 inch fish present, indicating that walleye stocking likely reduced perch abundance. Perch growth was superior to the statewide average length-at-age for this species. Other species collected in good numbers and sizes were rock bass, northern pike, and smallmouth bass. A fish management prescription was then created for Hubbard Lake which recommended the discontinuation of muskellunge stocking efforts while continuing stocking walleye every three years.

Evaluation of walleye stocking efforts (Table 1) were carried out in 1989, 1990, and 1991. These evaluations utilized nighttime electrofishing each year, and included the use of experimental gill nets and fyke nets in 1989. Using the Serns Index (Serns 1982; Ziegler and Schneider 2000), we determined that the 1989 and 1991 stocking efforts were unsuccessful (1 or less YOY walleye/acre collected). However, the 1990 collection included 83 YOY (age-0 fish) which resulted in an estimation of 4 YOY walleye/acre. This was still considered a poor year class of walleye, yet these fish were all from natural reproduction (Table 1). Adult walleyes were collected each year (1989-1991) representing several age classes. Walleye growth was considered to be average compared to walleye growth across the State of Michigan in 1989. Angler reports in the same year were considered good.

An extensive fish survey was conducted on Hubbard Lake in mid-May 1996 to examine long-term trends in the fish community. Effort consisted of 111 fyke-net lifts, 30 trap-net lifts and 4 inland gill-net lifts. Fyke- and trap-nets had a variety of mesh sizes and lead lengths. More than 4,000 fish were collected weighing over 7,000 pounds (Table 2). Fair numbers of walleye were collected with the nets. Eighty-nine percent of the total walleye catch in 1996 were 15-inches and larger, compared to 86% in 1986. Age-1 and age-4 walleye were collected in 1996 indicating some level of natural reproduction in 1995 and 1992. Walleye had not been stocked in Hubbard Lake since 1991 (Table 1). Walleye 15-18 inches were somewhat common (Table 3). Good numbers of age-6 and age-7 fish were represented in the survey catch (Tables 4 and 5), and these fish averaged 18-19 inches in length. Walleye were however growing slightly slower at Hubbard Lake compared to the statewide average length-at-age for this species (Table 4).

Very few quality size yellow perch were observed in this survey with only 2% 10-inches and larger. Rock bass were abundant in Hubbard Lake with 80% of the fish captured 8-inches or larger. Fair numbers of legal-size northern pike were available to anglers as depicted by the size distribution (Table 3). These fish grow well in Hubbard Lake both today and in the past (Table 4). More than 100 smallmouth bass were collected during the 1996 survey with 67% 14-inches and larger, compared to 28% in 1986. Other notable catches included the wide array of bait fish that inhabit the lake including minnows, shiners, and dace. White suckers were the most abundant fish collected during the 1996 survey (Table 2), and large suckers are common, with many fish ranging in length from 16-22 inches. Small white suckers are a good food source for predators and sucker abundance may help explain good growth of northern pike in Hubbard Lake (Diana 1987).

Another walleye evaluation was conducted in September of the same year (1996) to examine walleye natural reproduction. Sampling effort consisted of two hours of nighttime electrofishing along the south end of the lake. Ninety walleye were collected ranging in length from 3.2 - 14.8 inches and representing ages zero through four. Sixty-two age-0 walleye were collected at a rate of 32/hour.

According to the Serns Index (Serns 1982), there were approximately 7 age-0 walleye per surface acre in Hubbard Lake in the fall of 1996. This was considered a poor-average year class, yet all walleye (age-0 and adults) collected during the fall survey were again produced naturally. These fish represent years (1992 through 1996) when walleye were not stocked in Hubbard Lake (Table 1). However, very few fish (1/90) were legal size. It appeared that walleye growth had declined and it could take 4 to 5 years for a fish to reach legal size (15-inches).

The last fall walleye evaluation was made in Hubbard Lake over two October nights in 2004. The purpose of the survey was to determine the extent of walleye natural reproduction in recent years. More than seven miles of shoreline were covered at night with the electrofishing gear over varying habitats. A total of 94 walleye were collected with 76 of these being age-0 fish. The catch rate of age-0 fish was 19/hour, which is a good rate of capture of wild young walleye when compared to other northeast Michigan lakes. The Serns Index would indicate this to be a poor year class (2.4 fall YOY/acre), yet recruitment of young fish is highly encouraging. The YOY catch was 10.4 YOY/mile. Size of YOY ranged from 3-8 inches demonstrating great variability in growth of young walleye or time of hatching.

Seven additional age classes of walleye were collected during the fall 2004 evaluation (Table 6) with a possible strong 2001 year class indicated by a relatively higher catch of age-3 walleye. Walleye natural reproduction in other systems (Lake Erie, Saginaw Bay) was strong in 2001, and may have also been for Hubbard Lake. Year classes represented in the total 2005 catch were: 1991, 1995, 1996, 2000, 2001, 2002, 2003, and 2004, while walleye stocking efforts took place only in 1991. Some year classes were obviously not represented in the catch. However, electrofishing methods do not always collect adult walleye in proportion to their true abundance.

Fish community and angler surveys have been made at Hubbard Lake over many decades. Management has focused on the success of walleye stocking efforts as well as yellow perch population dynamics. The addition of various aquatic invading species such as zebra mussels and rusty crayfish have altered the fish community over time as evident in past survey results.

Current Status

A recent fish community survey was conducted at Hubbard Lake by MDNR Fisheries Division in 2006. Effort consisted of 41 large-mesh trap-net nights, 23 large-mesh fyke-net (2 inch mesh) nights, 4 small-mesh fyke-net (3/4 inch mesh) nights, and 5 maxi-mini fyke-net nights from May 8 through May 12, 2006. Lead lengths for the larger mesh trap and fyke nets were typically 75-100 feet. Additional sampling effort included 17 experimental gill-net nights at the end of May, and 30 total minutes of nighttime fish sampling with electrofishing gear in early July. Eighteen species of fish were collected during the 2006 survey (Table 7), compared to 23 species in 1996. Total catch was 2,796 fish weighing 2,349 pounds. Large predator fish including bass, walleye, and northern pike made up 37% of the total catch by number and 63% by weight. These proportions of the total catch were higher in 2006 but are skewed because of the higher number of minnows captured in the earlier survey. Non-game species such as bullheads, suckers, and gar made up 48% of the total catch by number and 36% by weight. The panfish community of Hubbard Lake is dominated by yellow perch, rock bass, and pumpkinseed. These panfish made up 9% of the total catch by number and less than 2% by weight. Species collected in the 1996 survey that were not collected in 2006 include carp and brook trout, as well as a few other

species of minnow or shiner. These fish are likely still in Hubbard Lake and simply were not captured during the 2006 survey.

Yellow perch are an important component of the Hubbard Lake fish community and the most abundant panfish captured during the 2006 survey. Despite this, yellow perch and other panfish did not represent a high proportion of the total catch which may reflect a decline in abundance. This apparent population decline may be a result of increased predation from walleye. Yellow perch ranged in size from 2-13 inches in length. A good proportion (21%) of larger yellow perch (10 inches and larger) were collected during the 2006 survey and comprised a larger proportion of the perch captured compared to 1996 (2%) (Table 3). However, large perch were very common during the 1986 survey (Table 3) when 83% of the total perch catch were 10-inches and larger. Perch ages 0 through 9 were represented in the recent catch. Growth of this species remains nearly an inch above the statewide average. Despite this, perch may have exhibited a slight decrease in growth rates compared to previous surveys (Table 4). This may be a result of competition with other fish or invading species (e.g. zebra mussels). However, current growth rates and abundance of perch suggest the population is in good shape and balanced. Population size and growth of perch will continue to be greatly influenced by walleye population size.

Rock bass are also a common panfish in Hubbard Lake today (Table 7) as they have been in the past (Table 2). Rock bass can grow to large sizes and were represented by ages 1, and 3 through 9. Growth rates of rock bass are average when compared to the statewide average for this species (Table 4). Like perch, rock bass growth rates may have declined over time (Table 4). Pumpkinseed were collected in low numbers in the 2006 survey and comprise a small part of the Hubbard Lake panfish community. Only one specimen was collected in 1986 and was absent from the 1996 survey. Bluegill were absent from the three most recent fish community surveys.

The predator population of Hubbard Lake is dominated by smallmouth bass, walleye, and northern pike. Smallmouth bass are abundant in this lake and can reach lengths over 20 inches. Good numbers of legal size (14 inches and larger) fish are available, and may be more abundant than they were in previous decades (Table 3). Despite their common occurrence, growth rates remain high for this species. Smallmouth bass grow nearly one inch faster in Hubbard Lake today when compared to the statewide average. Bass growth rates appear to be relatively stable over time as well (Table 4). Smallmouth bass remain a healthy, keystone component of the Hubbard Lake fish community.

Walleye comprised 12% of the total catch at Hubbard Lake in 2006 (Table 7) and ranged in length from 5-25 inches. Ninety percent of the walleye catch was legal size (15 inches and larger) in 2006, compared to 86% (1986) and 89% (1996) (Table 3). Walleye catch rates per year were calculated based on number of trap, fyke, and gill net lifts for 1986, 1996, and 2006. Catch rates were highest in 2006 (3.9/lift), followed by 1986 (2.0/lift), then 1996 (0.8/lift). Ages of walleye were partially determined with the use of dorsal spines in 2006 whereas scales were used to determine walleye ages in past surveys. Thus, ages and growth rates may not be comparable across years for walleye. It is known that spines typically provide the reader with more accurate ages of fish. Eighteen year classes of walleye were collected during the 2006 survey, including ages 0 through 17. Older fish were well represented in the total catch (Table 4). Good numbers of age 12 fish were also noted, indicating a strong 1994 year class of wild fish. Overall, current growth of Hubbard Lake walleye is one inch slower when compared to the statewide average. However, this should be interpreted with caution

since the statewide average is based on scale read ages, not spines. In general, Hubbard Lake walleye growth is currently normal.

Northern pike were again relatively uncommon as demonstrated by the recent survey catch (Table 7). Only 14 northern pike were collected during the 2006 survey for a catch rate (traps, fykes, gill nets) of 0.18/lift. This is compared to 0.36/lift in 1996, and 0.23/lift in 1986. These are low catch rates of pike for a northern Michigan waterbody. Percent legal (24 inches and larger) northern pike in the respective surveys was 40% (1986), 58% (1996), and 58% (2006). Northern pike were aged with dorsal fin rays in 2006 and thus growth rates may not be comparable to previous years. Despite this, pike growth appears to be average. Northern pike were represented by age 3 through 8 fish (Table 4).

Coldwater species such as trout, lake whitefish, and cisco are present in Hubbard Lake. These species utilize the cold water habitat, though abundance is low. Cisco catches have ranged from zero to 11 fish in the past three surveys while lake whitefish catches have ranged from zero to 4. Recent angler reports (from the pike spearing fishery) indicate a dramatic decline in whitefish sightings. Brook trout catches have ranged from zero to 6. Some tributaries to Hubbard Lake have native brook trout populations which explain the presence of this species. Rainbow trout catches have ranged from zero to 6 during the last three surveys. It is believed that the rainbow trout are a result of low level private stocking efforts for this species over the last decade as part of a kids fishing event.

Limnological parameters were also collected from Hubbard Lake in early August 2006. A temperature and oxygen profile recorded oxygen throughout the entire water column (Table 8). The thermocline was established around 25-30 feet deep and plenty of cold, oxygenated water was available for cold water fish. Secchi disk reading (a measure of a lakes clarity) was 12 feet. Alkalinity is a measurement of a lakes ability to buffer from the effects of acid rain and ultimately determines a lake water's pH. It is also a measure of lake productivity. This measurement was recorded as 152ppm in Hubbard Lake which is fairly high for a northern Michigan waterbody. Chlorophyll pigment is a measure of biological productivity and high levels can often lead to algal blooms. Results for Hubbard Lake were 1.78 micrograms per liter. This value is very low for lakes. Total phosphorus was also measured in Hubbard Lake at 9.8 micrograms per liter which is below average for most natural lakes. Finally, total nitrogen was measured in early August. This compound is also considered a limiting factor (like total phosphorus) at many waterbodies and is often limited in lakes. Total nitrogen at Hubbard Lake was 16.0 micrograms per liter. The results from all these parameters indicate Hubbard Lake's status as an oligotrophic lake. An oligotrophic lake is defined as having low concentrations of nutrients required for plant growth and thus the overall productivity of the lake is low.

An angler survey was also conducted at Hubbard Lake from late-April through September 2006, and from late-January through late-March. The survey followed a roving-access design during the open water period (roving counts and access interviews). One clerk worked full time to collect angling data. Both weekend days and three randomly selected weekdays were selected for sampling during each week. No holidays were sampled. The clerk followed a randomized count and interview schedule. One of two shifts were selected each sample day. The entire lake was sampled each day. The winter creel period included roving counts and access interviews. Catch and pressure estimates are provided in Table 9. Total angler hours for the period was 39,726 while there were nearly 11,000 angler trips. This latter number is lower than trip or angler day estimates from the 1970s (Table 10). Recent catch estimates included a harvest of 11,993 fish while more than 16,000 fish were caught and released. The

bulk of the harvest was from yellow perch and walleye which made up 74% and 21% of the total harvest, respectively. Perch were caught at a rate of 0.41/hour in 2006-07. This is significantly lower than perch catch rates from 1939 through 1964 (Table 10). Walleye were caught at a rate of 0.11/hour which is similar to catch rates from 1939 through 1964. Walleye harvest in Hubbard Lake on a per acre basis was 0.28/acre which was lower than the average (0.57/acre) for 18 large Michigan lakes (P. Hanchin, MDNR personal communication). Northern pike catch rates have significantly declined through time (Table 10). Overall, catch and harvest rates of walleye and perch in Hubbard Lake during the creel period were low, especially for a lake where the majority of anglers are seeking walleye and perch. This must still be interpreted with caution ince it only reflects a one-year period and a reduced winter fishing season (because of poor ice conditions).

Analysis and Discussion

The current fish community of Hubbard Lake can be generally characterized as having the following: 1) a panfish community considered low in diversity, and dominated by yellow perch (particularly the fishery) and rock bass, 2) a predator population having moderate diversity and dominated by smallmouth bass and walleye, 3) a fair growing, naturally reproducing walleye population that has been supplemented with stocking in previous decades, 4) a slowly declining native northern pike population, 5) a group of species which utilize the cold water niche of Hubbard Lake, at unknown population levels, 6) a typical non-game fish component comprised primarily of white suckers, bullheads, and gar. Management of Hubbard Lake has primarily been with the use of statewide regulations, maintenance of most species through natural reproduction, and providing low level stocking of various game fish when needed.

The Hubbard Lake panfish community is low in diversity but high in quality. Species available to anglers include yellow perch, rock bass, and pumpkinseed. Yellow perch and rock bass tend to thrive in the lake and have done so for years. Growth of perch has been variable over time which may be a result of a population adjusting to the zebra mussel colonization. Regardless, this species remains the most important game fish to Hubbard Lake anglers.

The predator base of Hubbard Lake is dominated by smallmouth bass and walleye. Northern pike also inhabit its waters, albeit in relatively low numbers. Smallmouth bass are important as a keystone predator which helps keep many other species in balance. In addition, they are an important predator on rusty crayfish, another invading species which typically alters species communities and water clarity. Smallmouth bass provide for a quality open water fishing experience in Hubbard Lake. Walleye have been able to sustain themselves primarily through natural reproduction. This species was stocked at low stocking rates in various years from 1977 to 1991. This was done in effort to essentially "jump start" the population and was considered a highly effective management practice for establishing a walleye fishery and reducing perch abundance. Walleye numbers in Hubbard Lake are as good, or better, as they have been in previous decades. Simultaneously, growth rates may be stabilizing, signaling that the natural population may be approaching appropriate population numbers. Northern pike are limited in abundance in Hubbard Lake. Few spawning areas exist for this species as a result of shoreline development and loss of riparian wetlands. Current spawning areas may be limited to Holcomb Creek/East Bay area and the West Branch River delta. Despite these two quality areas, the total amount of spawning grounds may not be sufficient for the relatively large lake acreage. Rusty crayfish also consume aquatic vegetation essential to pike habitat and spawning. Pike can grow to

impressive sizes in Hubbard Lake, yet stocking may need to be used in order to supplement the population.

The remaining non-game and cold water species remain a vital component of the Hubbard Lake fish community. These fish provide for forage for many species. Attempts should be made to protect the cold water niche which is utilized by trout, whitefish, and cisco.

Management Direction

1) The Hubbard Lake aquatic community is complex and should be monitored on a fairly consistent basis. Each game fish plays a vital role not only in the fishery, but also for overall ecosystem balance. A complete fish community survey documenting changes should be accomplished no later than 2016 at Hubbard Lake and follow the previous ten-year survey cycle. Periodic checks of the walleye population should be made more frequently. These checks will provide managers with updated essential information on walleye year-class strength and growth.

2) Continue to rely on natural reproduction of walleye in Hubbard Lake. This species provides a valuable fishery and helps to maintain a quality yellow perch population. Periodic walleye evaluations should be made to determine the amount of natural reproduction occurring and year-class strength. Walleye should be stocked in the event that multiple year-class failures occur in the wild population. This can be evident if four or more successive year classes are weak or absent. If stocked, managers should attempt to stock fingerling walleye. Fry stocking efforts often provide poor results and are typically limited to turbid waters which is not a characteristic of Hubbard Lake. Fry may be stocked only if spring fingerlings are unavailable.

3) Northern pike are native to Hubbard Lake but are found in limited numbers, possibly as a result of habitat loss. Numbers have demonstrated a decline over time. Efforts to increase population size can be attempted in two ways. Managers should continue to stock fry or fingerling pike into the appropriate marshes when fish are available. Investigations into construction of an additional pike spawning marsh should be made between MDNR, the local lake association, and various sportsmans groups. This species requires large amounts of spawning areas for such a large lake and can provide for a true quality fishery by attaining large sizes.

4) Muskellunge stocking efforts can be attempted if hatchery reared pike are unavailable (and muskellunge are available). Managers could stock either northern Michigan or spotted strain Muskellunge. This species may be better at becoming self-sustaining in Hubbard Lake due to its spawning habitat requirements. Muskellunge are less dependent on aquatic vegetation for spawning and can even use deep water chara beds which should still be abundant in Hubbard Lake. Good amounts of large forage such as white suckers are available for both muskellunge and northern pike.

5) Smallmouth bass are vitally important to the Hubbard Lake ecosystem. This species preys on rusty crayfish and can help reduce, or control, the population of this invasive species. In doing so, aquatic vegetation which is vital to the ecosystem can be preserved. Size and season limits are appropriate for bass and the fishery should be promoted.

6) Continue to work with the Hubbard Lake Sportsman and Improvement Association in monitoring the addition of brush shelters in Hubbard Lake. MDNR Fisheries Division should work as a liason

between the association and the permitting branch of government (Michigan Department of Environmental Quality) and assist in obtaining the necessary permits. Cover, especially near-shore, is limited in Hubbard Lake. Aquatic vegetation, which is essential for fish, is nearly absent from Hubbard Lake for reasons already mentioned. Landowners should allow for the natural recruitment of woody debris in near-shore areas and to maintain all submersed aquatic vegetation. Riparian wetlands and undevloped riparian zones should be protected.

7) Current Standard State of Michigan fishing regulations are appropriate for Hubbard Lake. A fishing exclosure was set in law for the innermost part of South Bay (between the point and Mt. Maria Road) during the 1970s and part of the 1980s. This fishing ban was established to protect overwintering brook trout which migrated down from the West Branch River and its tributaries, and used the area extensively. This fisheries order has not been active since the 1980s. Fisheries managers have no reason to believe there is a current brook trout overharvest problem at Hubbard Lake but are aware of the past history of this fisheries law.

8) Special lake whitefish and lake herring spearing regulations exist for Hubbard Lake. Yet lake managers know very little about the status of these species at this waterbody. Future sampling effort could be directed at gaining insight into the status of these species in Hubbard Lake. Efforts should employ the use of large mesh size stratified Great Lakes gill nets.

References

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Table 1.-Walleye stocking history for Hubbard Lake, Alcona County.

Month	Year	Strain	Number	Number/Acre	Avg. Length (in)
--	1977	--	55,556	6	--
--	1978	--	53,350	6	--
July	1980	--	642	--	--
August	1981	--	268,036	30	--
July	1982	--	7,008	1	--
June	1983	Macatawa	98,799	11	--
June	1984	Manistique	4,000	1	1.5
June	1985	Muskegon	76,920	9	1.0
June	1986	Muskegon	258,995	29	1.9
June	1989	Muskegon	200,714	23	1.8
June	1991	Muskegon	96,209	11	1.5

Table 2.-Species and relative abundance of fishes collected with survey gear at Hubbard Lake, May 13-20, 1996.

Common Name	Number	Percent	Length Range *(inches)*	Weight	Percent	Growth*
White sucker	1,974	48	4-24"	6,204.0	87	--
Emerald shiner	1,333	32	2-6"	8.5	0	--
Rock bass	213	5	1-13"	164.2	2	Above average
Walleye	122	3	5-23"	209.9	3	Below average
Yellow perch	119	3	2-15"	7.8	0	Average
Spottail shiner	115	3	2-5"	1.8	0	--
Smallmouth bass	104	3	2-20"	198.9	3	Average
Northern pike	52	1	12-44"	226.2	3	Above average
Brown bullhead	28	1	8-15"	33.6	0	--
Sculpins	10	0	2-4"	0.1	0	--
Sand shiner	7	0	2-4"	0.1	0	--
Rainbow trout	6	0	12-25"	10.8	0	--
Brook trout	6	0	3-13"	1.1	0	--
Fathead minnow	6	0	2-3"	0.0	0	--
Common shiner	5	0	3-5"	0.2	0	--
Carp	4	0	26-29"	43.4	1	--
Lake whitefish	4	0	17-20"	10.5	0	--
Yellow bullhead	4	0	11-16"	5.3	0	--
Logperch	3	0	3-5"	0.1	0	--
Creek chub	2	0	5-6"	0.1	0	--
Gars	1	0	27.0	1.7	0	--
Northern redbelly dace	1	0	3.0	0.0	0	--
Golden shiner	1	0	3.0	0.0	0	--
TOTAL	**4,120**			**7,128**		

** growth is compared to statewide average for that species*

Table 3.-Length-frequency distribution of certain game fishes collected during the 1986, 1996, and 2006 netting survey at Hubbard Lake.

Length (in)	N. pike 86	N. pike 96	N. pike 06	Walleye 86	Walleye 96	Walleye 06
1						
2						
3						
4						
5					6	1
6					4	
7						2
8						1
9						1
10						
11				1		3
12		1				6
13	1			6		7
14				50	4	9
15				104	15	11
16	4			77	20	40
17	4	2		60	17	87
18	3			34	20	57
19	3	5		29	14	42
20	5	1	1	15	15	27
21	4	3	1	4	4	11
22	1	6	1	6	3	5
23	3	4	2	7		3
24	4	6	1	4		
25	3	4	1	4		1
26		2	1	2		
27	2	4	1			
28	1	3	2			
29	2					
30		1				
31	1					
32	1	2				
33		1				
34	2	1				
35	1					
36		2				
37						
38						
39	1	2				
40						
41		1				
42	1		1			
43		1				

Table 3.-Continued

Length (in)	Y. Perch 86	Y. Perch 96	Y. Perch 06	S. Bass 86	S. Bass 96	S. Bass 06
1						
2		3	6	1	1	
3	102	77	17	1	4	1
4	2	17	32		2	
5	3	4	9		1	
6		6	14			
7		7	10	2	1	
8	1	1	8	2	2	6
9	3		9	4	3	7
10	17	1	7	23		7
11	248	1	12	51		17
12	205		6	63	14	36
13	84	1	2	10	6	48
14	4	1		22	20	66
15				14	31	122
16				5	11	109
17				8	6	144
18				8	1	84
19				2	1	20
20				2		1
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						
41						
42						
43						

Table 4.-Comparison of mean length (inches) at age for various game fishes of Hubbard Lake from 1986 to 2006. Number in parentheses represents number aged. Growth comparison in last column was across all ages for 2006. Dorsal spines, in addition to scales, were used to age some of the walleye, northern pike, and smallmouth bass in 2006. Statewide growth comparisons are based on ages with scales.

Species	Age group	1986 May	1996 May	2006 May	2006 growth compared to state average
Yellow perch	I	3.4 (11)	3.9 (23)	3.3 (16)	+0.9”
	II	5.1 (5)	6.4 (9)	4.5 (16)	
	III	9.8 (1)	7.5 (7)	6.5 (29)	
	IV	9.5 (1)	8.8 (3)	8.3 (19)	
	V	11.2 (23)		10.4 (14)	
	VI	12.3 (19)	13.9 (2)	11.4 (9)	
	VII	13.2 (10)		12.5 (2)	
	VIII	14.0 (5)		12.3 (3)	
	IX			12.9 (2)	
	X				
Walleye	I		5.7 (10)	7.8 (5)	-1.2”
	II	11.1 (1)		12.5 (12)	
	III	13.8 (7)		14.2 (20)	
	IV	15.8 (53)	15.0 (2)	17.6 (15)	
	V	18.7 (22)	16.2 (17)	17.4 (19)	
	VI	19.9 (10)	18.1 (35)	17.1 (16)	
	VII	23.1 (21)	18.8 (21)	18.5 (11)	
	VIII	25.3 (3)	20.2 (4)	18.8 (16)	
	IX			18.7 (17)	
	X		22.5 (2)	19.6 (10)	
	XI		22.1 (2)	18.7 (7)	
	XII			18.9 (18)	
	XIII			18.5 (4)	
	XIV			19.0 (4)	
	XV			19.6 (1)	
	XVI			20.1 (4)	
	XVII			19.1 (4)	
	IX				

Table 4.-continued

Species	Age group	1986 May	1996 May	2006 May	2006 growth compared to state average
Rock bass	I		2.0 (2)	4.1 (1)	+0.1”
	II	2.8 (1)	3.5 (7)		
	III	5.6 (16)	5.9 (24)	6.4 (10)	
	IV	7.0 (15)	7.8 (15)	6.7 (11)	
	V	8.1 (7)	9.1 (30)	6.8 (21)	
	VI	8.8 (7)	10.0 (8)	7.3 (13)	
	VII	9.5 (30)	10.6 (9)	7.7 (7)	
	VIII	10.3 (8)	11.4 (9)	9.3 (1)	
	IX	11.0 (5)	12.0 (5)	10.6 (1)	
	X	11.3 (8)	12.3 (3)		
	XI		12.7 (1)		
S. bass	I	3.1 (2)	3.7 (6)	3.9 (1)	+0.9”
	II		8.7 (4)	9.4 (14)	
	III	10.9 (43)	12.4 (14)	11.5 (26)	
	IV	14.2 (27)	14.0 (7)	13.7 (48)	
	V	15.4 (5)	15.3 (19)	15.1 (33)	
	VI	16.1 (6)	16.2 (16)	16.2 (22)	
	VII	17.4 (5)	16.6 (7)	17.1 (33)	
	VIII	17.3 (6)	18.3 (1)	18.0 (18)	
	IX	18.6 (9)		18.5 (15)	
	X			19.0 (9)	
	XI	20.6 (2)	19.9 (1)		
N. pike	I	13.8 (1)	12.6 (1)		--
	II	18.6 (17)	19.0 (6)		
	III	22.5 (13)	21.9 (9)	21.9 (3)	
	IV	26.9 (6)	24.9 (18)	23.9 (2)	
	V	33.0 (8)	25.2 (8)	25.4 (3)	
	VI	42.0 (1)	34.0 (5)	26.0 (1)	
	VII		35.5 (2)	34.8 (2)	
	VIII			28.8 (1)	
	IX		37.8 (2)		
	X		36.1 (1)		

Table 5.-Estimated age frequency (percent) of fish caught from Hubbard Lake with trap nets, gill nets, and fyke nets, May 13-20, 1996.

	AGE									
	I	II	III	IV	V	VI	VII	VIII	IX	X+
Northern pike	2	12	17	35	15	10	4		4	2
Yellow perch	52	20	16	7		5				
Smallmouth bass	8	5	19	9	25	21	9	1		1
Walleye	11			2	18	38	23	4		4
Rock bass	2	6	21	13	26	7	8	8	4	6

Table 6. -Age and growth analysis of walleye collected during the fall nighttime evaluation at Hubbard Lake, 2004. All YOY were aged.

Age Group	**Number of Fish**	**Length Range (in)**	**Mean Length (in)**
O	58	3.8 – 8.1	6.1
I	4	9.7 – 11.3	10.7
II	4	13.5 – 15.7	14.9
III	6	15.8 – 17.8	16.6
IV	1	17.5	17.5
V			
VI			
VII			
VIII	1	19.0	19.0
IX	1	16.7	16.7
X			
XI			
XII			
XIII	1	22.9	22.9

Table 7.-Species catch and relative abundance of fishes collected during the Hubbard Lake fish community survey, May 8-12, May 30-June 1, and July 6, 2006. Weight is calculated.

Species	Number	Percent by number	Weight (lb.)	Percent by weight	Length range (in.)
Brown bullhead	1,144	40.9	547.8	23.3	8-16
Smallmouth bass	691	24.7	945.5	40.3	3-20
Walleye	335	12.0	488.1	20.8	5-25
White sucker	189	6.8	280.2	11.9	10-22
Yellow perch	133	4.8	22.2	0.9	3-12
Rock bass	100	3.6	15.9	0.7	5-9
Emerald shiner	76	2.7	0.2	--	2-4
Mimic shiner	73	2.6	0.3	--	2-3
Northern pike	14	0.5	36.9	1.6	21-42
Cisco	11	0.4	1.7	0.1	9-15
Pumpkinseed	11	0.4	0.1	--	3
Yellow bullhead	11	0.4	0.9	--	12
Black bullhead	2	0.1	1.7	0.1	15
Longnose gar	2	0.1	4.2	0.2	25-31
Chub sp.	1	--	--	--	--
Lake whitefish	1	--	1.0	--	14
Rainbow trout	1	--	2.6	0.1	19
Stickleback sp.	1	--	--	--	--
Total	**2,796**		**2,349**		

Table 8.-Water temperature and dissolved oxygen profile for Hubbard Lake, August 8, 2006.

Depth (ft)	Temperature (F)	Dissolved Oxygen (ppm)
3	76	8.6
9	76	8.6
12	76	8.6
15	76	8.6
18	76	8.6
21	76	8.5
24	76	8.5
27	71	8.7
30	69	7.5
33	65	7.3
36	64	7.1
39	60	7.3
42	59	7.0
45	56	6.7
48	55	5.8
51	54	5.2
54	54	4.9
57	54	4.6
60	54	4.1
63	53	4.0
66	53	3.6
70	53	3.5
72	53	3.3
75	53	3.2
78	53	3.2

Table 9.- Estimated fish harvest and release, angler hours, and angler trips for Hubbard Lake during the 2006-2007 fishing season.

Species	Apr-May	June	July	Aug	Sept	Jan	Feb	Mar	Total
Harvest									
Walleye	158	400	362	700	663	0	268	0	2,551
Northern pike	40	0	0	0	0	0	0	0	40
Smallmouth bass	40	220	68	92	54	0	0	0	474
Yellow perch	0	126	543	1,541	6,523	0	161	0	8,894
Channel Catfish	0	0	0	0	34	0	0	0	34
Released									
Walleye	47	42	405	390	960	0	87	0	1,931
Northern pike	7	84	8	0	68	0	0	0	167
Largemouth bass	0	0	0	0	13	0	0	0	13
Smallmouth bass	634	1,377	336	2,142	1,974	0	0	0	6,463
Yellow perch	0	0	685	941	5,840	0	47	0	7,513
Bluegill	15	0	0	0	55	0	0	0	70
Pumpkinseed	0	0	0	14	102	0	0	0	116
Rock bass	0	0	0	10	0	0	0	0	10
Rainbow trout	0	0	0	10	0	0	0	0	10
Channel catfish	0	0	0	0	13	0	0	0	13
Carp	11	0	0	0	0	0	0	0	11
Other statistics									
Total catch	952	2,249	2,407	5,840	16,299	0	563	0	28,310
Angler hours	3,218	5,990	6,472	9,129	9,943	0	4,974	0	39,726
Angler trips	1,290	1,787	2,076	2,533	2,128	0	1,115	0	10,929

Table 10.- Total catch rates (number /hour) of fish and fishing effort from Hubbard Lake for various periods.

	1939 – 1950*	1951 – 1964	1970	1973	2006-2007
Yellow perch	1.79	0.95			0.41
Walleye	0.16	0.15			0.11
Northern pike	0.18	0.10			0.005
Smallmouth bass	0.002	0.003			0.175
All species	2.2	1.3			0.7
Angler days or trips			28,180 days	35,550 days	10,929 trips

*years of 1946 and 1947 excluded

**total catch reported for 1939-1964 were assumed to include both harvested and released fish