Hubbard Lake
Alcona County
Thunder Bay River watershed, last surveyed 2017

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Environment

Hubbard Lake, at 8,850 acres, is Michigan's twelfth 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. 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. Another invasive, Round Goby, also has become part of the Hubbard Lake fish community within the last decade.

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 coldwater 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. Management began a slow shift towards cool water species such as Walleye, Smallmouth Bass, Northern 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; fry and small fingerling Walleye; 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 stocked 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 nets, 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 Sucker, 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, Northern Pike spawning marshes were constructed to enhance the predator base in the lake. Entrance to marshes were enhanced and water levels were maintained longer in the spring. Netting surveys were conducted in the late 1960s documenting good numbers of pike, Rock Bass, Yellow Perch, Smallmouth Bass, bullheads, 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 evaluation was 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 nets, trap nets, 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 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 (indicated by length-at-age) was superior to the statewide average 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), managers 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 by the Wisconsin-based Serns index, yet these fish were all from natural reproduction (Table 1). Adult Walleye 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 nets 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 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 3-14 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 to 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).

Another 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 age-0/acre), yet recruitment of young fish was consistent and 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.

A 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 was 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 included Common 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 remained 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 remained 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, growth rates and abundance of perch suggested the population was in good shape and balanced. Population size and growth of Yellow Perch will continue to be greatly influenced by Walleye population size.

Rock Bass were also a common panfish in Hubbard Lake (Table 7) as they had been in the past (Table 2). Rock Bass grew to large sizes and were represented by ages 1, and 3 through 9. Growth rates of this species are average when compared to the statewide average (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 Hubbard Lake surveys.

The predator population of Hubbard Lake based on the 2006 survey was dominated by Smallmouth Bass, Walleye, and Northern Pike. Smallmouth Bass were abundant and reached lengths over 20 inches. Good numbers of legal size (14 inches and larger) fish were available and may have been more abundant than they were in previous decades (Table 3). Despite their high relative abundance, growth rates remained high for this species. Smallmouth Bass grow nearly one inch faster in Hubbard Lake in 2006 when compared to the statewide average. Bass growth rates appear to be relatively stable over time as well (Table 4). Smallmouth bass remained 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-net fyke-net, 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, growth of Hubbard Lake Walleye was 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 was considered normal.

Northern Pike were again relatively uncommon as demonstrated by the 2006 survey catch (Table 7). Only 14 Northern Pike were collected 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 from 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 appeared to be average. Northern pike were represented by age 3 through 8 fish (Table 4).

Coldwater species such as trout, Lake Whitefish, and Cisco have been collected in Hubbard Lake over the years. These species utilize the coldwater 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 wild 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 from the previous 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 coldwater 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 relatively high for a northern Michigan waterbody. Chlorophyll pigment is a measure of biological productivity. 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 element is also considered a limiting factor in productivity (like total phosphorus) in many waterbodies. Total nitrogen at Hubbard Lake was 16.0 micrograms per liter. The results from all these parameters indicate Hubbard Lake's status as a mesotrophic 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-site 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 with Walleye (Hanchin 2017). Northern Pike catch rates had 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 these two species. This must still be

interpreted with caution since it only reflects a one-year period and a reduced winter fishing season (because of poor ice conditions).

Current Status

Recent fishery surveys by DNR for Hubbard Lake have focused on continued evaluation of Walleye natural reproduction (2013 and 2015) and gathering baseline information on adult Walleye abundance (2017). Juvenile assessments were made with nighttime electrofishing on one September night in both 2013 and 2015 (Table 11). Each night the shoreline was electrofished for nearly three hours and Walleye were collected. Age-0 Walleye were found to be in fair numbers in 2013 and strong numbers in 2015. Yearlings and adults were collected in both years as well (Table 11). Juvenile assessments have been made at Hubbard Lake on six occasions between 1990 and 2015 (Table 11). Age-0 Walleye have been collected each year with catch rates ranging from 5-31 per hour, showing some annual consistency in natural reproduction, while year-class strength naturally varies among years, which is typical of a wild population. Yearling Walleye were also collected in five of the six surveys.

A comprehensive netting effort was conducted by the DNR following ice-out in April 2017. The purpose was to obtain an estimate of the number of adult Walleye in Hubbard Lake. Adults were defined as fish that were sexually mature. All adult fish were marked either with a jaw tag or had a pectoral fin removed. Fish were captured and marked during two hours of nighttime electrofishing on April 4, and from 52 trap-net nights from April 9-12.

A total of 3,762 adult Walleye were captured and marked. Of this total, 2,623 were jaw tagged while the remaining fish had a pectoral fin removed. The average length of all Walleye was 17.0 inches (Table 12). Male Walleye averaged 16.2 inches, ranging in length from 12-21 inches with most in the 15-17 inch size range. Female Walleye averaged 18.4 inches, ranging in length from 15-25 inches with most in the 17-19 inch size range (Table 12).

The recapture run was made at night on April 13 and involved three boats electrofishing nearly the entire shoreline of Hubbard Lake (10.8 hours, 25.5 shoreline miles). All Walleye captured were analyzed for a jaw tag or missing pectoral fin and were given an additional mark so as to not be recounted if recaptured on the same night. A total 959 adult Walleye were captured during the nighttime recapture effort of which 141 (which were all males) were marked from the previous week. The Chapman modification of the Peterson method (Ricker 1975) was used to estimate the Walleye population from the formula:

P = (Marked sample + 1) (Captured sample + 1) / (Recaptured sample + 1), where

P = adult Walleye population estimate
Marked sample = marking run Walleye sample
Captured sample = recapture run total Walleye sample
Recaptured sample = number of recaptured Walleye in the recapture run

The estimate of adult Walleye was pooled for both sexes due to the lack of recaptured female Walleye in the recapture run. The pooled estimate was 27,133 adult Walleye in Hubbard Lake for a density of 3.06 adults per acre. Hanchin (2017) reported that the average adult Walleye density from 23 large Michigan lakes surveyed for Walleye from 2001-2010 was also 3.0 per acre, while the median estimate was 2.4 per acre. These estimates were from some of the better Walleye lakes in Michigan. Thus, the

number of adult Walleye in Hubbard Lake is near the average and above the median based on the 2017 survey. Hanchin (2017) also found a threshold density of 3 adult Walleye per acre above of which all populations exhibited low mean growth indices relative to the state average. The growth index for Hubbard Lake Walleye was -2.0 inches. This means that for pooled age groups, Walleye in Hubbard Lake grow approximately two inches slower overall than Walleye across Michigan. This is not surprising since natural reproduction at this lake is fairly consistent and fish have the ability to live long in Hubbard Lake. A very healthy 19 year-classes of Walleye were captured during the survey (Table 13). This is a higher number of year-classes when compared to other regional lakes. Growth tends to be average to slightly above average for young Hubbard Lake Walleye but slows down significantly beyond age 5. There was good representation of fish through age 12 with very strong year-classes noted from the years 2006, 2007, 2008, 2010, and 2011 based on the number of fish aged from those years. Younger year-classes were also considered strong.

Hanchin (2017) reported the one-year harvest rate of jaw tagged Walleye at 23 Michigan lakes averaged 14.2% with a median of 11.6%. We jaw tagged 2,623 adult Walleye at Hubbard Lake in April 2017. As of late June 2020 (three years following the tagging event), anglers have turned in only 184 jaw tags for a harvest rate of 7.0%. Even if estimates of tag loss and angler non-reporting were included, the annual harvest rate would still be considered low and well within an acceptable range for Walleye exploitation.

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 and Rock Bass, 2) a predator population having moderate diversity and dominated by Smallmouth Bass and Walleye, 3) a slow-growing and relatively long-lived naturally reproducing Walleye population that has acceptable density levels to produce a consistent fishery, 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 Longnose Gar. Management of Hubbard Lake has primarily been with the use of statewide regulations and maintenance of most species through natural reproduction.

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. Yellow Perch, although still common in Hubbard Lake, may be less abundant in Hubbard Lake today compared to years before Walleye were firmly established. This may also have an impact on angler hours as less are available to anglers. 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 an 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 invasive rusty crayfish and Round Goby. Smallmouth Bass provide for a quality fishing experience in Hubbard Lake and are frequently targeted by tournament anglers. 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. Growth rates are currently low signaling that the natural population may be peaking and having density-dependent impacts. Harvest rates of this species is low based on recent tagging efforts and this species has the ability to live longer in the lake compared to other inland populations. Northern Pike are limited in abundance in Hubbard Lake and the previous spawning marsh used for pike is no longer operated 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.

The remaining non-game and coldwater 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 coldwater niche which is utilized by trout, Lake Whitefish, and Cisco.

Management Direction

1) The Hubbard Lake aquatic community is complex and should be monitored on a 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 2026 at Hubbard Lake and should mimic survey effort from the 2006 survey. 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, although high predation rates could be suppressing the perch population as well. Periodic Walleye evaluations should be made to determine the amount of natural reproduction occurring and year-class strength. Walleye should not be stocked at Hubbard Lake. Densities are relatively high, reproduction is consistent, growth rates are relatively slow, and exploitation is low. Healthy Walleye (and other predators) will be essential in reducing or stabilizing Round Goby numbers.

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. The DNR does not have a stocking program for Northern Pike, so this management action is not practical.

4) Smallmouth Bass are vitally important to the Hubbard Lake ecosystem. This species preys on rusty crayfish and Round Goby and can help reduce, or control, the population of these invasive species. Size and season limits are appropriate for bass.

5) Continue to work with the Hubbard Lake Sportsman and Improvement Association in monitoring the addition of brush shelters in Hubbard Lake. This has been an ongoing program but has been halted in recent years. MDNR Fisheries Division should work as a liaison between the association and the permitting branch of state government (Department of Great Lakes and Energy) 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 undeveloped riparian zones should be protected. If brush shelters are pursued further, they should contain more natural wood material with limbs and branches.

6) Special Lake Whitefish and Cisco spearing regulations exist for Hubbard Lake. Yet lake managers know very little about the status of these species at this waterbody. These populations are believed to be very low and possibly even extirpated. 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.

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Figure 1. Location of Hubbard Lake in Michigan's northeastern Lower Peninsula.

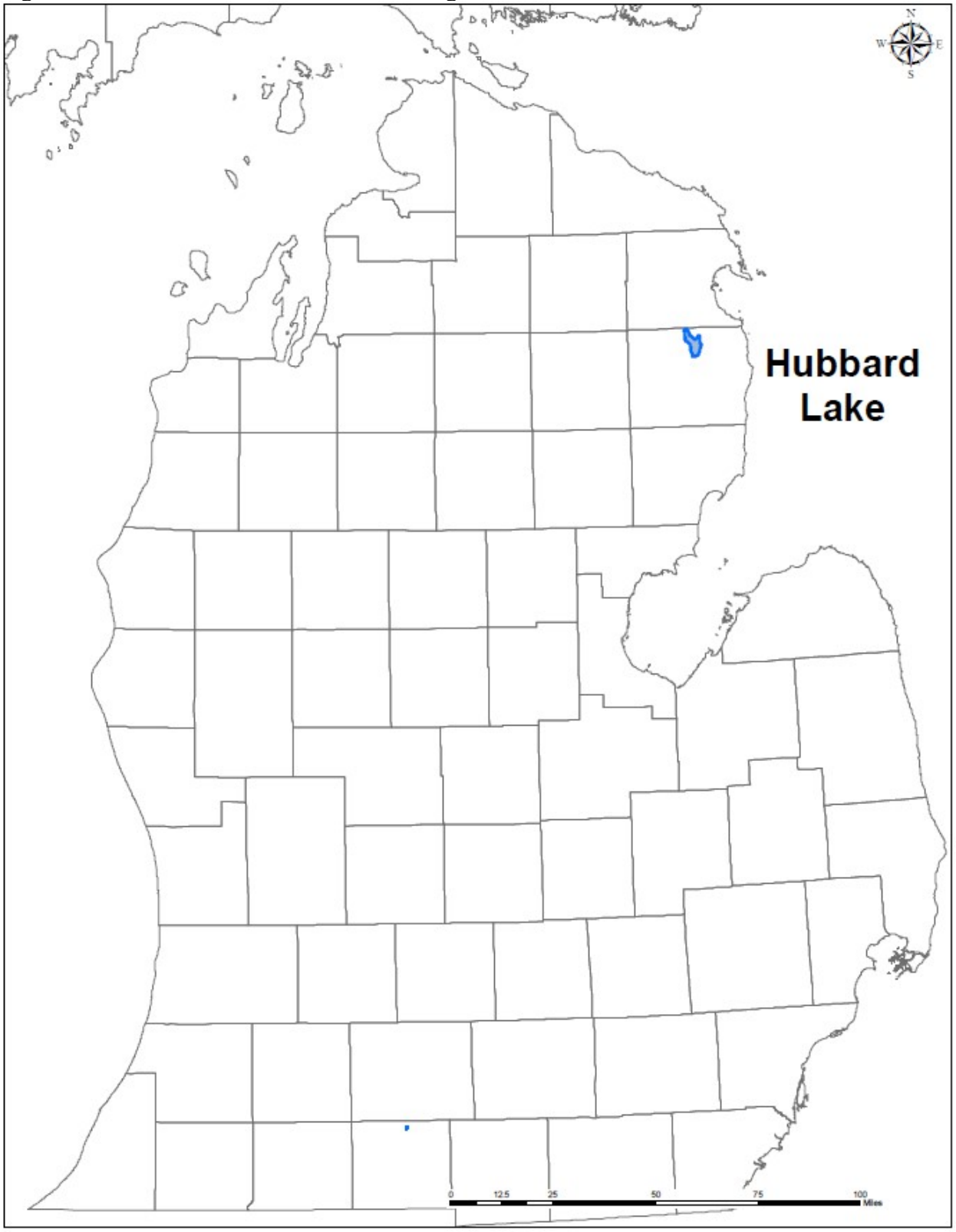

Figure 2. Depth map in feet of Hubbard Lake and boat launch sites.

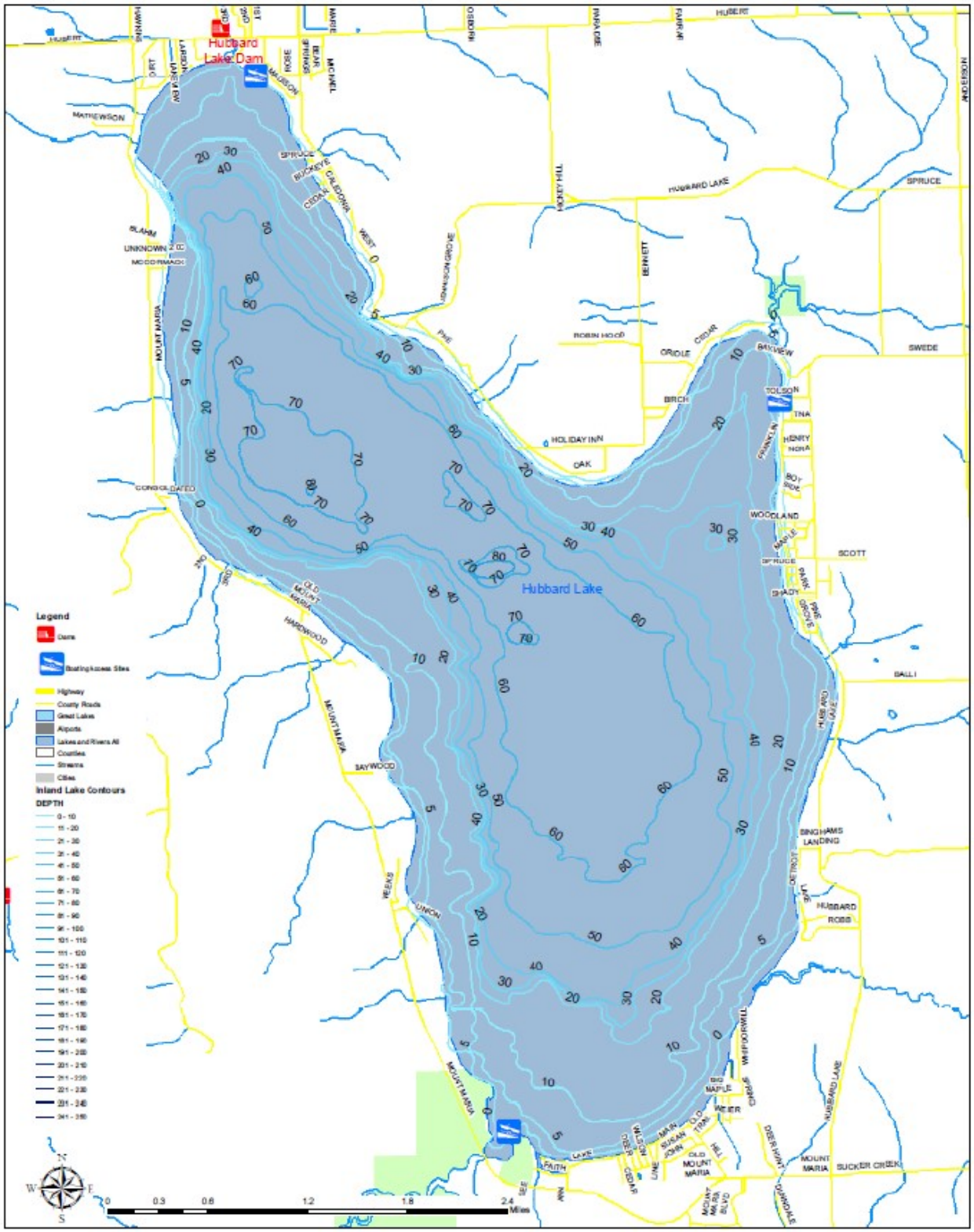

Table 1. Walleye stocking history for Hubbard Lake, Alcona County.

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	--
Sculpin sp.	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	--
Common 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	--
Gar sp.	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)	
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)	

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)	--	
Smallmouth	I	3.1 (2)	3.7 (6)	3.9 (1)	+0.9”
Bass	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)	--	
Northern 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 (age 0) 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
Common 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

Table 11. Results of fall Walleye assessments made with nighttime electrofishing at Hubbard Lake from 1990 through 2015.

Year	***Date***	***Water Temp (F)***	***Hours Shocked***	***Miles Shocked***	***Age-0 Walleye collected***	***No. age-0 per hour***	***Yearling walleye collected***	***Adults collected***
1990	10/24	50	4.90	--	73	15.0	8	56
1991	10/16	50	1.20	3.80	15	12.5	0	12
1996	9/18	58	2.00	--	62	31.0	9	19
2004	10/12, 18	55, 56	4.00	7.30	76	19.0	4	14
2013	9/18	65	2.85	7.13	15	5.3	11	8
2015	9/21	63, 68	3.37	6.00	56	16.6	4	8

Table 12. Length-frequency of Walleye marked during the 2017 spring population estimate. Recaptured fish not included.

Inch Group	Male	Female	Combined Sex
12-12.9	4		4
13-13.9	20		20
14-14.9	160		160
15-15.9	993	4	997
16-16.9	1714	25	1739
17-17.9	1076	73	1149
18-18.9	348	104	452
19-19.9	83	93	176
20-20.9	31	35	66
21-21.9	3	23	26
22-22.9		7	7
23-23.9		2	2
24-24.9		1	1
25-25.9		1	1
Average Length (in)	16.2	18.4	17.0

Table 13. Age and growth data for Walleye captured at Hubbard Lake in April 2017.

Age	**Number aged**	**Length range (in)**	**State Average Length (in)**
II	9	12.2 -14.6	10.4
III	9	12.0 -15.0	13.9
IV	15	13.9 – 16.6	15.8
V	15	15.2 – 20.5	17.6
VI	21	15.8 – 21.5	19.2
VII	17	14.6 – 21.4	20.6
VIII	5	14.7 – 19.6	21.6
IX	24	14.7 – 22.8	22.4
X	48	14.5 – 23.0	23.1
XI	17	15.7 – 21.9	--
XII	6	18.6 – 22.5	--
XIII	3	20.9 – 24.1	--
XIV	2	22.3 – 22.5	--
XV	1	20.0	--
XVI	1	25.5	--
XVII	1	20.0	--
XVIII	1	22.0	--
XIX	1	23.2	--
XX	1	23.2	--