Mullett Lake
Cheboygan County
Cheboygan River Watershed, last surveyed 2017

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Environment

Mullett Lake is in northern Cheboygan County of the northern Lower Peninsula of Michigan (Figure 1), and at 16,702 acres, is one of the largest inland lakes in Michigan. It is located about five miles south of the town of Cheboygan. Mullett Lake is fed by the Indian and Pigeon rivers on the south shore, and a number of small streams throughout its length (Figure 2). The lake outlet is the Cheboygan River which flows north through the town of Cheboygan before entering Lake Huron. There is no dam or control structure directly on Mullett Lake. However, the Cheboygan Dam and locks in the town of Cheboygan (Figure 2) are maintained by the Michigan Department of Natural Resources (MDNR) and influence the water level of Mullett Lake. The Mullett Lake water level is controlled by the Cheboygan Dam (originally built in 1867) and Great Lakes Tissue Hydroelectric facility through by-pass gates. The gates establish a summer (elev. 593.1 feet) and winter (elev. 592.15 feet) targeted lake level. The levels were set by the Cheboygan County Board of Supervisors in 1934, and have been under DNR control since 1967, when control was transferred from Consumers Energy. The dam is a complete barrier to upstream fish movement, while the locks act as a partial barrier for movement of fish from Lake Huron upstream to the Cheboygan River and Mullett Lake. Lake Huron fish infrequently migrate upstream through the lock system.

Multiple boat launching sites can be found on Mullett Lake. MDNR operates and maintains the Mullett Lake Village (northwest shore), Aloha State Park (northeast shore) and Jewell Road (east shore) boating access sites (Figure 3). These are paved launch sites with ample parking and toilet facilities. Mullett Township maintains a small unimproved launch site with limited parking on the southwest shore near the town of Topinabee. Mullett Lake is part of the Inland Waterway of lakes and rivers in Emmett and Cheboygan counties. Recreational boaters can enter Mullett Lake from both upstream and downstream waters. Because of this connectivity, movement of some fish between waters of the Inland Waterway occurs. In addition to boat launches, there are a number of road endings on Mullett Lake that provide public access to the lake, typically for ice fishing.

The 34 mile perimeter shoreline of Mullett Lake is largely developed and dominated by private residences. A report from 1956 showed the lake had 700 cottages along its shoreline. Today, there are 1,051 dwellings along its shoreline (31 dwellings per mile), and 25% of the shoreline is armored (summer 2017 measurements). During 2017, 544 small docks and 482 large docks were counted. The catchment area of Mullett Lake is broad, at 457,212 acres. This includes the entire Pigeon River drainage, and the Indian River drainage which itself drains Burt, Douglas, Crooked, and Pickerel lakes, as well as the Sturgeon River watershed. From the national land cover dataset, the watershed is 50% forested, 17% wetland, 12% grassland, 8% agricultural, 7% urban, and 6% water.

The Mullett Lake bathymetry is non-uniform (Figure 3). Percent shoal area is approximately 15%. The south and middle portions of the lake are very deep, and reach a maximum depth of 147 feet. The north end of the lake is shallower and has a number of sunken islands. Mean depth of Mullett Lake is

35 feet. A thermocline is routinely established in Mullett Lake in the summer and high dissolved oxygen levels can be found throughout most of the water column as was observed on August 22, 2017 in 120 feet of water (Table 1). The thermocline was established at approximately 38 feet, and in most summers, is established at depths of 30-45 feet. Mullett Lake can be classified as an oligotrohic lake due to having highly oxygenated water below the thermocline, little aquatic vegetation growth, and low algal levels. Alkalinity was measured at 150 parts per million in 2017, as compared to 144-148 parts per million in the summer of 1956. Long term water quality monitoring, organized and summarized by Tip of the Mitt Watershed Council, has demonstrated declining levels of phosphorus and chlorophyll-a in Mullett Lake from 1987 to the present (Figures 4 and 5). In addition, water clarity has increased over this time period (Figure 6) due to the declining levels of nutrients in the water column. These factors together dictate the lower trophic status of the lake today, compared to the late 1980s (Figure 7). Because of this lowered productivity, aquatic vegetation is not abundant in Mullett Lake and typically confined to the Indian and Pigeon river mouths. Submersed vegetation is present at these locations, but is rare throughout the rest of the lake except for chara flats. Bottom substrate is primarily sand and marl, with pockets of shoreline gravel and cobble.

Known invasive species to the Mullett Lake environment are Sea Lamprey, Round Goby, zebra mussels, quagga mussels, rusty crayfish, and Eurasian water milfoil. The mussel species are thought to have a profound impact on the lake through their ability to reduce the amount of food (plankton) in the water column through filter feeding. Other non-native species, though often widely accepted, are Rainbow Smelt, Alewife, Rainbow and Brown trout.

Standard State of Michigan fishing regulations apply for all species in Mullett Lake (see Michigan Fishing Guide), with the exception of Walleye. As of 2018, Walleye are specially regulated in the lake with a lower daily bag limit (3 fish, 15 inches minimum size limit) and later opening date or possession season for harvest (May 15). The Walleye regulation was enacted in 2010 for a minimal period of four years.

To summarize, Mullett Lake is a large natural inland lake that stratifies thermally with high dissolved oxygen levels throughout the water column. Water clarity is high, and productivity is considered low. It is an important waterbody in the Inland Waterway, with an unimpeded connection to Burt Lake upstream, and to the Cheboygan and Lower Black rivers downstream. Its connection to Black Lake has been severed since 1904 due to the construction of Alverno Dam. This is important since various species such as Lake Sturgeon and Walleye historically moved freely between these two waterbodies. The fish communities of Mullett Lake consist of both native and non-native species. Most attractive to anglers are the cool water fish species such as Yellow Perch, Walleye, Smallmouth Bass, Northern Pike, and a coldwater species Rainbow Trout. Walleye and Smallmouth Bass fishing tournaments are known to occur frequently at Mullett Lake. In 2016 and 2017, MDNR registered seven bass fishing tournaments.

History

Mullett Lake has a history of fisheries management activities dating back to 1887 (Table 2). This history will be summarized in four time periods: 1887-1964, 1965-1996, 1996-2009, and 2010-2018. These period breaks were chosen since management direction transitioned at or near the year selected. Management summaries beyond 2009 will be summarized in the "Current Status" section of this report.

1887-1964

Fisheries activities for Mullett Lake during this period reflected the early days of fish management in the State of Michigan. It was during this early period, particularly the first half of the twentieth century, that the lakes and rivers of Michigan were still being explored and the managing agency (Michigan Fish Commission or Michigan Department of Conservation) was also in its developmental stages. A survey of Mullett Lake in 1887 is thought to be the first formal examination of the lake and fish community by the Michigan Fish Commission. It is not known whether sampling gear was used for this, or if observations were simply gathered from locals. Records indicate the presence of fish species such as Rock Bass, Yellow Perch, Burbot, Lake Whitefish, Cisco, Walleye, Northern Pike, Lake Trout, and various sucker species.

Fisheries management by the Michigan Department of Conservation (MDOC) between World War I and II was very much aquaculture driven. Warm-, cool-, and coldwater species were reared throughout the state and widely stocked, regardless of the need for such management activity. This is reflected in the stocking records for Mullett Lake during this period (Table 3). For example, species such as Rock Bass and Yellow Perch were stocked occasionally during this period and were common within Mullett Lake. Some species were stocked that may have had a hard time adapting to the Mullett Lake environment, such as Largemouth Bass and Warmouth. In addition, some species were transferred as adults in low numbers to the lake from other waterbodies. This included Northern Pike and Walleye (Table 3). According to Crowe (1958), Walleye were native to the Inland Waterway lakes, but there was a "real or imagined scarcity of Walleyes in the Inland Waterway" and because of this there were "frequent complaints by fisherman and resort owners." Walleye fry were stocked in Mullett Lake on numerous occasions between 1891 and 1949 (Table 3). Adult trap and transfers began in 1931 and were discontinued in 1949. A total of 4,973 adult Walleye were transferred from below the Cheboygan Dam to Mullett Lake in this period. This adult stocking program was discontinued due to the "expense and the insignificant numbers of Walleyes transferred" (Crowe 1958). During the transfer program, managers were also able to tag 2,367 Walleyes in 1931-1932, and 568 in 1942 and transfer them to the Inland Waterway lakes. The purpose of this program was to examine Walleye movement throughout the waterway. Crowe (1958) reports that the tagging studies demonstrated that: 1) Walleye that were tagged and released in Mullett Lake were captured throughout the entire waterway lakes and rivers, 2) Walleye that spawn below Alverno Dam in the Lower Black River are typically Mullett Lake residents, and 3) there was low Walleye exploitation based on angler tag returns.

Also occurring during this period was a MDOC program to reduce the rough fish (i.e. suckers) community in the Inland Waterway lakes. Crowe (1949) reported that commercial fisherman used trap nets to accomplish this task, then sold their catches. Mullett Lake was typically netted at the north end, and Walleye were a relatively high percentage of the catch. Crowe (1949) states that the majority of White Suckers trapped and sold were from other lakes in the Inland Waterway. This program began in 1939 and was ended in 1956, with the percentage of the total catch by species from netting in Mullett Lake as follows from highest to lowest percentage: Rock Bass, Walleye, suckers, bullheads, and Northern Pike (Laarman 1976).

Following complaints from anglers that the lake had poor fishing, MDOC gathered temperature and dissolved oxygen profiles at Mullett Lake on August 5, 1948. The purpose was to determine if the lake

was suitable to Lake Trout survival and stocking efforts. Mullett Lake anglers could catch Brook and Rainbow trout, as well as Lake Whitefish, but fishing for Lake Trout was considered poor. Managers found the lake had a cold water component below the thermocline, but that dissolved oxygen levels were marginal for Lake Trout. They made recommendations to stock age-2 Lake Trout, but only small numbers of fingerlings were stocked in 1950 and 1951 (Table 3).

Statewide creel census was occurring throughout Michigan lakes and rivers from 1928 through 1964. Data was gathered from anglers by MDOC law enforcement officers in the field. From 1928 through 1938 the catch in Mullett Lake was dominated by Cisco, Walleye, and Northern Pike, and to a lesser percentage Yellow Perch and Burbot (Laarman 1976). From 1940 through 1950, Yellow Perch dominated the percent of total catch from the general creel census, followed by Walleye and Northern Pike at 9% each. From 1951 through 1964, Yellow Perch again dominated the catch composition of anglers at 65%, followed by Walleye at 11% (Laarman 1976). Overall catch rates (0.33 catch/hour of fish) were lowest at Mullett Lake compared to other Inland Waterway lakes.

Very little fish stocking occurred in Mullett Lake in the 1950s. Managers began to better assess the current Mullett Lake fish and angling community. In the summers of 1955 and 1956, temperature and dissolved oxygen profiles were again measured at ten locations in Mullett Lake in attempt to assess species suitability. They found a lake with a strong thermocline with good oxygen levels throughout most of the water column. The first extensive fish and aquatic vegetation community analysis was completed by MDOC in 1956. Managers described a lake with good alkalinity and pH values, large sandy-gravel shoals, and 20 species of aquatic vegetation mostly confined to the south end of the lake. Overall vegetation was considered sparse. Angler reports suggested that fishing was generally poor, though Yellow Perch were considered to be abundant, Walleye and Northern Pike common, and other species such as Smallmouth and Largemouth bass, scarce. Other species observed or periodically caught were darters, suckers, bullheads, Alewife, gar, Bowfin, Common Carp, Lake Sturgeon, Cisco, Muskellunge, and Rainbow Smelt. Managers used gill nets and shoreline seining to directly assess the fish community. Their assessment was that fish were scattered throughout the lake, which could lead to poor angler catches. Game-fish collected in highest numbers were Yellow Perch, Rock Bass, and Northern Pike, followed in lesser numbers by Pumpkinseed, Smallmouth and Largemouth bass, Muskellunge, and Walleye. The only cold water species collected were Cisco. Non-game species collected included mostly White Suckers, Brown Bullheads, Longnose Gar and a variety of shiners, minnows, darters, Logperch, chubs, and killifish. Two species they collected which were thought to be recent invasives were Alewife and Trout-Perch.

1965-1995

Fisheries management at Mullett Lake in these three decades centered around stocking of cold water species such Lake Trout, Splake, Brown Trout, and Rainbow Trout (Table 3). Management was conducted by the Michigan Department of Natural Resources (MDNR), the new renamed agency replacing MDOC in 1968 (MDNR 1974). MDNR conducted angler surveys through the mail in 1970 and 1973 (Laarman 1976) and documented 65,000 and 32,000 angler days for Mullett Lake in these years. The predominant catch from the 1970 survey by Mullett Lake anglers was Rainbow Smelt, Yellow Perch, and Walleye. This was despite the fact that Lake Trout and Splake were being stocked prior to and in 1970 (Table 3).

Managers would evaluate the fish community of Mullett Lake on seven occasions from 1965 through 1995. Gill nets were used on most of these evaluations with the primary purpose of evaluating the trout stocking efforts (Table 2). In mid-June of 1967, MDOC used 20 overnight lifts of 300-375 foot long gill-nets, supplemented with shoreline electrofishing, to collect over 2,000 fish. Many of the species collected are still found in Mullett Lake today. Species such as Coho Salmon, Splake, Muskellunge, Trout-Perch, Alewife, and Rainbow Smelt were caught in low numbers while Walleye and Yellow Perch were more common. Gill-net catch rates of many of the primary species were higher in this survey compared to similar efforts done in July of 1956 (Laarman 1976).

In 1972, Michigan Department of Natural Resources (MDNR) utilized an unknown number of gill-nets to again assess the cold water fish community. Data is generally lacking for this survey, although their efforts produced a larger (n=115) catch of Cisco. MDNR again surveyed Mullett in September of 1975, using 23 net nights of 1,000 foot experimental gill-nets. The goal was to check the growth and survival of stocked yearling Lake Trout, and to establish gill-netting index stations. Thirteen species were collected (Table 4). Four age classes of Lake Trout were collected, with most specimens less than 20 inches in length. Thus, Lake Trout survival and growth was considered acceptable. No Splake were collected despite recent stocking efforts, and only one Lake Whitefish was caught. Cisco were common in the deep water sets, ranging in length from 10-18 inches and represented by nine age classes. Eight year classes of Walleye were also collected and demonstrated a good length distribution (Table 4). Another species, White Bass, was collected for the first documented time.

The 1975 index netting stations were again sampled with 500 foot experimental gill-nets (1.5-6 inch mesh) in mid- October of 1981. Effort consisted of fewer net nights (12) compared to the previous survey. The purpose was to again assess Lake Trout stocking efforts. Good numbers of Lake Trout were collected (Table 5) with most of the fish larger than 24 inches, and represented by seven year classes. Cisco 7-18 inches were again common from seven year classes. Most of the Cisco were 9-12 inches. No Lake Whitefish were collected during the netting effort. Other common fish in the catch were Walleye (Table 5) and sucker species.

The surveys in 1975 and 1981 indicated that survival and growth rates of Lake Trout in Mullett Lake were acceptable. Regardless, however, it was believed that this species was not providing a focused fishery and an adjustment in management action was needed. By 1987, MDNR began replacing stocked yearling Lake Trout with stocked yearling Splake in hopes of providing a better recreational fishery (Table 3). The 1981 gill-netting index stations were replicated in October 1987 by MDNR. Effort was 12 net-nights with 500 foot experimental gill-nets (1.5-6 inch mesh). Only two juvenile Lake Trout were collected in the effort and no adults were found. No Splake were captured, despite recent stocking efforts. Cisco were again common but were less abundant than in previous surveys. Walleyes and Yellow Perch were found in good numbers (Table 6). White Bass, first captured in 1975, were a significant part of the 1987 catch in gill-nets, with five year classes established, and a length distribution of 8-17 inches (Table 6).

MDNR considered a different type of fish community survey for Mullett Lake in June of 1988. Gill-nets were not used to assess the cold water fish community. Instead, 79 lifts and 134 net-nights of Great Lakes trap-net effort was used in the shallow water to catch fish. Despite this, 3 Lake Trout were collected as well as 30 Splake (Table 7) which were 12-19 inches long. Most numerous catches were for Rock Bass, Smallmouth Bass, Walleyes, Northern Pike, White Bass, and sucker species. The

sucker species were combined for both white and redhorse species. Nine year classes of Smallmouth Bass were collected with fish ranging from 7-21 inches (Table 7). This species demonstrated average growth, while 60% were legal size (14 inches or larger) if compared to today's regulations. Fifty-seven Northern Pike were collected from five year classes, with 42% 24 inches or larger (today's pike size limit). Over 200 Walleye were collected and represented by 10 year classes, which was considered good. Legal sized fish (15 inches and larger) were 66% of the Walleye catch, and growth was considered average. Few Yellow Perch were caught in the trap netting effort, as this species was likely not as vulnerable to the trap-nets which had larger mesh size for the pots. White Bass had become a prominent part of the Mullett Lake fish community based on the catch of over 300 fish (Table 7). Most specimens were 13 inches, while five year classes were found.

By 1989, Lake Trout stocking efforts had temporarily ceased, while yearling Splake, Brown Trout, and Rainbow Trout continued to be stocked by MDNR (Table 3). Managers again used fall gill-nets to assess the recent stocking efforts. The Great Lakes experimental gill-nets were 500 feet long. Four net-nights/lifts in Scott Bay captured five Lake Trout between 22 and 26 inches, and seven Splake ranging from 15-22 inches. Also captured were five large Brown Trout, one large Rainbow Trout, and 16 Cisco. Cold water species that were stocked were surviving and growth was acceptable. The question remained: were anglers actually fishing for these stocked species?

1996-2009

This period marks an aggressive period in fisheries management and angler surveys at Mullett Lake. Managers would narrow their focus on Walleye management during this period while not actively stocking cold water species. Many of the decisions would be based on social desires. This is also a period when certain invasive species likely entered Mullett Lake, including zebra mussels, quagga mussels, and Round Goby. The invasion of mussels is thought to have entered the lake in the mid to late 1990s as evidenced by increasing water clarity and overall lower productivity demonstrated in Figures 6 and 7. This management period also brought forth Lake Sturgeon rehabilitation efforts for Mullett Lake (which will be covered in the "Current Status" section).

Splake stocking efforts had ceased by 1996, but interestingly, Lake Trout yearlings were once again stocked annually in Mullett Lake from 1996 through 1998 by MDNR. Other cold water species stocking efforts (Rainbow and Brown trout) no longer occurred. The year 1998 would be a pivot point in fisheries management at Mullett Lake.

By 1998, managers were considering the cool water species component of the Mullett Lake fish community in their management actions. Fall nighttime electrofishing was completed along the shoreline in 1996 and 1997 and documented a strong natural year class of Walleye in 1996 and a weaker year class in 1997 (Figure 8; Table 8). Plans were to conduct a population estimate of Walleye in 1998 at Mullett Lake, while simultaneously conducting an angler census. Trap nets were used to capture Walleye in Mullett Lake while electrofishing was used to capture fish in the Cheboygan and Lower Black rivers (near Alverno Dam). The primary focus of the survey was to gather a clearer picture of the Walleye population by tagging adult fish during the spring spawning run. A total of 736 walleye 15-inches and larger were jaw tagged and released from the same locations prior to the fishing season.

A creel (angler) survey was then used on Mullett Lake from May 17 through August 31, 1996 to: 1) generate estimates of harvested and released fish, 2) determine angler fishing preferences, and 3) generate a recapture number of tagged Walleye for population estimation. The creel survey was a cooperative project between the Mullett Lake Preservation Society (MAPS) and MDNR Fisheries Division. MAPS provided funding for air counts, clerk salary, and boat fuel. Fisheries Division supervised the project and supplied the boat, motor, and necessary equipment (Lockwood 2000).

A total of 330 total Walleye were observed in the creel period, of which 16 were jaw tagged from the spring. A mark and recapture method with the Chapman modification (Ricker 1975) was used to calculate a total Mullett Lake Walleye population of 14,350 adults with 95% confidence intervals of 9,035-23,916 fish. This demonstrated an estimate of 0.82 adult Walleye per acre. The creel census also estimated a harvest of Walleye for this period of 3,338, or 0.2 fish harvested per acre. This is generally a low harvest rate for any lake that is considered a Walleye lake. The census documented a total harvest of 18,727 fish and release of 26,588 fish (Table 9), with Yellow Perch dominating the total catch, followed by Walleye, Northern Pike, and Smallmouth Bass. Anglers were also asked what species they were predominantly fishing. For this summer period, most anglers were seeking Walleye, then Yellow Perch, Northern Pike, and Smallmouth Bass (Table 10). Only 1% of the anglers were fishing for cold water species in Mullett Lake, despite the recent stocking efforts for trout and Splake.

In addition to the spring netting and tagging, as well as creel census, MDNR examined other aspects of the fish community through summer netting in Mullett Lake with Great Lakes gill-nets and trap-nets. The lake survey revealed an overall healthy fish population according to reports, with an excellent Smallmouth Bass population and good Northern Pike population. These species were considered to be growing well with many age classes represented.

The Walleye population was noted as "of special concern" on Mullett Lake based on the spring 1998 netting estimate and creel census data. The population estimate of less than one adult fish per acre was considered low, especially when compared to more robust Walleye populations at nearby lakes. The harvest rate (0.038 per hour) and catch rate (0.021 per hour) of Walleye at Mullett Lake was also considerably low (Table 9) as was the harvest per acre (0.20/acre). Despite this, 59% of the anglers sought this species while fishing during the summer.

It was not known at the time whether the Walleye numbers present in Mullett Lake in 1998 were appropriate for the lake's carrying capacity. The overall cool water species predator base (Walleye, pike, bass) appeared to be appropriate when combined, and exhibited good size distributions. However, anglers at the time were asking for a shift in fish abundance to favor Walleye. This would result in the initiation of future spring fingerling Walleye stocking efforts, and the discontinuation of Splake and Lake Trout stocking.

In the fall of 1998, MDNR again conducted fall nighttime electrofishing to assess the strength of the 1998 wild year class of Walleye (Table 8). As they had been the year prior, catches were again low suggesting two successive weak wild year classes. As a result of this and pressure from the public, Walleye fingerling stocking efforts were initiated in 1999.

Spring fingerling Walleye were stocked in Mullett Lake from 1999 through 2003 by MDNR (Table 3). In most years, fingerlings were marked with the antibiotic oxytetracycline which would allow later

determination of origin (stocked versus wild). Annual stocking rates of spring fingerlings during this period were less than 6 fingerlings per acre. This was below the MDNR recommended stocking guidelines for spring fingerling Walleye which were 25-100 per acre (Dexter and O'Neal 2004). The low stocking rates were a product of limited fingerling availability since MDNR fingerling production from external ponds was severely limited during this period.

Walleye recruitment assessments were completed in the fall during the stocking years from 1999 through 2003. The purpose was to evaluate survival of fingerlings to their first fall, and to determine the percentage of stocked versus wild young fish when applicable. Catch rates of age-0 fish (Figure 8; Table 8) increased slightly in some of the stocked years when compared to catch rates from 1997 and 1998. Yearling Walleye catches also increased in 2001 and 2002 (Table 8). Marked fish analysis demonstrated that more than half of the age-0 Walleye collected from 1999 through 2002 were of stocked origin (Table 8), though sample sizes were typically small. Overall juvenile catch rates of Walleye in Mullett Lake remained low despite the low level stocking rates, and wild production was certainly even less impressive.

Walleye stocking efforts and recruitment evaluations ceased for a number of years following 2003. Juvenile assessments were again conducted by MDNR in 2007 and 2008, both demonstrating limited natural recruitment of Walleye based on poor catch rates of age-0 Walleye per hour (Figure 8; Table 8).

The year 2009 would be another pivot point in management at Mullett Lake, particularly for Walleye. Mullett Lake was scheduled to be surveyed under the MDNR Large Lakes Survey Program in 2009. This program was initiated by MDNR in 2001 with the goal of developing a program for monitoring highly valued fish species in the largest inland lakes across the state (Clark et al. 2004). Hanchin (2017) states that the efforts targeted four key species including Walleye, Northern Pike, Smallmouth Bass, and Muskellunge in the large inland lakes where allocation of resources between state and tribal governments was most pressing as laid out in the 2007 Inland Consent Decree (U.S. v Michigan 2007). Main objectives for Mullett Lake were to determine the abundance, growth, mortality and harvest of the aforementioned species. These species were captured in April of 2009 in both Mullett Lake, the Cheboygan River (upstream of Cheboygan Dam), the Lower Black River (below Alverno Dam), and in the Indian River lower reaches in either 73 large mesh trap net lifts, or just over 58 hours of day and nighttime electrofishing. The electrofishing was conducted primarily in the rivers, while the trap netting was solely conducted in Mullett Lake. All Walleye were marked with a dorsal fin clip. Fish marked in rivers were considered Mullett Lake fish, which was a valid assumption based on tagging studies conducted in the 1930s, 1940s, and 1998. Sampling effort in 2009 was conducted by MDNR, with assistance from the Little Traverse Bay Band of Odawa Indians (LTBB) and the Grand Traverse Band of Ottawa and Chippewa Indians (GTB).

The number of Walleye collected during the spring clipping efforts in Mullett Lake and the associated rivers was 713 (not including recaptured fish) and they ranged in length from 10-28 inches (Hanchin 2017). The average length of Walleye was 19 inches, and nearly all fish were 15 inches or larger. Eighty-two percent of the Walleye were 17-21 inches. In addition, 106 Smallmouth Bass and 440 Northern Pike were tagged in the spring effort. The recapture run was conducted with electrofishing gear in the rivers (where clipping was completed) and along the entire Mullett Lake shoreline at night. During the recapture run, 177 adult Walleye were captured, of which 47 were previously clipped.

Hanchin (2017) reported that the estimated number of adult Walleye from this survey method was 2,648 fish, providing a low adult density of 0.2 fish per acre. The mean adult Walleye density for 23 of Michigan's best Walleye lakes which were sampled from 2001 through 2010 was 3.0 fish per acre, while the median was 2.4 per acre (Hanchin 2017). There was concern from biologists that the low estimate of Walleye may have been more a product of utilizing a closed system population model (Chapman-Peterson) in what is actually an open system environment of Mullett Lake. Most of the clipped fish were captured at the outlet of the Cheboygan River from Mullett Lake, and in the Cheboygan and Lower Black rivers. Other more traditional recapture methods were also used to calculate the adult Walleye density (multiple and single-census methods) but ranged from 2,374-7,476 fish. Regardless of the accuracy of any of the estimates, the Mullett Lake adult Walleye population was considered to be very low in density compared to other Michigan lakes with Walleye (Hanchin 2017). The sideboards to the estimate is that it was completed in an open system environment where Walleye movement is significant, and it was the first Walleye survey in Michigan between state and tribal agencies that followed a different protocol of not using a creel survey as the recapture run, but rather, using electrofishing. Hanchin (2017) suggested that the latter point is likely to bias survey results low.

In the 2007 Consent Decree, adult Walleye numbers were predicted for Michigan Walleye lakes with a Wisconsin-based regression model which used lake acreage and recruitment source (U.S. v Michigan 2007). However, such a model did not take into account habitat suitability and lake productivity for estimating densities, and emphasized lake size as a predictor. The number of predicted Walleye from the Inland Consent Decree would be a guiding factor in determining potential allocation of Walleye between Tribal agencies and State of Michigan recreational anglers. Prior to the 2009 empirical estimate, the adult Walleye population was predicted at more than 49,000 adult fish (U.S. v Michigan 2007). Thus, the empirical estimate of 2,648 fish was considered alarmingly low among tribal agencies and the MDNR Fisheries Division.

A spring and summer creel census by MDNR was used to assess the fishery and would be used as a secondary recapture run for Walleye, enabling managers to calculate a population estimate of adult fish via the single-census method. The 2009 creel survey started on April 25 and ended October 31. Approximately 45,000 angler hours and 11,800 angler trips were measured during the period (Table 11). This was compared to 87,500 anglers hours and 21,000 angler trips calculated in a shorter summer window (May through August) in 1998. Thus, Mullett Lake fishing pressure was half as much in 2009 as compared to 1998. With this reduced fishing pressure was less harvest of certain species. For example, the Walleye harvest in 2009 was 836 fish and harvest per hour was 0.0185 (Table 11), whereas these numbers in 1998 were 3,338 and 0.0381, respectively. Walleye total catch and harvest rates were significantly lower in Mullett Lake in 2009 compared to 1998. It was surprising that numbers of this species were considered low in 1998, and appeared even lower in 2009. Very few fin clipped Walleye were recaptured during the creel census, leading to a slightly higher but highly imprecise population estimate compared to the spring method previously mentioned.

Interestingly, Yellow Perch harvest between the years was similar (12,000 in 1998 compared to 14,000 in 2009) when comparing April through August. However, the total catch of perch (including released fish) was three times higher in 2009 (Table 11). This could possibly have been a response of a building perch population while Walleye numbers were depressed.

Other notable species caught were Smallmouth Bass, Northern Pike, and Rainbow Trout. When comparing April through August between the surveys, there was much less fishing effort for Mullett Lake in 2009 compared to 1998, yet Smallmouth Bass total catch was more than double in 2009. Bass catch and release rates per hour increased significantly over the period (Table 9 and 11), likely signaling the growing popularity of bass fishing in northern Michigan lakes. Northern Pike total catch decreased three-fold between censuses. Rainbow Trout total catch between the censuses remained relatively low. Anglers fishing the open water in 2009 were targeting Walleye (37%), followed by Smallmouth Bass (30%), Yellow Perch (15%), and Northern Pike (5%). It appeared that fewer anglers were targeting Walleye in 2009 compared to 1998 (59%), possibly due to the low numbers present in the lake. Open water perch fishing had stayed relatively stable between the years, with 15% of the anglers seeking perch in 2009, compared to 18% in 1998.

Following the spring Walleye estimate and summer creel survey, the State and tribes proposed a number of conditions for Walleye harvest to be in effect from 2010 through 2014. Both parties had general concerns regarding the accuracy of the 2009 survey and recognized the difficulties of sampling Mullett Lake for Walleye. Based on the estimate, the State and Tribes projected the Walleye population in Mullett Lake to be between 2,001 and 3,577, and agreed to use the upper 95% assymetrical confidence limit on the estimated number as the point estimate for calculating safe harvest levels. All agencies then agreed to use a total exploitation rate of 40% for determining a safe harvest level of walleye in Mullett Lake. MDNR also agreed to implement a self-imposed harvest reduction for Walleye beginning in 2010 in order to reduce the risk of sport fishery overharvest. An exception to the standard statewide Walleye regulation (opens last Saturday in April; daily possession of 5 fish) was created for the state recreational fishery. The Walleye opener would now be May 15 for Mullett Lake, the Cheboygan River (upstream of Cheboygan Dam), and the Lower Black River below Alverno Dam; while the daily possession limit for anglers would be 3 fish. This regulation would be in effect at least through 2014. A plan to better understand the Mullett Lake fish community, with emphasis on Walleye, would soon be established among the agencies.

Current Status

2010-2017

Continued collaboration and focused investigations were the hallmark of this period of management at Mullett Lake. State and Tribal resource agencies, with assistance from Michigan State University, committed to studying Walleye movement, stocking success, natural recruitment, foraging dynamics, angler dynamics and catches, and the general fish population of Mullett Lake from 2010 through 2017. Both State and Tribal agencies agreed to periodically stock spring fingerling Walleye to rebuild the population.

MDNR conducted a creel survey at Mullett Lake through parts of the winter months in early 2010 (Table 12), and from late April through October of the same year (Table 13). The winter creel was reliant on having safe ice conditions and was the first attempt at such a venture at Mullett Lake for part of the ice fishing season. Angler hours during the winter were 26,000 along with 6,000 angler trips (Table 12). Yellow Perch dominated the total catch, but was still considered relatively low at 59,000 fish harvested or released.The harvest of other species was considered low. The open water creel also demonstrated an overall lower amount of fishing pressure when examining comparable months of creel in 1998 and 2009. For example, overall angler hours for Mullett Lake from April through August were

87,520, 31,435, and 19,968, for 1998, 2009, and 2010, respectively. This sharp decrease in angler hours during the 10 year period could be explained by a variety of factors (economy, gas prices, fishing quality). Walleye harvest again declined significantly in 2010 to just 469 fish for these spring and summer months. Yellow Perch total catch (harvest and release) was estimated at 30,912, 51,390, and 30,988 for the spring and summer months for 1998, 2009, and 2010, respectively. Perch catches were highest in September and October in both 2009 and 2010.

An additional creel survey was conducted by MDNR in January through part of March in 2011. Angler hours were shy of 35,000 while angler trips was over 8,000 (Table 14). Yellow Perch total catch was over 80,000 fish, while the catch of other species during this period was insignificant.

The year 2010 marked the beginning of a number of Walleye stocking events in Mullett Lake. MDNR stocked 101,000 spring fingerlings (1.8 inch average) in the lake in June of 2010, while MAPS stocked 4,000 (7 inch average) fall fingerlings (Table 3). The spring fingerling stocking rate was approximately 6 per acre. The spring fingerlings were Muskegon River strain stock, while the fall fingerlings were from Bay de Noc strain. Both sources of fingerlings were marked with the antiobiotic oxytetracycline as a means of evaluating stocking efforts. State and Tribal agencies together electrofished the shoreline of Mullett Lake in the fall of 2010. The effort was prior to the fall fingerling stocking by MAPS, thus they were directly evaluating survival of spring fingerling stocked Walleye to their first fall. Age-0 Walleye catch rates increased slightly following the stocking event (Figure 8), while approximately a half of the fish surveyed were considered stocked fish (Table 8).

Walleye stocking efforts by MDNR, the Tribes, and MAPS continued annually between 2011 and 2013 (Table 3). Stocking efforts were a combination of spring and fall fingerling events. In 2013, MDNR stocked 466,000 unmarked spring fingerlings into Mullett Lake at a rate of 27 fingerlings per acre, which was a significant stocking effort. Agencies continued to work together to evaluate spring fingerling stocking efforts each year (2011-2013) by electrofishing in the fall prior to any fall fingerling stocking efforts. Age-0 Walleye catch rates increased over this stocking period, but in general, were still relatively low compared to nearby Burt Lake which annually supported higher juvenile catch rates (Godby 2017) without stocking, and a consistent fishery for Walleye. The fall juvenile catch rate in 2013 remained the highest during the period when fish were stocked (Figure 8; Table 8).

Many studies were done on Mullett Lake starting in 2011 as part of an intensive effort to understand Walleye population dynamics in the Inland Waterway. Studies included Walleye population abundance estimates for each lake, Walleye diet analysis, and determining the extent of Walleye movement among lakes in the Inland Waterway.

From 2011-2013, a total of 651 Walleye were jaw tagged in Mullett Lake and the upper Cheboygan River, while 591 were tagged in the Lower Black River below Alverno Dam. This was in addition to 11,664 Walleye tagged elsewhere in the Inland Waterway over that time period (Herbst 2015). The tagging was done to determine spawning site fidelity, post spawn movement of Walleye, general fish abundance, and fishing mortality rates. Walleye jaw tags were returned from anglers over a period of four years, while tagged fish were also recaptured in subsequent surveys. Lessons learned from the efforts were that closed population Walleye models for individual lakes were not appropriate. This was especially true for Mullett Lake proper (not including Lower Black River which was estimated at 477

fish) which had a new derived population estimate of 2,246 Walleye based on a closed population mark and recapture estimate in the spring of 2011. Movement rates based on tag returns indicated that most Walleye spawning in the Lower Black River and Cheboygan River move into Mullett Lake post-spawn. The site fidelity of Mullett Lake Walleye to the Black River for spawning was strong. Herbst et al. (2017) found that spawning location population-specific exploitation rates typically did not exceed target rates that were mandated in the waterway by the Inland Consent Decree. This was primarily because the low observed fishing mortality rates throughout the system resulted in an overall exploitation rates that was lower than the 35% that is allowed per the 2007 Inland Consent Decree. If fishing rate increased, however, some spawning populations would be at risk because that would result in certain spawning populations experiencing annual exploitation rates would likely surpass the target. This included harvest of fish spawning in the Lower Black River (which were typically Mullett Lake fish). Herbst et al. (2016) recommended that combining areas within the waterway that have high migration exchange rates (i.e. Black River and Mullett Lake) to better align with management of Walleye in these locations. In addition, jaw tag returns from anglers and subsequent surveys showed that many Mullett Lake Walleye migrate to Burt Lake and the Sturgeon River during the spring spawning migration.

Herbst et al. (2016) examined the prey fish community of Mullett Lake and Walleye diets in all Inland Waterway lakes in 2011 and 2012. They used small-mesh vertical forage gill nets to assess the prey community. Round Goby, though prevalent in Mullett Lake, were not vulnerable to the sampling efforts and were captured in low numbers. Most abundant in the vertical gill nets in Mullett Lake were Yellow Perch, followed by Alewife, Spottail Shiners, Rainbow Smelt, and Trout-Perch. The authors found that Walleyes were less reliant on pelagic forage such as Alewife, smelt, or Cisco (based on stomach analysis of sampled and angler caught fish). Rather, Herbst et al. (2016) showed that Walleyes demonstrated substantial variability in their diet, a generalist feeding strategy, and a reliance on littoral prey. For example, native forage such as Yellow Perch were fed on heavily by Mullett Lake Walleye mostly in the spring (along with invertebrates), whereas non-native forage such as Round Goby dominated their diet in the summer, fall, and winter. The authors also suggested that the impacts of non-native forage such as Round Goby is still evolving. For example, goby can be a valuable food source for Walleye as they have a relatively high energy density. Gobies are known to prey on zebra mussels, and thus when fed upon by predators, transfer that energy to higher trophic levels (Herbst et al. 2016). However, goby are also known as being egg predators of other fishes, and ultimately compete for resources with other prey items.

Walleye stocking efforts ceased following 2013 with the exception of one small (1/acre) stocking event of fall fingerlings by tribal agencies in 2014. That year, anglers were reporting large numbers of wild Walleye fingerlings in the diets of Rainbow Trout. As a result, DNR again electrofished nearly 10 miles of shoreline in the fall of 2014 to determine the relative survival of wild Walleye prior to the stocking of fall fingerlings by the tribes. The 2014 year class of wild fish proved to be the largest year class documented in Mullett Lake in years that were surveyed based on age-0 catch rates (Figure 8; Table 8). The relative size of the 2014 cohort was considered much larger than what may have survived from previous combined stocking efforts, and again demonstrated how strong a wild year class of fish could be when compared to stocking efforts. No fall indexing was completed in 2015, however, DNR did survey over 11 miles of shoreline at night in 2016 to gage year class strength again in a non-stocking year. This year class of wild fish also proved to be very strong, and only overshadowed by the 2014 year class (Figure 8). It was becoming apparent that Walleye numbers were

significantly increasing in Mullett Lake by 2016, based on supplemental stocking and mostly on strong wild year classes. The number of juvenile Walleye caught during fall nighttime electrofishing has increased significantly in Mullett Lake, and demonstrated greater year to year variability than at nearby Burt Lake (Figure 9).

A recent creel census was conducted by MDNR for Mullett Lake in 2016 and the winter of 2017. The purpose of the census was to gather insight into angler and fishery dynamics following Walleye stocking efforts. The census occurred from early-May through November 2016 and followed a random stratified roving design. Angler hours for this period were just over 50,000 (Table 15), which was relatively higher than the two recent summer surveys, but lower than the 1998 fishing pressure estimate (Figure 10). Most anglers during the open water fishing season were seeking Walleye (40%), followed by Black Bass (21%) and Yellow Perch (13%) (Figure 11). These percentages in 1998 were 59%, 7%, and 17%, respectively. Walleye were still a popular fish to anglers, but had dropped in preference. The popularity of bass angling was growing at Mullett Lake, which also was true statewide. In addition, anglers seeking trout appeared to be growing during this period (increase from 1% to 5%).

During the 2016 census, anglers that sought Walleye and had completed a fishing trip were polled in regards to their daily bag limit of Walleye (3 fish). Forty-eight anglers who could meet these requirements were interviewed, of which 17% had attained their 3 fish limit during their fishing trip (Figure 12). Thus, even with a reduced bag limit, most Walleye anglers (83%) still did not catch their daily limit. The Walleye harvest and catch/release had increased in 2016 compared to the previous summer censuses (Figure 13 and 14) as did catch rates (Figure 15). The harvest still remained relatively low (0.28 fish per acre) compared to harvest rates of Walleye at other Michigan Walleye lakes which ranged from 0.01 to 1.61 per acre, with a mean of 0.46 per acre (Hanchin 2017). It is important to note that the strong 2014 year class of Walleye were likely not fully vulnerable to catch by anglers in 2016.

Yellow Perch total catch from the spring through the fall of 2016 was significantly lower than estimates of perch catch in 2009 and 2010 (Figure 16), which was a period when Walleye numbers were believed to be at an all-time low. Northern Pike total catch among the four censuses showed a trend similar to Walleye, with lowest catches in 2009 and 2010, and higher catches in 1998 and 2016 (Figure 17). Smallmouth Bass fishing appeared to be increasing at Mullett Lake, as did the catch (Figure 18). Rainbow Trout harvest and catch rate showed the most dramatic increase during the census periods (Figure 19). The estimate of harvest of this species was 669 fish, which was more than at nearby Lake Huron ports where trout stocking was occurring.

A follow-up creel census was conducted by MDNR on Mullett Lake from early January through March in 2017 (Table 16). Angler hours were significantly lower compared to winter estimates made in 2010 and 2011 (Figure 20). With fewer anglers fishing, Yellow Perch total catch was also significantly lower in 2017 compared to previous estimates when densities of perch were thought to be higher (and Walleye fewer) (Figure 21). The total catch of other species such as Walleye, Northern Pike, and Cisco was also considered very low (Table 16).

2017 Spring Fish Community Survey

A fish community survey was conducted on Mullett Lake in late-May and June 2017 by MDNR Fisheries Division. A variety of net types and sizes were deployed using Status and Trends protocol. Status and Trends is a methodology developed by Fisheries Division in which gear is standardized throughout the state and survey effort is a function of lake size (Wehrly et al. in press). The variety of gear types and mesh sizes is intended to sample different sizes of fish, species, and life stages to give a picture of the overall fish community. This type of survey was different from past Mullett Lake surveys which often used gear types that selected for certain species and sizes. Survey effort for this 2017 survey was considerable, with two boats/crews netting over a two-week period in the spring. Survey effort consisted of 22 large-mesh trap-net lifts, 41 large-mesh fyke-net lifts, 20 small-mesh fyke-net lifts, 24 experimental gill-net lifts, 8 straight-run gill-net lifts, 10 seine hauls, and four 10-minute electrofishing transects. The experimental gill-net effort (24 net nights) was deployed to begin to develop an "index" for Yellow Perch based on catches at distinct coordinates and depths. This 2017 index came at a time when perch numbers were considered low, and Walleye densities were trending higher. Age and growth of most game fish species were determined by collection of fin rays/spines or scale sub-samples. Weights for each species were calculated using length-weight regressions summarized by Schneider (2000).

Thirty-nine species of fish were collected during the 2017 survey (Figure 22; Table 17), which is a relatively high number compared to most natural lakes in northern Michigan. Total catch was 3,629 fish weighing more than 2,500 pounds. Large predator fish including Smallmouth and Largemouth bass, Walleye, Northern Pike, and Muskellunge made up 14% of the total catch by number and 41% by weight. Non-game species such as Bowfin, Common Carp, bullheads, suckers, and gar made up 18% of the total catch by number and 38% by weight. The panfish community of Mullett Lake is dominated by Rock Bass and Yellow Perch, with insignificant numbers of Bluegill, Pumpkinseed, Green Sunfish, and Black Crappie present. Panfish made up 39% of the total catch by number and 17% by weight. Other notable species collected during the survey were Round Goby, White Bass, Cisco, Lake Sturgeon, and Rainbow and Brown trout. Species not endemic to Mullett Lake that were captured were Round Goby, White Bass, Common Carp, Sea Lamprey, Alewife, Rainbow Trout, and Brown Trout. The adult Sea Lamprey of Mullett Lake are a small landlocked population which completes its life cycle in the tributaries and lake itself (Johnson et al. 2016).

Walleye are a common predator in Mullett Lake based on the survey results (Table 17). They ranged in length from 5-25 inches with 40% of legal size (15 inches or larger) (Figure 23; Table 18). We captured 11 year classes of this species (Table 19). They reach legal size in Mullett Lake between age 4 and 5, with gender likely being a factor in how quickly they attain legal size. Growth of Walleye age-5 or less appears slower today in Mullett Lake compared to age and growth data from previous surveys (Table 19). This could be attributed to higher densities of younger fish in recent years from stocking events and strong wild year classes. Twenty-four experimental gill-net lifts at varying depths were used during the fish community survey. The coordinates and depths for each of these lifts may be considered index stations for future assessment and comparison of Walleye (and Yellow Perch) through time (Figure 24). The Walleye catch by cohort from the experimental gill-nets is demonstrated in Figure 25. The cohort analysis correlates well with the spring fingerling stocking events from 2013 (age-4), 2011 (age-6), and 2010 (age-7). In addition, a strong year class also matches the wild production event from 2014 (age-3). Age-1 Walleye were likely not fully vulnerable to the gill-nets, but were still captured in acceptable numbers, indicating a strong 2016 year class, as was also depicted with nighttime electrofishing the previous fall (Figure 8). No fall electrofishing was conducted to

measure the strength of the 2015 year class. However, during the spring gill-netting in 2017, we captured good numbers of age-2 fish which suggests we have multiple data sets that indicate strong year classes of natural reproduction occurred in three years at Mullett Lake (2014-2016) following stocking events from 2010-2013.

Smallmouth Bass were also common in the survey catch. The average size of a fish caught was just short of 15 inches (Table 17). Strong numbers of Smallmouth Bass 15-19 inches are available to anglers (Table 18) with fish up to 21 inches also present (Figure 26). Survey catches suggest that this species may be more abundant today than in past decades, especially prior to the 1980s. Smallmouth Bass reach legal size (14 inches or larger) in Mullett Lake at approximately age-4, which is relatively fast growth. Growth of this species is very fast in Mullett Lake, and likely attributed to the abundant forage of rusty crayfish and Round Goby. Age 2-6 bass were most abundant, however we found 13 year classes present with fish up to age-14 (Table 19).

Northern Pike comprised 3% of the catch by number, but 16% by weight. Forty-one percent of the pike collected were of legal size (24 inches or larger) (Table 18). Northern Pike to 36 inches were caught (Figure 27), but it is likely that pike greater than 40 inches can be found in Mullett Lake. Ten year classes of pike were noted (Table 19). Pike growth is about one-inch faster in Mullett Lake when compared to pike populations across Michigan.

White Bass were caught in larger numbers in the 2017 survey compared to past surveys. Fish ranged from 14-17 inches in length (Table 18), and most surprisingly, were represented by eight year classes and fish living as old as age-15 (Table 19). In contrast, Cisco were caught in lesser numbers when examining catches of this species from the gill net surveys of the 1970s and 1980s. This is likely due to differences in survey timing and deep water gill-net effort. Cisco in the 2017 survey ranged from 11-15 inches and were represented by five year classes. Past surveys that captured more Cisco showed a broader length and age distribution (Table 19).

The panfish community of Mullett Lake is dominated by Rock Bass and Yellow Perch. Rock Bass are very abundant, comprising 30% of the total catch by number and 13% by weight. This species can grow large in Mullett Lake, as demonstrated by the presence of fish 10 inches and larger (Table 18).

Yellow Perch are the popular panfish of Mullett Lake among anglers. Over 300 perch were captured in the survey (all gear types) with fish ranging from 2-13 inches in length (Table 18). Good proportions of perch 8-inches and larger were found (Figure 28). Age analysis of the perch found twelve year classes and a growth rate comparable to perch across Michigan. Growth rates of perch do not appear to have changed significantly over the course of various surveys (Table 19).

As previously mentioned, we used 24 experimental gill-net lifts at varying depths during the fish community survey (Figure 24). The coordinates and depths (12-36 feet) for each of these lifts can be considered index stations for future assessment and comparison of Yellow Perch. We caught 10.3 perch per gill net lift in the 2017 survey which were distributed relatively uniform for ages 2-6, and showed declining numbers with older ages (Figure 29). The overall catch of 10.3 per lift is compared to 23.0 perch per gill-net lift in adjacent Burt Lake from 2015. We used a weighted catch-curve regression analysis for perch ages 4-12 (ages believed to be most vulnerable to gill-nets) and computed

a perch annual mortality of 28%, which was lower than the Burt Lake annual mortality for the same ages of 38%.

Other species of interest in Mullett Lake were sucker species and Round Goby. Both White Suckers and Silver Redhorse are common in the lake, and grow to very large sizes. These species are prey for predators at small sizes, and compete for food resources with game fish at larger sizes. Round Goby, a relatively new inhabitant to Mullett Lake, were abundant. Gobies ranged from 1-3 inches, with most less than 3 inches. Larger fish may have been more abundant in deeper water, yet we did not deploy gear that could efficiently sample this species offshore.

We believe some other species are present in the lake, but were either not collected or captured in lower numbers. For example, it is well known that Mullett Lake has a small Rainbow Smelt population, yet none were captured in the survey. Rainbow Trout were captured in low numbers during the survey. This species is an important member of the Mullett Lake fish community. Their low catch number is likely due to their suspension in the water column, which would prevent us from capturing them in gill-nets in higher numbers. Some of this species may also still have been drifting back from the Pigeon or Sturgeon rivers following the spring spawning run.

Lake Sturgeon Management

Lake Sturgeon are a threatened species in Michigan. Hayes and Caroffino (2012) characterize the Mullett Lake sturgeon population as below its minimal viable population size. The population declines of sturgeon statewide have mirrored the declines within Mullett Lake. Certainly dams (Alverno, Cheboygan) have isolated populations within the Inland Waterway and reduced spawning areas.

Lake Sturgeon management has undergone many changes within the Inland Waterway, including at Mullett Lake. By 1928, sturgeon fishing was closed in Mullett Lake (and adjacent waters) due to perception of low numbers. In 1948, a spearing season for sturgeon opened again for the months of January and February with a limit of 2 fish and a minimum size of 36 inches. The minimum size increased to 42 inches in 1952, and by 1958, the sturgeon fishing season was reduced to only the month of February. By 1959, Lake Sturgeon had been classified a game fish by the MDOC, continuing the realization that Lake Sturgeon were an important member of the Michigan fish community, and not a nuisance species. In 1974, anglers in Mullett Lake and the adjacent lakes could only harvest sturgeon greater than 50 inches. The number of Lake Sturgeon voluntarily reported by year and reported catch statistics for these Mullett Lake fish can be found in Table 20. From 1974 through 1999, 111 sturgeon were reported harvested from Mullett Lake. It is likely that more were harvested and not reported.

By the late twentieth-century, concerns arose among sturgeon enthusiasts and MDNR officials about the Inland Waterway and Black Lake Lake Sturgeon populations. Sturgeon fishing had become prohibited in Mullett (and Burt) Lake by 2000. Some previous stocking efforts of fall fingerlings had occurred earlier in the 1980s and 1990s in Mullett Lake. Stocking efforts increased substantially by 2003 through a collaborative effort between MDNR, Michigan State University (MSU), Sturgeon For Tomorrow, Tower-Kleber Limited Partnership, and MAPS. Variable numbers of fall fingerlings have been stocked nearly annually in Mullett Lake from 2003 through 2017 (Table 3). Based on high survival rates of the stocked fingerlings in nearby Black Lake, the numbers stocked in Mullett Lake were reduced to 500 fall fingerlings annually.

MDNR and MSU conducted a Lake Sturgeon population estimate at Mullett Lake in both 2010 and 2011 to gain insight into fish distribution and abundance in the lake. Sampling gear consisted of large-mesh gill-nets which were tended in the day to prevent fish mortality. In 2010, only 16 sturgeon were collected, and all fish were 42 inches or less. The total unique number of sturgeon collected in 2011 was 70 fish, which only included one fish over 50 inches. Data suggested that the Lake Sturgeon population of Mullett Lake was made up almost entirely of relatively small and immature stocked fish, but that stocking was slowly rebuilding the population.

Analysis and Discussion

The current (2017) fish community of Mullett Lake can be generally characterized as having the following: 1) a panfish community that is low in diversity, and dominated by Yellow Perch (particularly the fishery) and Rock Bass, 2) a perch population that may be slightly depressed currently due to competition from Round Goby and predation from Walleye, 3) a predator population having moderate diversity and dominated by Walleye and Smallmouth Bass, and to a lesser degree, Northern Pike, 4) an average growing Walleye population supported by stocking activity, but dominated by natural reproduction in recent years, 5) an increasing Walleye population which is larger than in previous surveys and changes seasonally and annually in number through ingress and egress of fish from other adjacent waters, 6) species such as Rainbow Trout, Brown Trout, Rainbow Smelt, Alewife, and Cisco that utilize the deep and cold water habitat of Mullett Lake, 7) a non-game fish community typical for a large inland glaciated Michigan lake comprised primarily of suckers, bullheads, and gar, and 8) a remnant adult Lake Sturgeon population well below the lake's carrying capacity, and a growing juvenile sturgeon population reestablished from recent ongoing stocking efforts. Mullett Lake also has a number of invasive species, some of which have been integrated into the aquatic community, others which have not. Zebra and quagga mussels, and Rusty Crayfish, have invaded the lake in recent decades and demonstrated the typical invasive curve of spreading quickly and having deleterious impacts on the lake ecosystem. Other invasives such as Alewife and Rainbow Smelt have been found in the lake for much longer and have stabilized in lower numbers.

The current fishery of Mullett Lake can be generally characterized as having the following: 1) an open water fishery that is diverse for Walleye, Smallmouth Bass, Yellow Perch, Rainbow Trout, and Northern Pike, but mostly driven by Walleye angler hours, 2) a growing open water fishery for Smallmouth Bass, 3) a stable open water fishery for Rainbow Trout which are wild fish mostly from the Pigeon River, and 4) a limited-period ice fishery dominated by perch anglers which may be currently depressed. Management of Mullett Lake has primarily been with the use of statewide regulations (with the exception of Walleye), maintenance of most species through natural reproduction, and providing low level stocking of various fish (Walleye, Lake Sturgeon) when needed.

The Mullett Lake panfish community is low in diversity, but can be high in quality. Yellow Perch are the main attraction for anglers at this lake in the fall and winter months. The lake receives considerable fishing pressure for this species when the population is at acceptable levels and large fish are available. Healthy fish populations of Mullett Lake ensure that fishing pressure is spread out across the Inland Waterway lakes and not focused on one lake (i.e. Burt or Black Lake). Analysis of past creel data and survey data suggests that there is an inverse relationship between Yellow Perch and Walleye. Numbers of Walleye currently are on the rise, while perch numbers appear lower based on angler pressure and survey catches. Perch grow to large sizes in Mullett Lake not by growing fast, but by living to older

ages. For example, it takes a perch approximately 6-7 years old to reach 10 inches in length. Thus, having large year classes of perch at Mullett Lake are key to having some fish reach large sizes through longevity. Increased predator numbers (Walleye, Rainbow Trout) will influence the number of perch that recruit to older ages.

The predator base of Mullett Lake is more diverse. Most anglers seek out Walleye and Smallmouth Bass during the open water season. These angler types are usually distinct from one another spatially. Walleye numbers are currently on the increase in Mullett Lake through both supplemental stocking and recently produced large wild year classes. Recruitment of these fish to legal size will likely recruit more anglers to Mullett Lake, and in doing so, spread fishing pressure throughout the waterway. The magnitude of fish produced naturally in recent years (2014-2016) is greater than the magnitude of recruitment from stocking in previous years. Walleye numbers will continually change within the lake, even within one year. Immigration and emigration of Walleye to and from Mullett Lake has been documented on a number of past surveys. This is one reason that conducting a population estimate for this species is a challenge for this lake. At times, spawning within the lake can be highly successful based on recent electrofishing studies. In other years, in-lake production is likely hindered. It is not fully understood the percentage of Walleye that spawn in the lake in a given spring, compared to the Mullett Lake numbers that emigrate out of the lake to spawn in other locations (Lower Black River, Sturgeon River, Burt Lake). Jaw tagging analysis of Walleye has documented this movement over a number of years. These studies also show that at times Mullett Lake can receive Walleye directly from Burt Lake. The Walleye population in Mullett Lake must always be looked at within the context of the Inland Waterway as a whole.

Smallmouth Bass have been a benefactor of the changing aquatic community in Mullett Lake post zebra and quagga mussels. The mussels have taken much of the pelagic energy of the lake and converted it to the benthic environment which is suitable for rusty crayfish and Round Goby. Smallmouth Bass have taken advantage of these new food sources and appear to be increasing in the lake, as are the fishery hours exerted on this species. Northern Pike are targeted directly by some anglers in Mullett Lake (both summer and winter), but likely are caught mostly as an incidental catch. Pike numbers appear to be stable over time. The cool and cold water refuge of the lake allows for maximum growth of this species, and opportunities to seek cold water prey (Cisco, trout) and cool water prey (perch, suckers). Overall pike numbers are not high in Mullett Lake compared to northern Michigan lakes with unlimited spawning habitat. However, their numbers are acceptable and they are an important member of the fish community. Muskellunge are not common in Mullett Lake, but they are present. Recent increases in minimum size limit (46 inches) for this species were appropriate for Mullett Lake and parts of the Inland Waterway.

Various introduced species have found their niche in Mullett Lake and support a fishery, including Rainbow Trout. The Rainbow Trout population is based solely on natural reproduction, and will fluctuate annually based on the strength of year classes produced primarily in the Pigeon River. Routine surveys of the Pigeon River document large and variable numbers of juvenile Rainbow Trout, which once they smolt, return to Mullett Lake where they feed and attain larger sizes. Most of the juvenile trout smolt at age-1, since fish of this age are quite common in the river, but age 2 fish are uncommon. Their lake prey, based on stomach analysis of caught adult fish, includes invertebrates, juvenile Yellow Perch and Walleye, among other items. They are an accepted part of the fish community of Mullett Lake, and are also a predator and competitor for resources.

Rainbow Smelt and Alewife are both invasive species that are present in Mullett Lake in relatively low numbers. These species provide additional forage, but also compete with important game fish such as Yellow Perch for food. Zebra mussels and quagga mussels have likely had the most profound effect on the Mullett Lake ecosystem since their arrival over twenty years ago. They have had a profound impact on plankton levels and native mussels in the lake since they became established. These post-mussel changes have been documented within the Great Lakes (i.e. Lake Huron) as well as at many Michigan inland lakes. Their numbers likely are reduced since their initial invasion, as is typical for invasive species. Limnological evidence suggests that a new carrying capacity for Mullett Lake fish and aquatic organisms is likely in effect when compared to pre-mussel invasion.

Management Direction

Mullett Lake is an important waterbody in northern Michigan. It is part of a complex waterway of lakes and rivers, and itself drains a large watershed. The fishery and the general recreational use it supports is important to the statewide and local economy. Below are some management recommendations for Mullett Lake, some of which can apply to other parts of the Inland Waterway. These management recommendations were written following a review of recent surveys of the fish communities and fishery of the lake, as well as an ongoing analysis of limnological factors. Some of these recommendations can be accomplished by local groups such as the Mullett Lake Preservation Society.

1) Water quality monitoring and limnological analysis should continue at Mullett Lake. Data has been collected dating back to the 1980s for Mullett Lake, including information related to trophic status and productivity. This data has been collected through volunteer monitoring and Tip of the Mitt Watershed Council. The information provided pre-dates mussel invasion, and has been a valuable tool for today's managers in understanding the current conditions and carrying capacities of the lake. With its close proximity to Lake Huron, it is safe to assume that other invasive species will become part of the Mullett Lake aquatic community through time. Because of this, we should continue to capture such data to be used as a tool by future fisheries managers and concerned residents in their understanding and future management of the lake.

2) Careful scrutiny of future aquatic vegetation treatments should occur for Mullett Lake. Aquatic vegetation is important as spawning substrate and cover for various fish species, and it serves as the base of the food chain. Native vegetation should be protected throughout the lake. Submersed vegetation is important for Yellow Perch and Northern Pike populations for spawning and nursery habitat. Both species are important to the fishery.

3) Consideration should be given to the long term monitoring of aquatic vegetation levels and mussel densities in Mullett Lake. Mussels (zebra and quagga) have entered the lake ecosystem and had profound impacts. Mussels may have declined in the lake based on observations and water quality data parameters. However, we do not know what the long term effects of these invasive species will be for an inland lake. Periodic quantification of their populations, along with aquatic vegetation, will give future managers a better platform for making fisheries management decisions.

4) Fisheries surveys at Mullett Lake date back to the late 1800s. Many surveys of a variety of types have occurred here since then. However, some of the surveys have been species or program specific.

The 2017 fish community survey examined the overall fish community with a broad amount of gear types over a two-week period, providing a more accurate picture of the fish community. This effort should be duplicated periodically to allow for more direct comparisons over time. This should be done approximately every 20 years, or when need arises (e.g. new invasive species detected). Species specific surveys can be used periodically. For example, Yellow Perch age structure and densities can be determined from periodic experimental gill netting used the 2017 index sites.

5) Anglers should provide catch reports for fish at Mullett Lake more frequently to MDNR biologists, particularly for Walleye, Yellow Perch, Northern Pike, Rainbow Trout, and Muskellunge. Catch reports are a valuable tool for managers, and often considered in management plans for the lake.

6) Creel/angler surveys of Mullett Lake are a very valuable tool for managers. These surveys provide critical information such as fishing pressure, catch, and angler preferences that also shape lake management principles. These types of surveys are done infrequently due to personnel shortages and costs. Partnerships for such efforts should be examined in the future.

7) Walleye year class strength should continue to periodically be examined at Mullett Lake through fall shoreline electrofishing at night. Historical stations should be re-surveyed. Surveys may be in stocking years, or non-stocking years. Most historical sampling has documented infrequent large wild year classes. However, more recent indexing has documented strong wild year classes. These surveys, followed by angler reports of sub-legal fish, are a valuable tool for managers in evaluating the direction of the Walleye population.

8) Walleye stocking should only be accomplished at Mullett Lake when broodstock numbers are low, or when surplus fingerlings are available from a hatchery source (State or Tribal). Recent stocking from 2010-2013 documented acceptable survival of spring fingerlings. However, wild year classes that succeeded those stocking events overshadowed the stocking efforts. The abililty of the lake to produce strong year classes (even if not frequent) is much greater than cumulative efforts from stocking. If stocking should occur, it should be done with spring fingerlings from a marked source so that those efforts can be evaluated.

9) Walleye densities of Mullett Lake should not be compared to Walleye numbers in nearby lakes (i.e. Burt Lake). In addition, the trophic state (productivity) of Mullett Lake should be considered when determining what the "right" number of Walleye should be for this waterbody. Walleye emigration and immigration at Mullett Lake is significant, and has been documented through many tagging studies. The carrying capacity of this large, deep and unproductive lake for Walleye is considered lower than nearby lakes which have a different morphology. Walleye population fluctuations are normal, and allow other populations of fish (i.e. Yellow Perch) time to rebuild and support a productive fishery.

10) Walleye regulations should be returned back to the statewide standard for this species (daily possession 5 fish, opening date last Saturday in April) at Mullett Lake. The amount of harvest in the lake proper with the two additional fishing weeks (last Saturday in April - May 15) will be minimal, and reversion will help simplify regulations with other nearby lakes such as Burt Lake. The current regulations for this species in the Cheboygan River (upstream of Cheboygan Dam) and Lower Black River (below Alverno Dam) should remain conservative with an opening date for fishing of May 15, but a reversion of the daily possession limit from 3 fish back to 5 fish (statewide regulation). This later

opening date will protect against overharvest of fish by state recreational anglers during April and early May when fish are concentrated in these spawning locations and vulnerable to overharvest.

11) The 2007 Inland Consent Decree (U.S. v Michigan 2007) defines a Walleye "system" as a lake and its incoming tributaries. Three previous Walleye movement studies dating as far back as the 1940s have documented spawning and movement of this species from Mullett Lake into the Cheboygan and Lower Black Rivers downstream, even suggesting unique spawning site fidelity and possible genetic uniqueness. Fish that are harvested in these lower rivers by tribal anglers should be considered in the partial allocation as Mullett Lake fish, and not only Great Lakes fish.

12) Muskellunge are a unique fish in the Inland Waterway and Mullett Lake. Minimum size limits were increased for ths species from 42 to 46 inches recently in order to better manage the species and ensure natural reproduction. MDNR has a long term plan for periodic surveying and tagging of this species to better understand growth rates, densities, movement, habitat, and exploitation. Although most of the fish captured and tagged since 2016 have been in waterway rivers (Indian, Cheboygan, Black, Crooked), some of these fish are from Mullett Lake. Efforts should continue to tag and track fish in Mullett Lake and the remainder of the waterway. New mandatory harvest reporting should help increase understanding of this fishery.

13) Rainbow Trout are a member of the Mullett Lake fish community. Studies have shown that approximately 5% of the total summer angler hours are directed at this species. These are wild trout that spawn and hatch in the Pigeon River predominantly. The juvenile trout typically live a full year in the river, and upon smoltification, return to Mullett Lake to feed and grow to impressive sizes. Various studies have documented production of Rainbow Trout throughout the entire Pigeon River, with annual year class variability evident. We will continue to rely on natural reproduction of this species. This is an important but secondary fishery (to perch and Walleye) in Mullett Lake. Current regulations are a 5 fish daily possession limit, no more than 3 of which may be 15 inches or greater.

14) Populations of landlocked Sea Lamprey should continue to be reduced in Mullett Lake. Cooperative efforts among State and Federal officials have documented this low density landlocked population. Efforts by the U.S. Fish and Wildlife Service are underway to reduce this population (in the entire Inland Waterway) through male sterilization methods. This is a preferred method with the goal of eliminating the small population and lessen reliance on chemical control of larval lamprey in the Pigeon River.

15) The population of adult Lake Sturgeon should continue to be restored in Mullett Lake. Previous gill-netting efforts of the entire lake have documented few adult sturgeon, and acceptable survival of stocked fish. Efforts should continue to stock Lake Sturgeon from Black Lake broodstock/genetic sources. It is likely that this entire waterway population of sturgeon was at one time the same genetically prior to the construction of Alverno Dam. Periodic surveys of the Mullett Lake sturgeon population will be conducted to assess recruitment of stocked fish, as well as documenting and tagging adults. Sturgeon rehabilitation is a joint effort among state and tribal agencies, universities, and local groups such as MAPS and Sturgeon For Tomorrow. A Mullett Lake Sturgeon Management Plan should be written to provide direction for stocking and density goals. This plan should be written in the next decade once more lake netting efforts are accomplished.

16) Continue to work with the Northern Inland Lakes Citizen Fisheries Advisory Committee on issues related to Mullett Lake and the Inland Waterway. This committee, created in 2010, acts as a bridge between MDNR and the public (local anglers, MAPS). Meetings are bi-annual as needed, and are a conduit of information sharing between managing agencies and the public.

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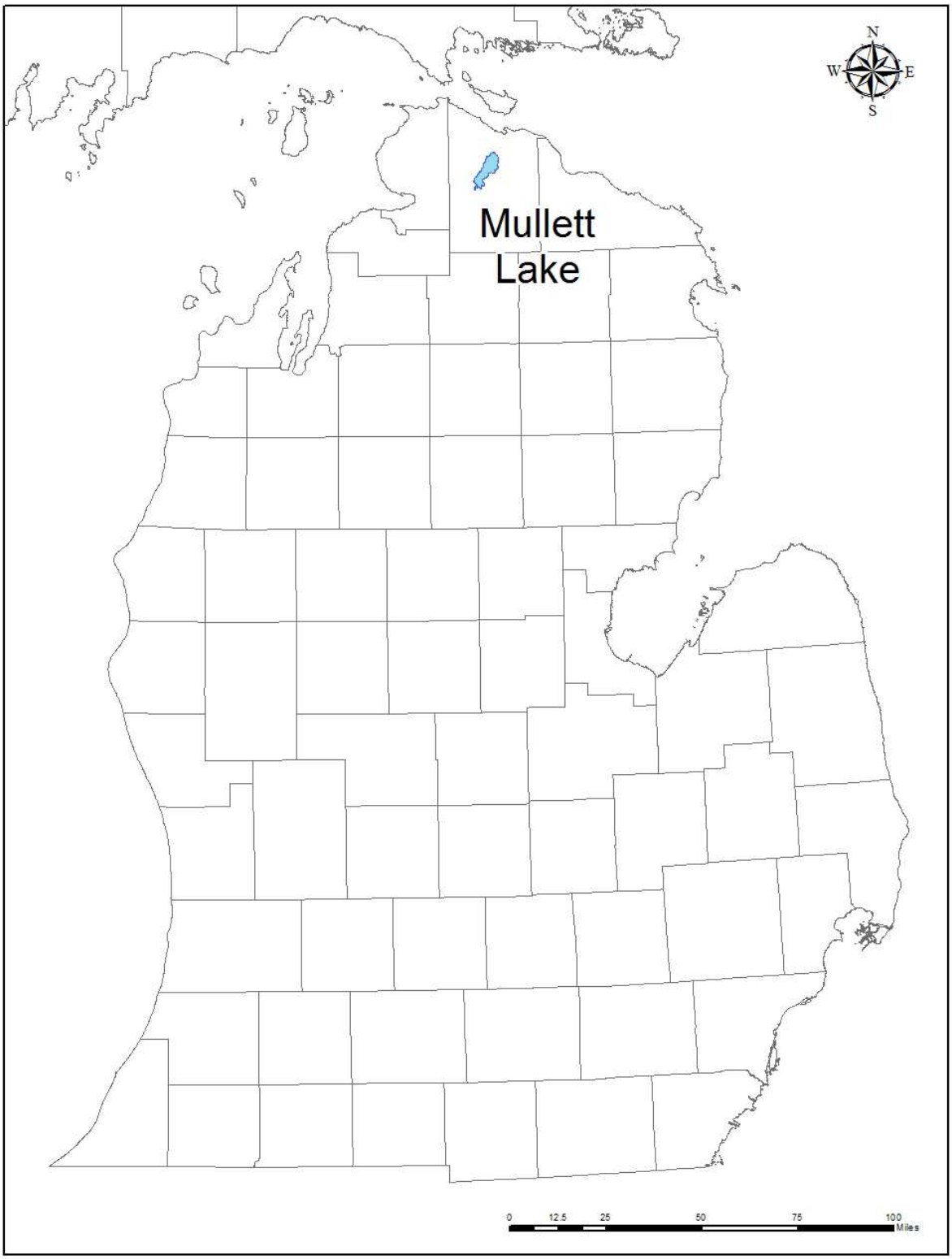


Figure 1.-Location of Mullett Lake in the Lower Peninsula of Michigan.

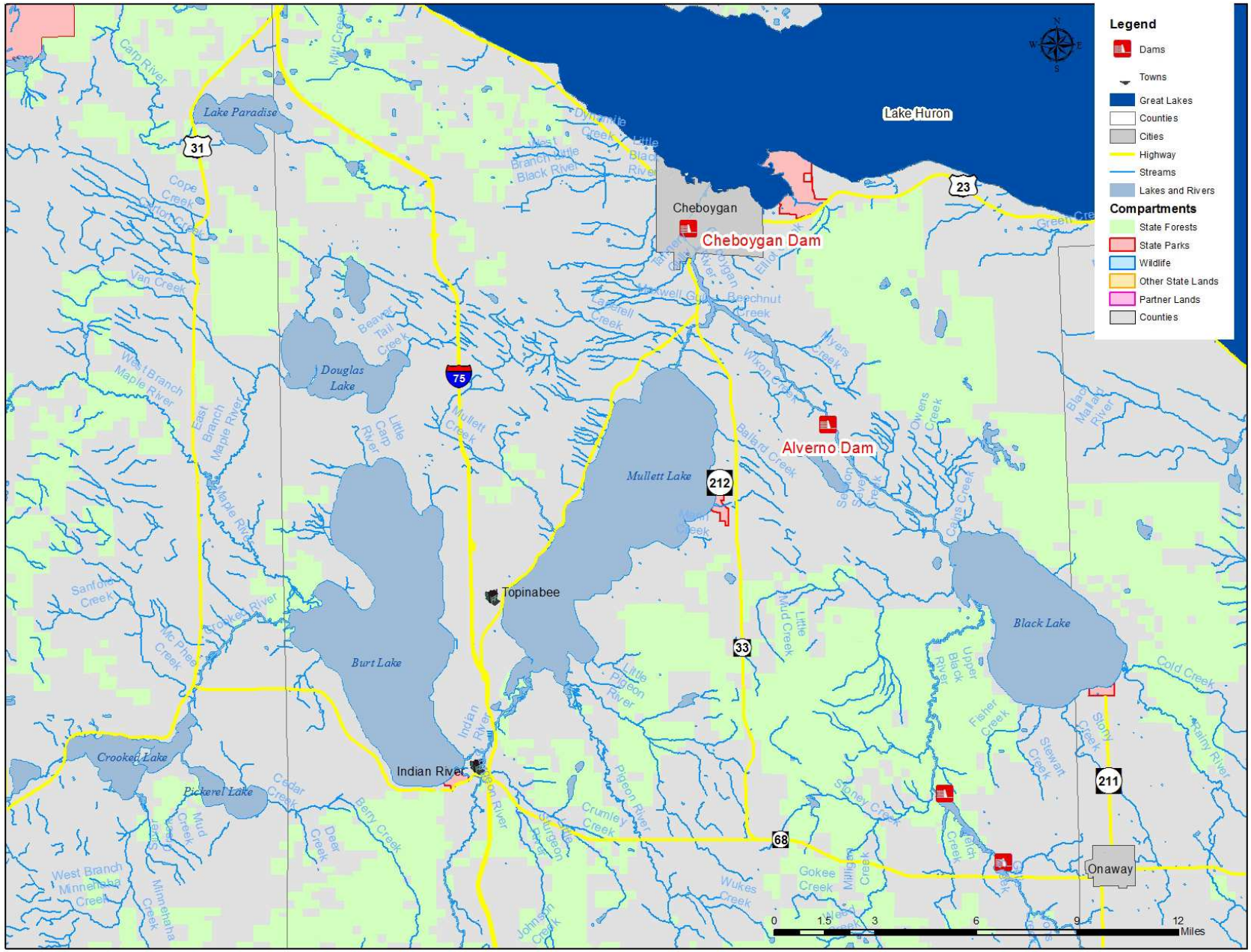


Figure 2.-Close-up view of Mullett Lake and surrounding geography.

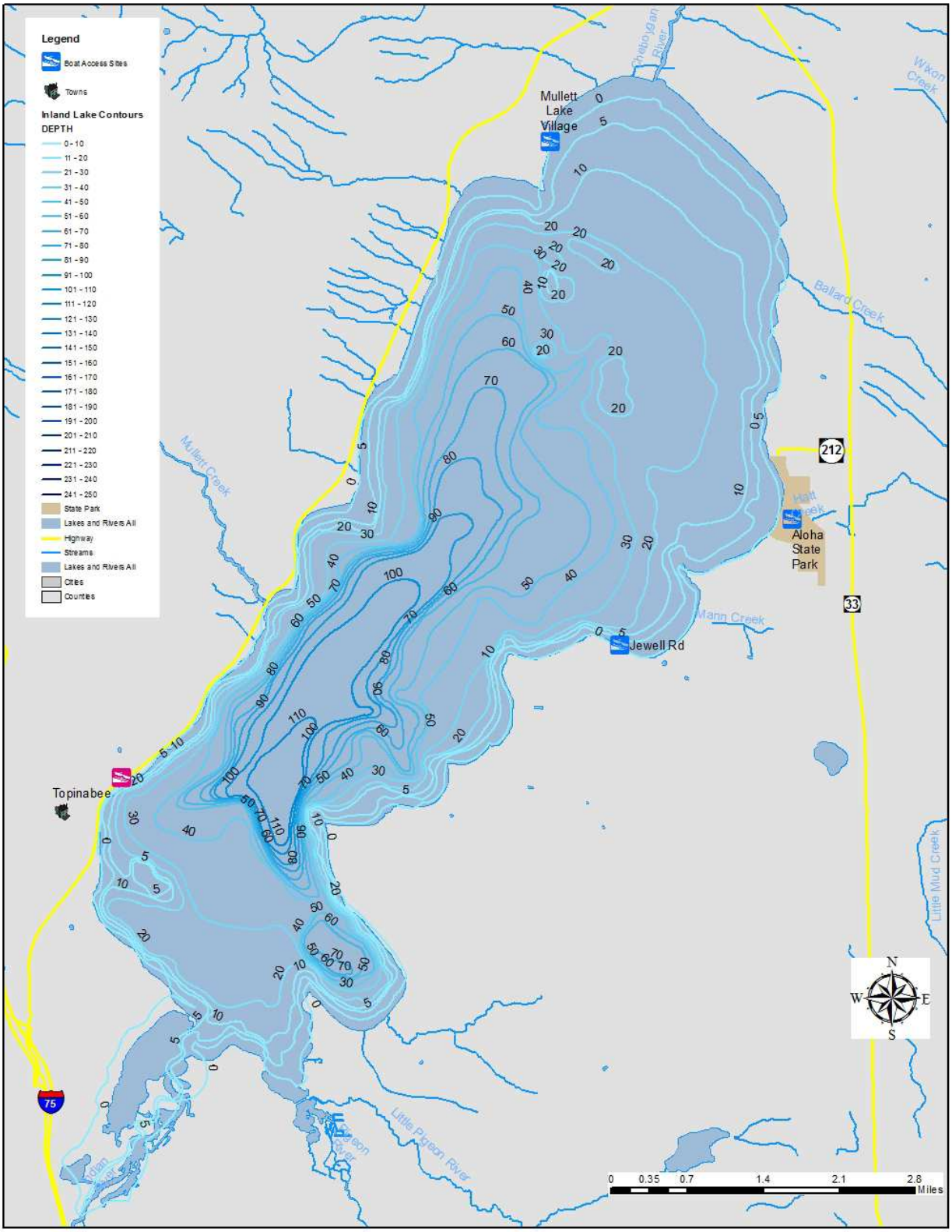
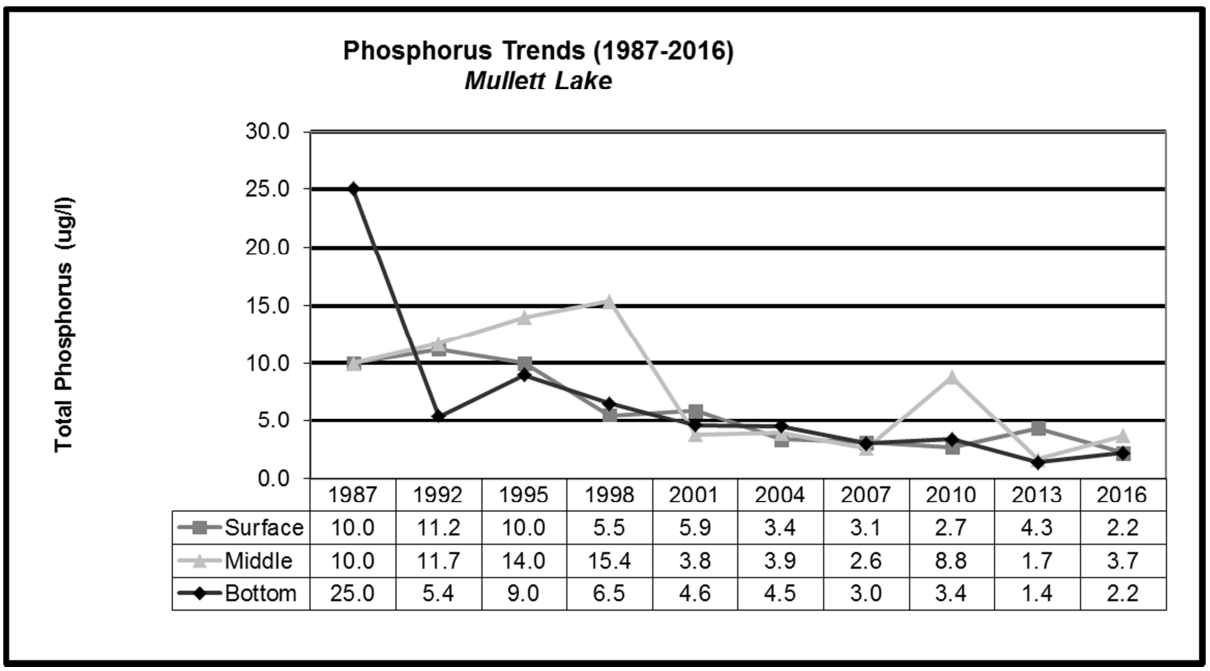


Figure 3.-Bathymetric map of Mullett Lake and boat launch sites.



	1987	1992	1995	1998	2001	2004	2007	2010	2013	2016
Surface	10.0	11.2	10.0	5.5	5.9	3.4	3.1	2.7	4.3	2.2
Middle	10.0	11.7	14.0	15.4	3.8	3.9	2.6	8.8	1.7	3.7
Bottom	25.0	5.4	9.0	6.5	4.6	4.5	3.0	3.4	1.4	2.2

Figure 4.-Trends in phosphorus levels at Mullett Lake from 1987 through 2016 based on comprehensive water quality monitoring by Tip of the Mitt Watershed Council.

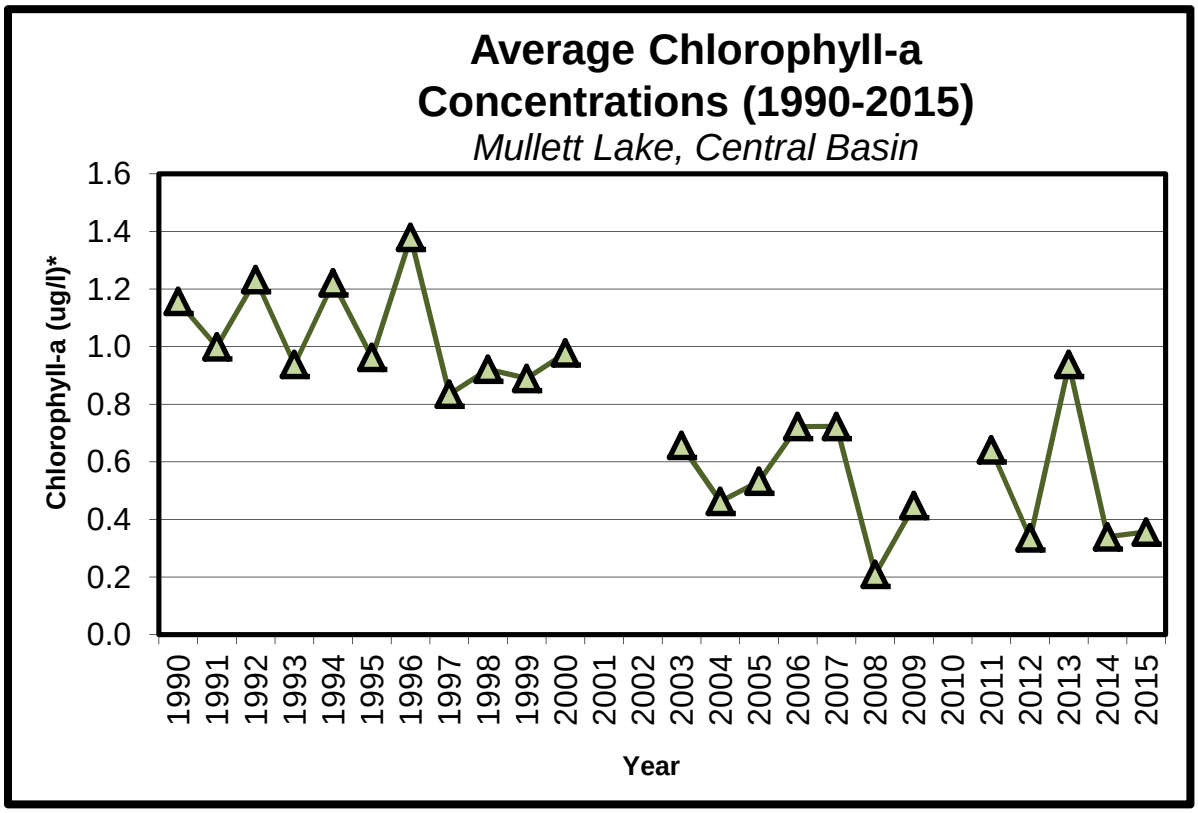


Figure 5.-Trends in chlorophyll-a concentrations at Mullett Lake from 1990 through 2015 based on volunteer water quality monitoring activities and Tip of the Mitt Watershed Council.

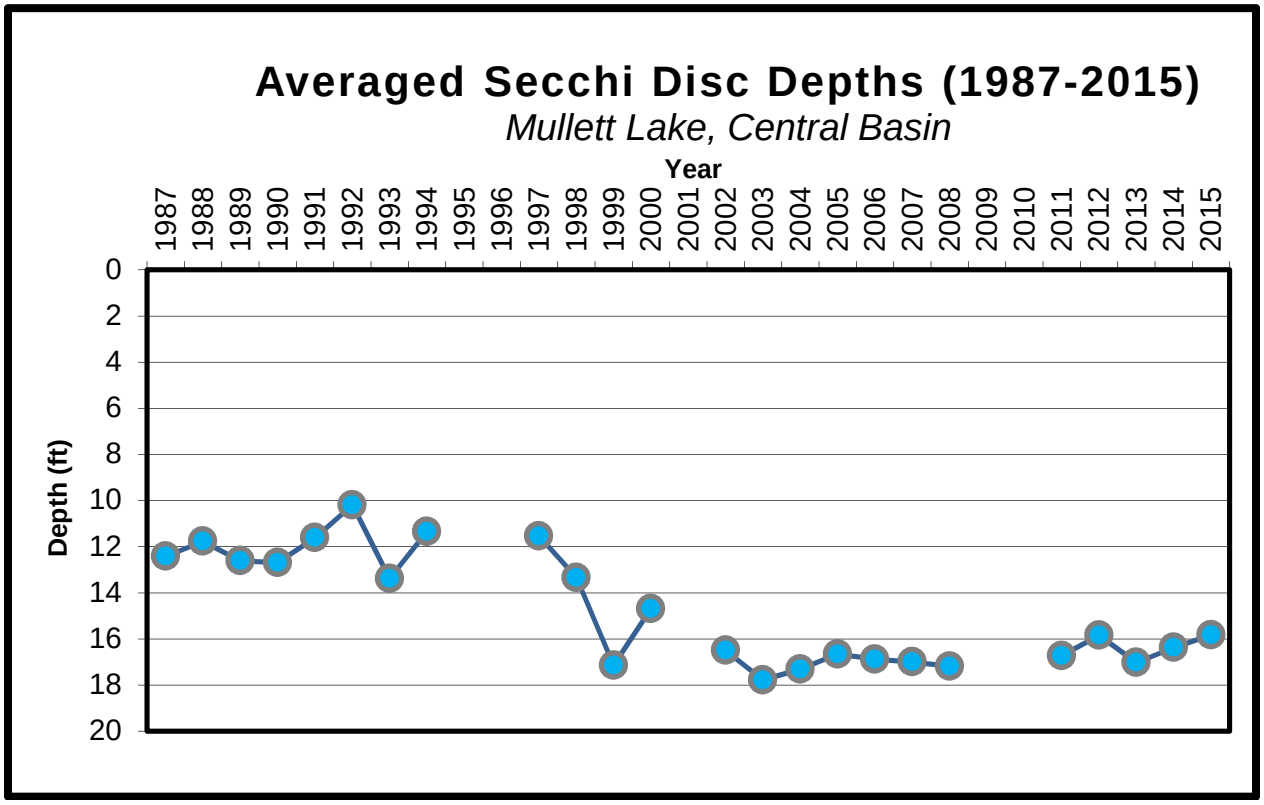


Figure 6.-Average secchi disk depth readings as a measure of water clarity in Mullett Lake from 1987 through 2015. Data collected through the volunteer quality program and graph from the Tip of the Mitt Watershed Council.

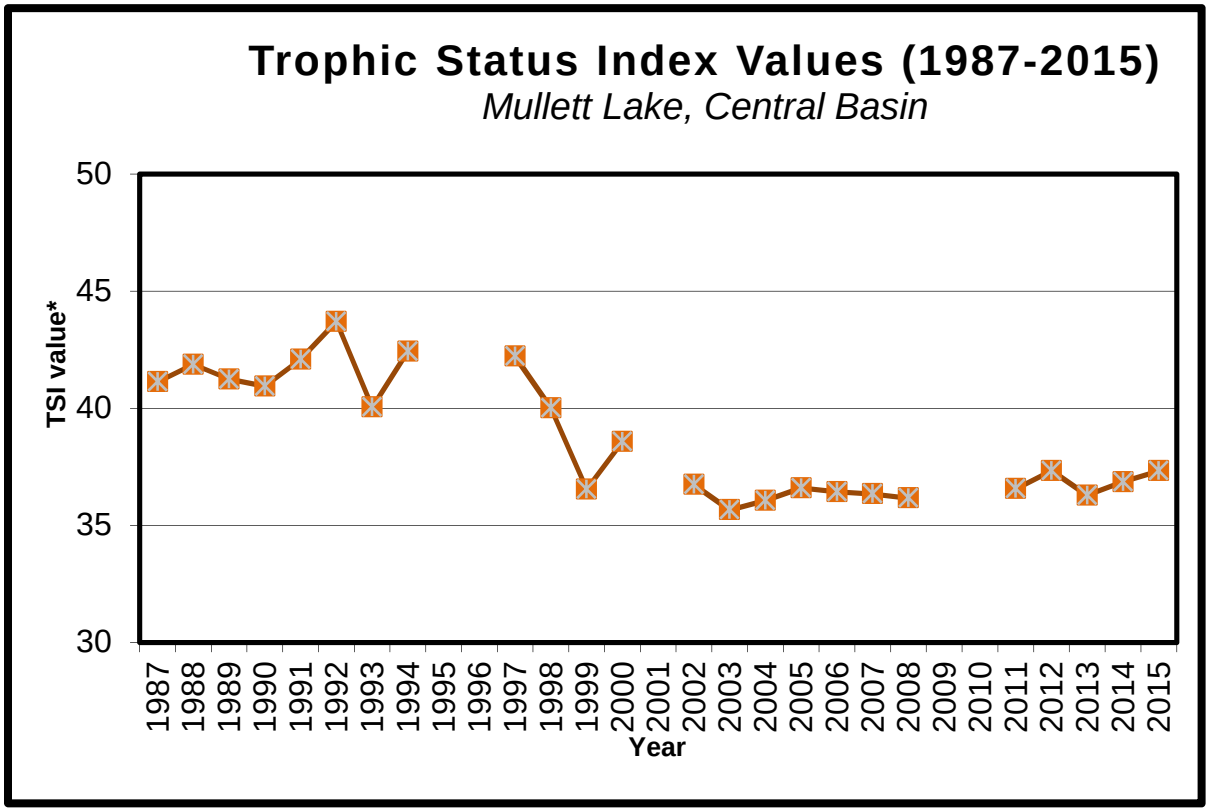


Figure 7.-Trophic status index values of Mullett Lake based on various water quality parameters from 1987 through 2015. Graph from the Tip of the Mitt Watershed Council.

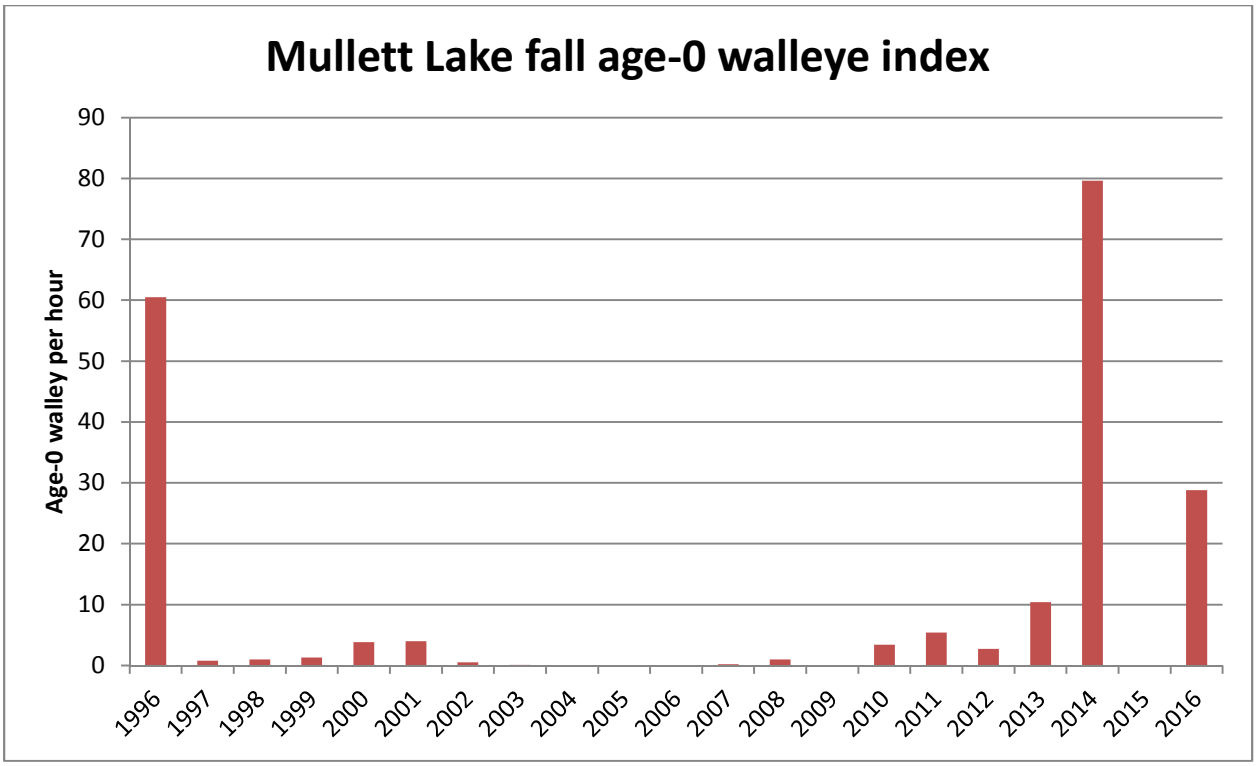


Figure 8.-Nighttime fall electrofishing catch of age-0 walleye at Mullett Lake. Sampling was not conducted in 2004-2006, 2009, and 2015.

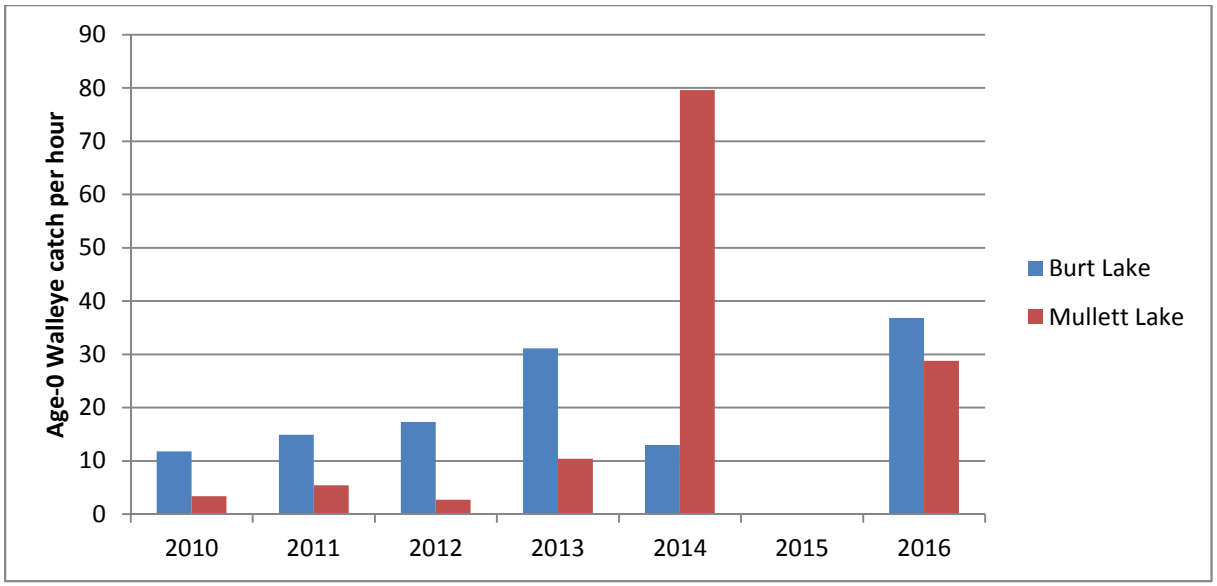


Figure 9.-Fall nighttime electrofishing catch rates of age-0 Walleye between 2010 and 2016 at both Mullett and Burt lakes. Sampling did not occur in 2015.

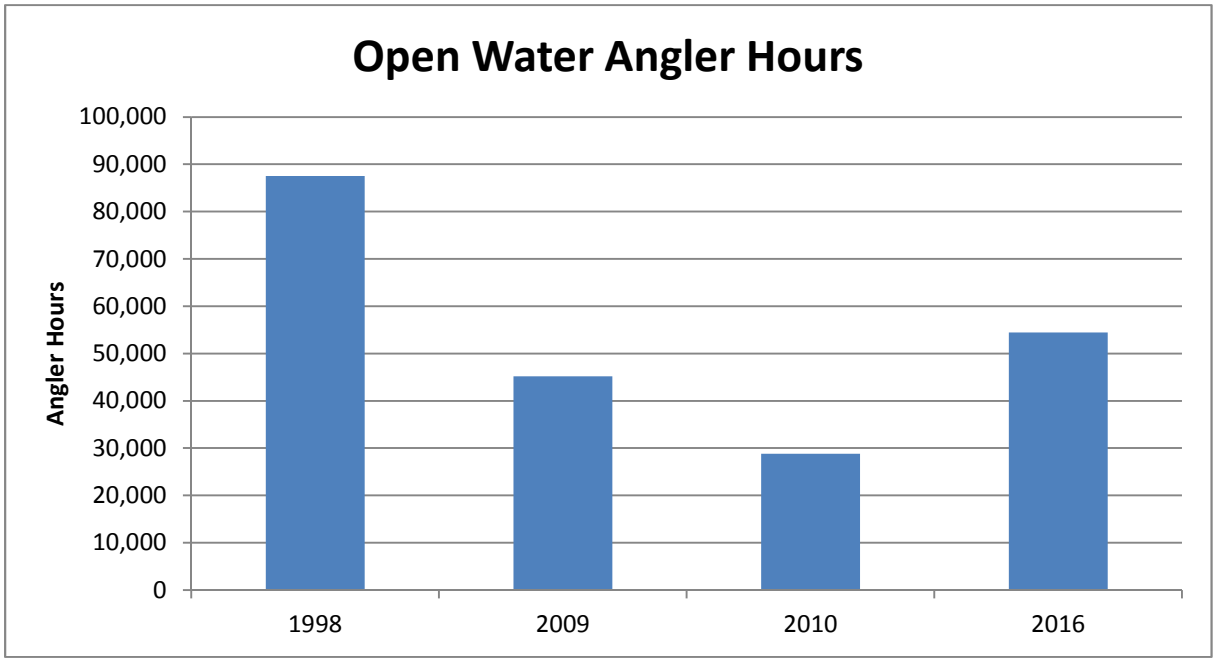


Figure 10.-Open water anglers for Mullett Lake by year. The 1998 estimate does not include fishing beyond August. The 2009 and 2010 estimates were through October, while the 2016 estimate includes November.

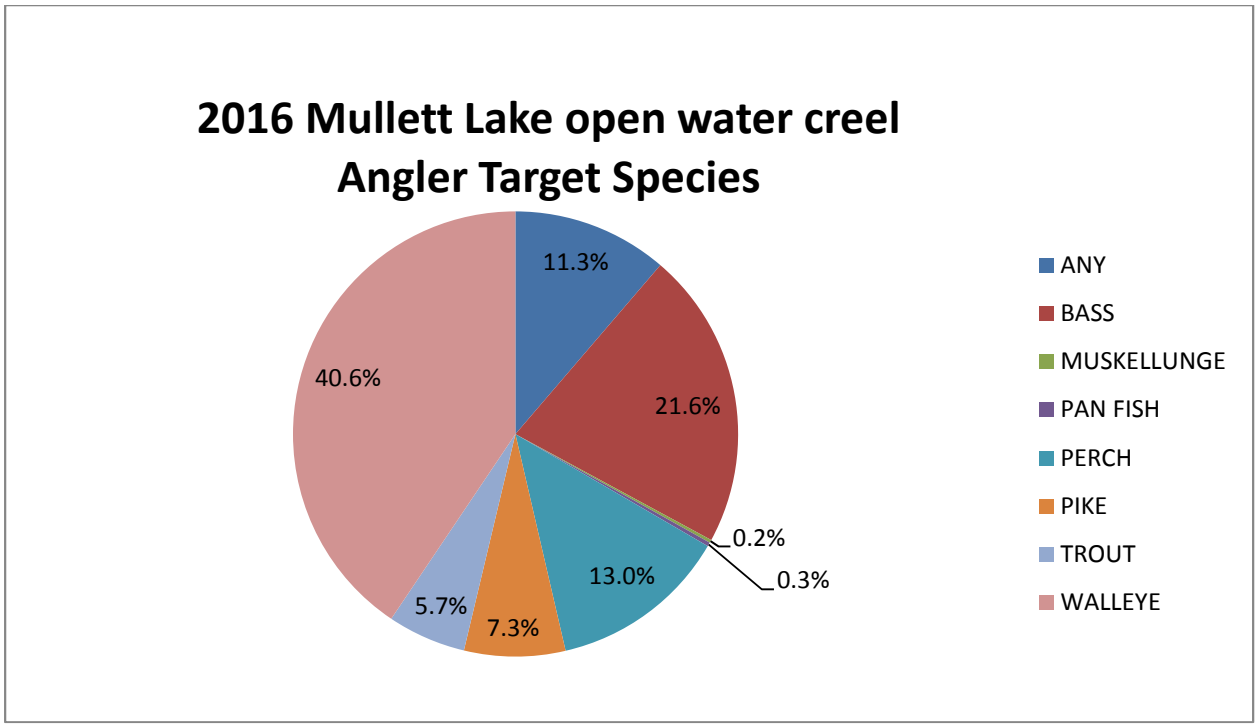


Figure 11.-Species target preferences for anglers during the open water season at Mullett Lake, 2016 (n=1,718).

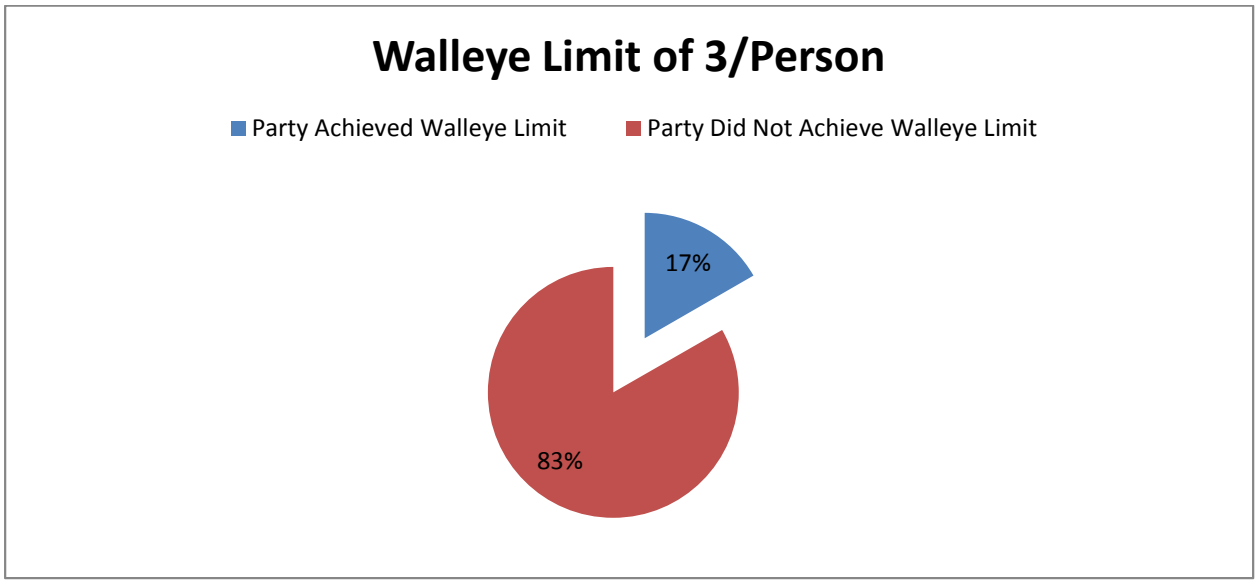


Figure 12.-Percent of anglers who caught their limit of Walleye (3) while seeking Walleye solely as their fishing target. Based on completed fishing trips (n=48).

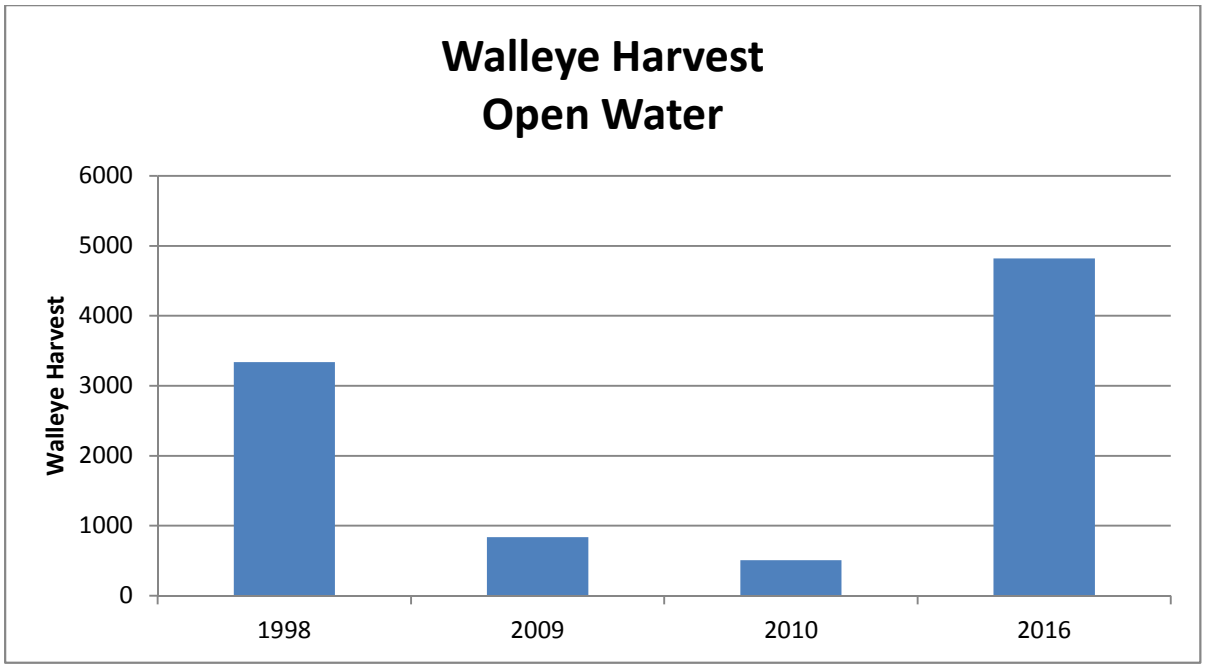


Figure 13.-Open water Walleye harvest for Mullett Lake by year. The 1998 estimate does not include fishing beyond August. The 2009 and 2010 estimates were through October, while the 2016 estimate includes November.

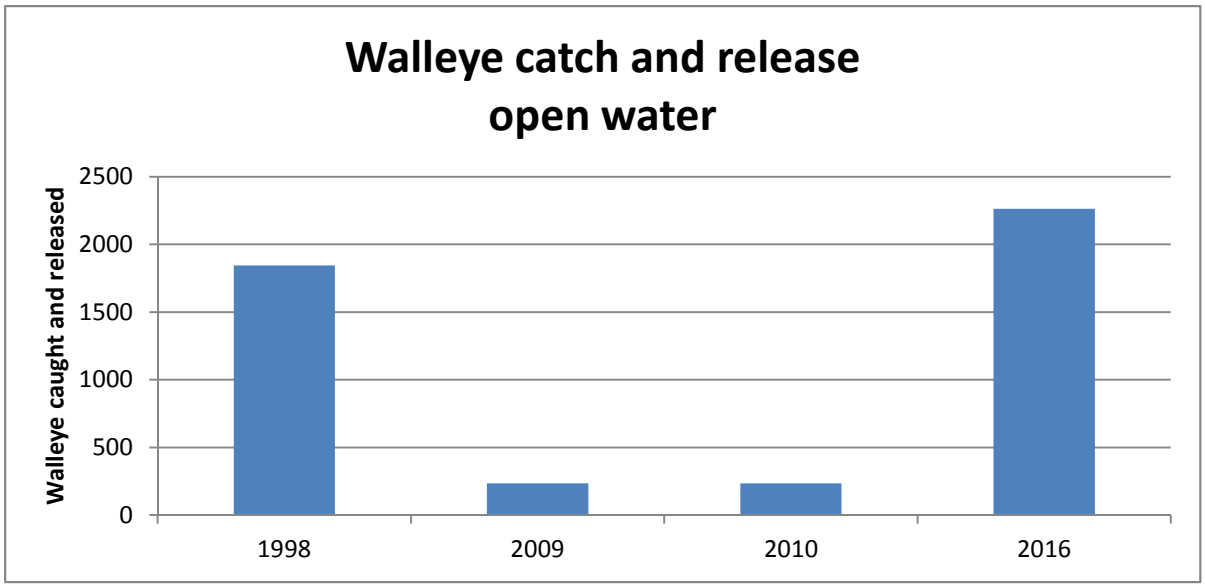


Figure 14.-Open water Walleye catch and release for Mullett Lake by year. The 1998 estimate does not include fishing beyond August. The 2009 and 2010 estimates were through October, while the 2016 estimate includes November.

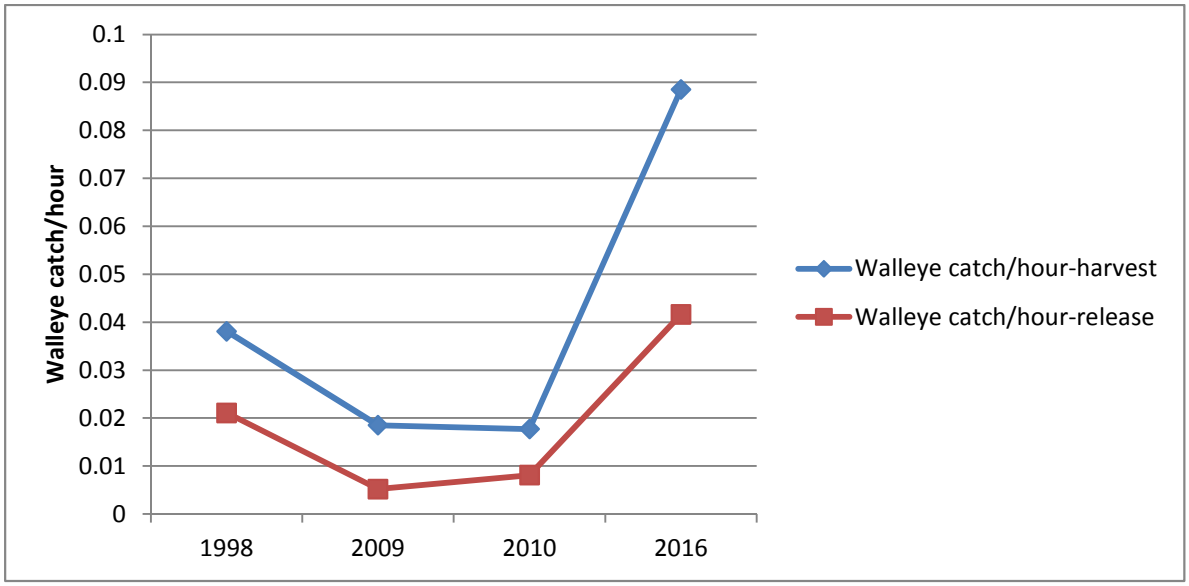


Figure 15.-Open water Walleye catch rates for Mullett Lake by year. The 1998 estimate does not include fishing beyond August. The 2009 and 2010 estimates were through October, while the 2016 estimate includes November.

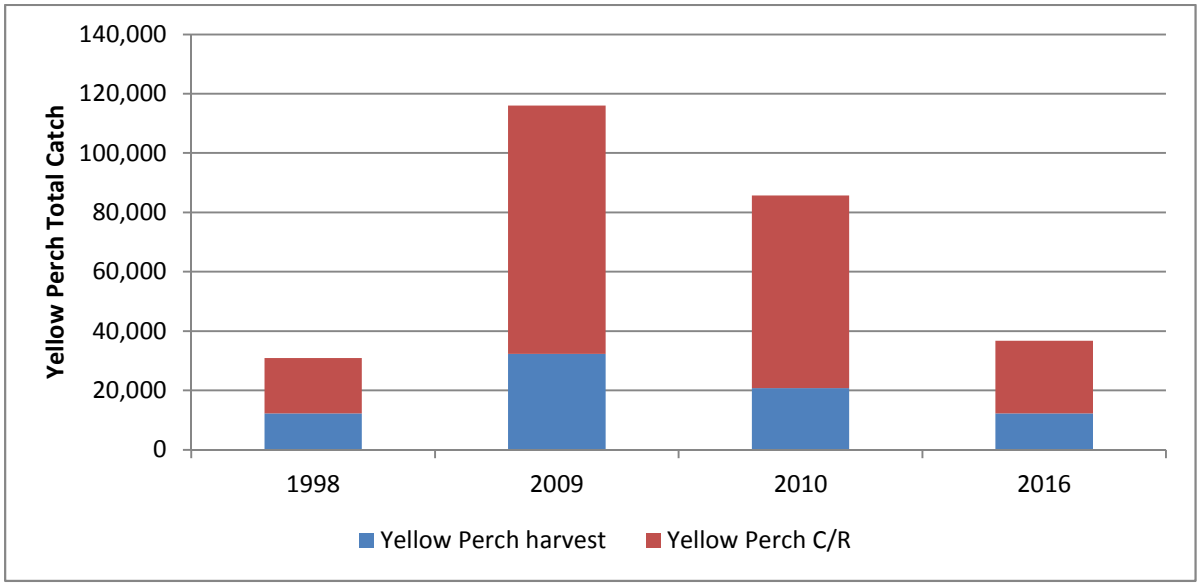


Figure 16.-Open water Yellow Perch total catch for Mullett Lake by year. The 1998 estimate does not include fishing beyond August. The 2009 and 2010 estimates were through October, while the 2016 estimate includes November.

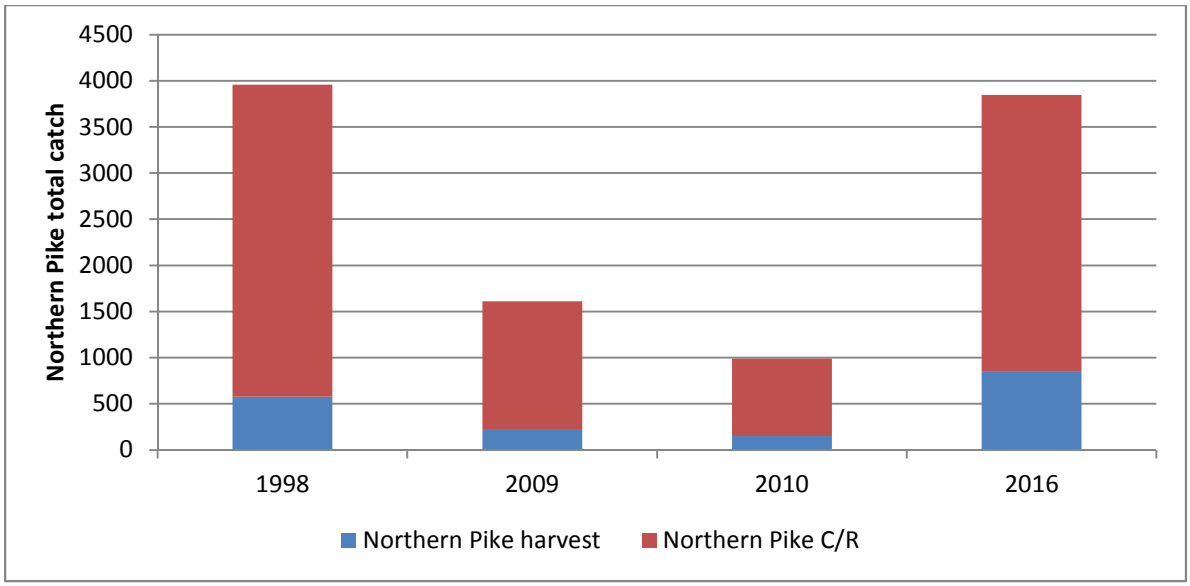


Figure 17.-Open water Northern Pike total catch for Mullett Lake by year. The 1998 estimate does not include fishing beyond August. The 2009 and 2010 estimates were through October, while the 2016 estimate includes November.

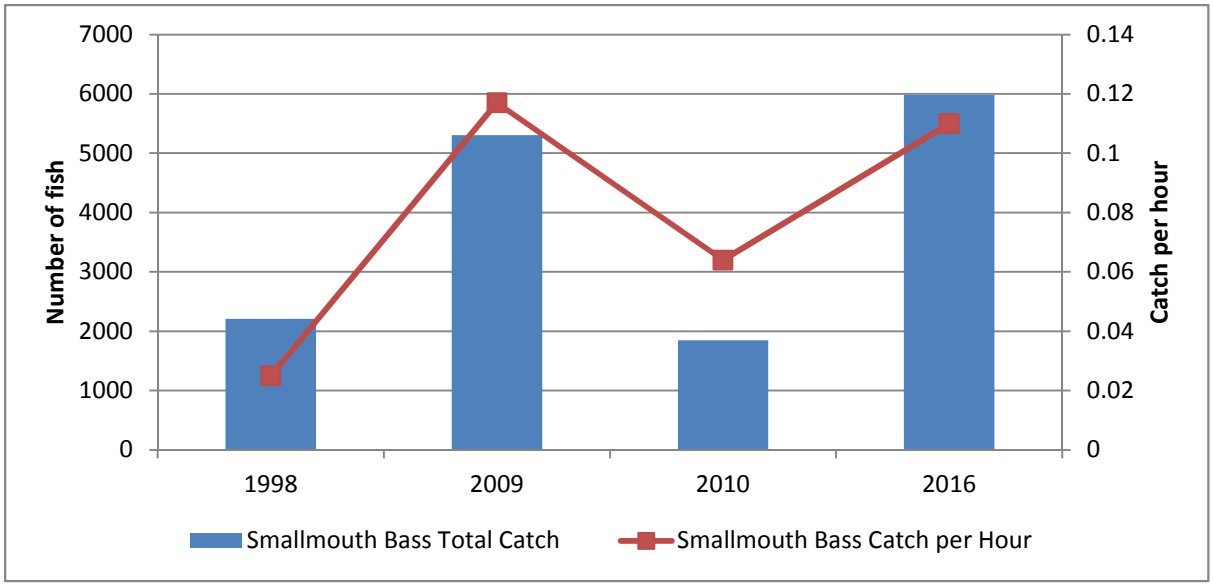


Figure 18.-Open water Smallmouth Bass total catch for Mullett Lake by year. The 1998 estimate does not include fishing beyond August. The 2009 and 2010 estimates were through October, while the 2016 estimate includes November.

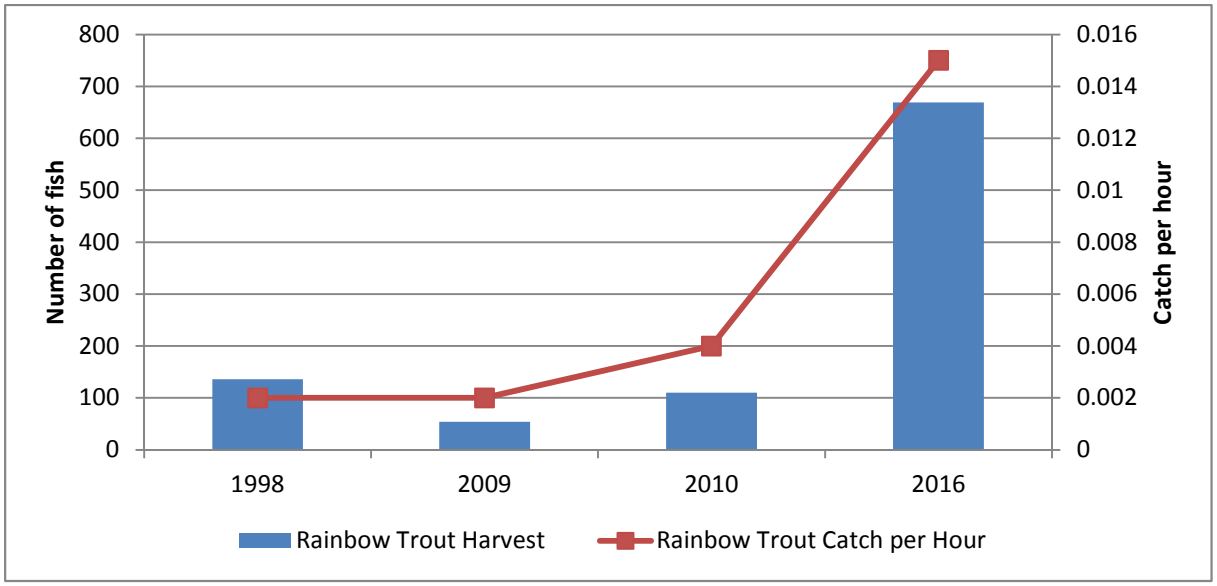


Figure 19.-Open water Rainbow Trout harvest and total catch rate for Mullett Lake by year. The 1998 estimate does not include fishing beyond August. The 2009 and 2010 estimates were through October, while the 2016 estimate includes November.

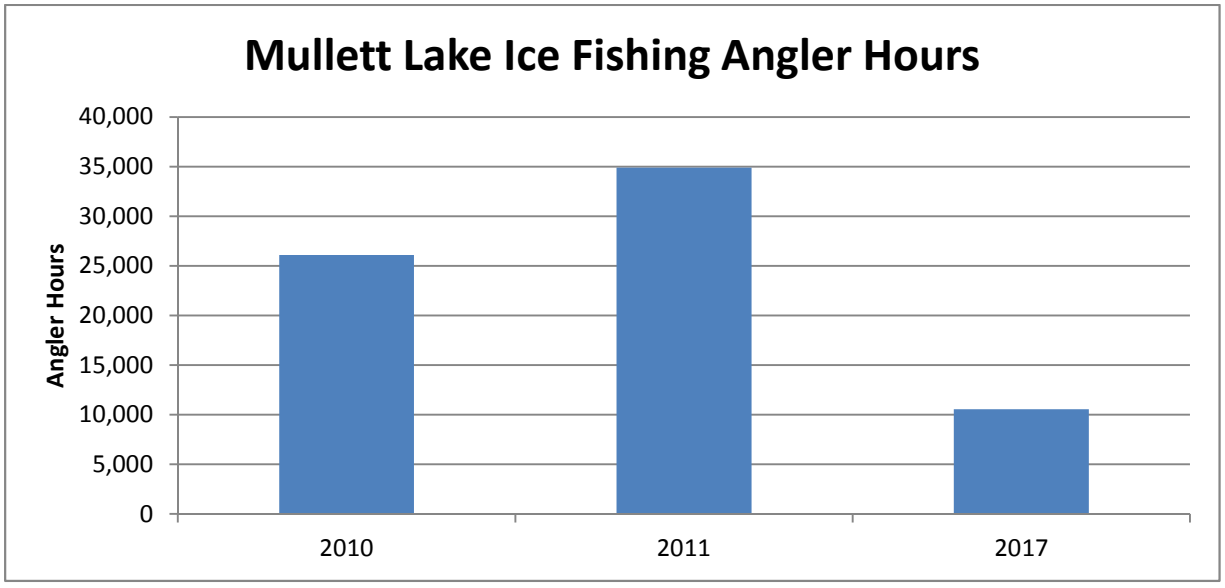


Figure 20.-Winter angler hours by year at Mullett Lake during creeled periods.

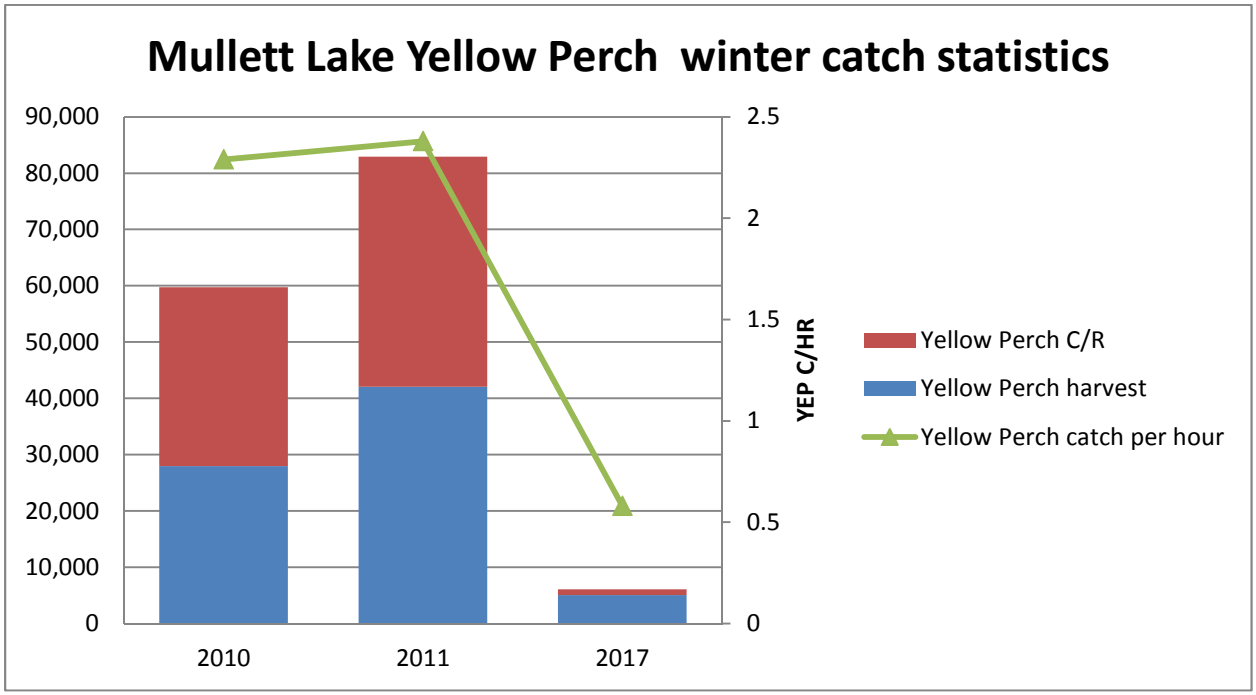


Figure 21.-Yellow Perch catch statistics during winter creel periods (January through March). Creeled days was variable between years as a result of ice conditions.

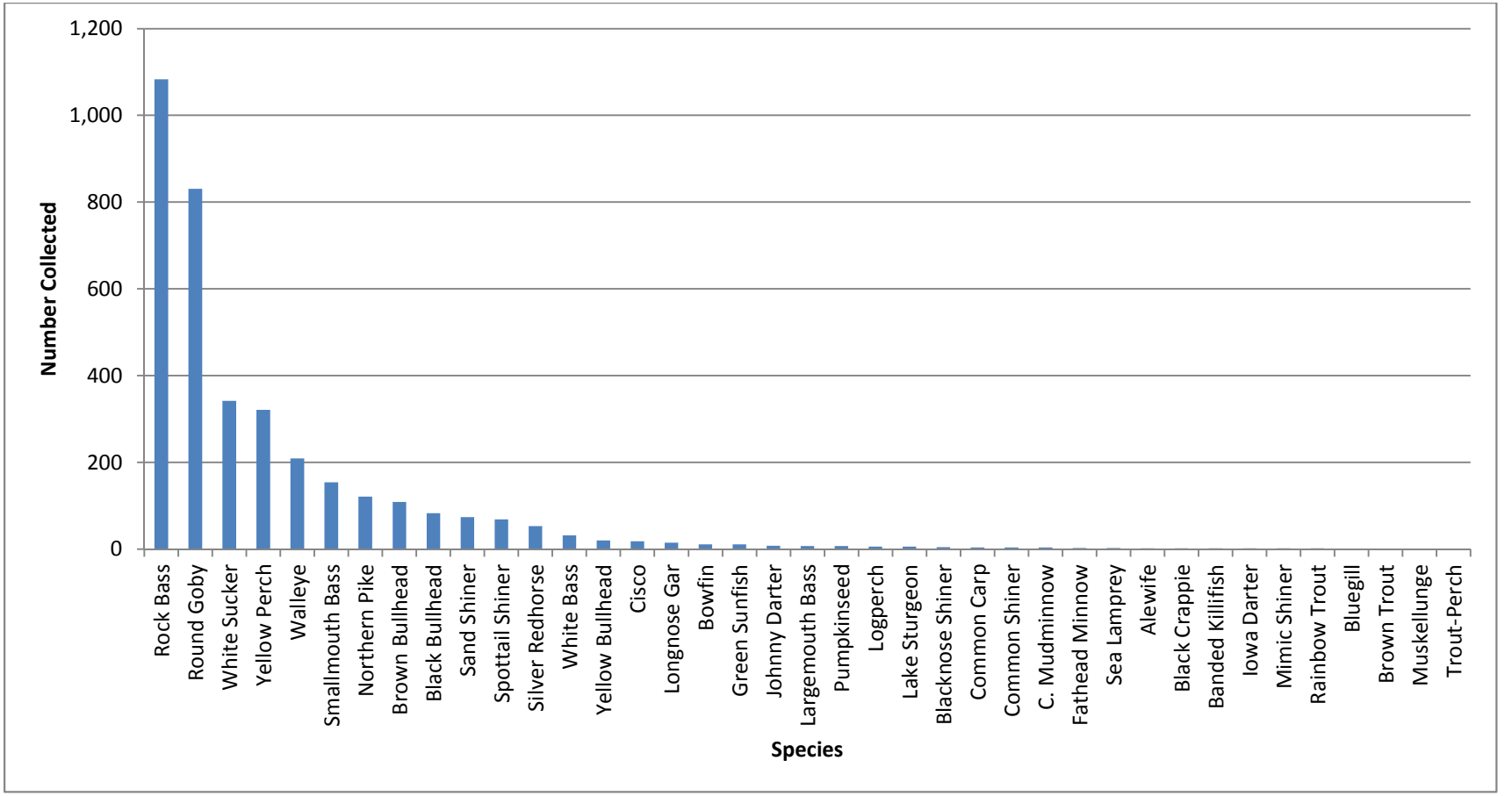


Figure 22.-Relative catch of fish species collected during the spring/summer 2017 fish community survey at Mullett Lake.

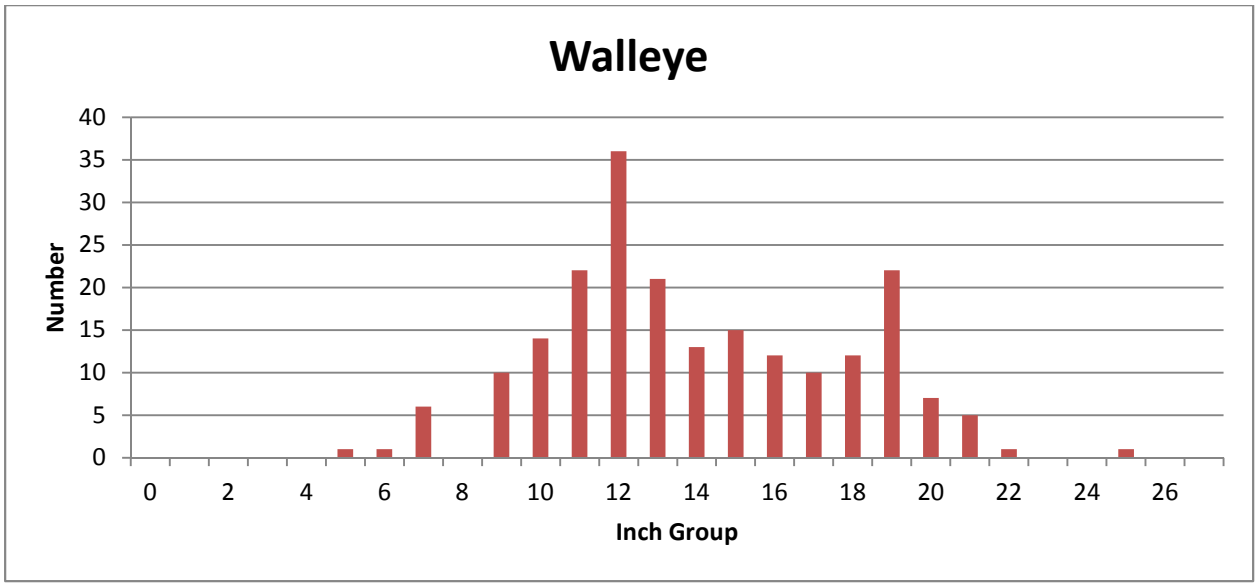


Figure 23.-Length-frequency distribution of Walleye collected during the spring 2017 survey at Mullett Lake with all gear types.

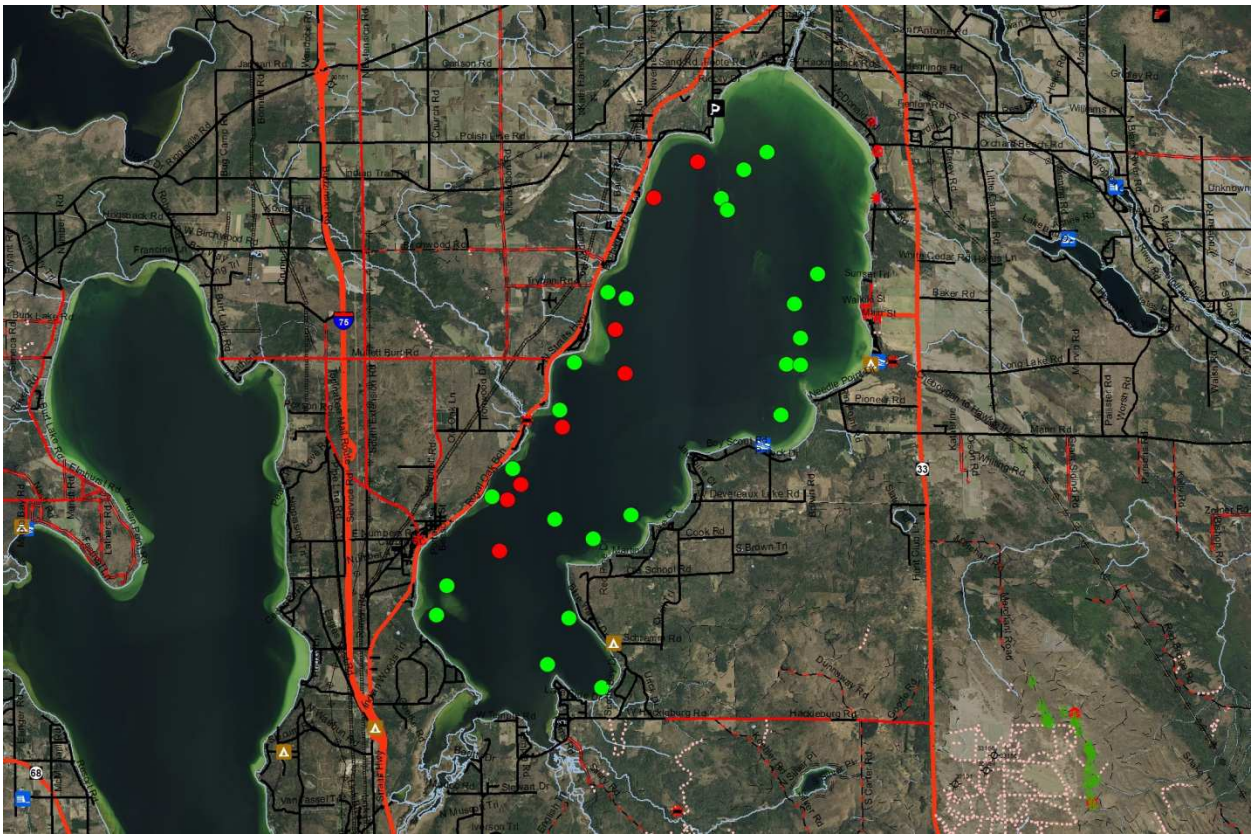


Figure 24.-Map demonstrating location of 24 experimental gill-net lifts (green dots) and 8 straight-run gill-net lifts (red dots) to be used for current and future index station sampling of Walleye and Yellow Perch in Mullett Lake. Experimental gill-net depths were from 12-36 feet, while straight-run gill-net depths were typically in deeper water.

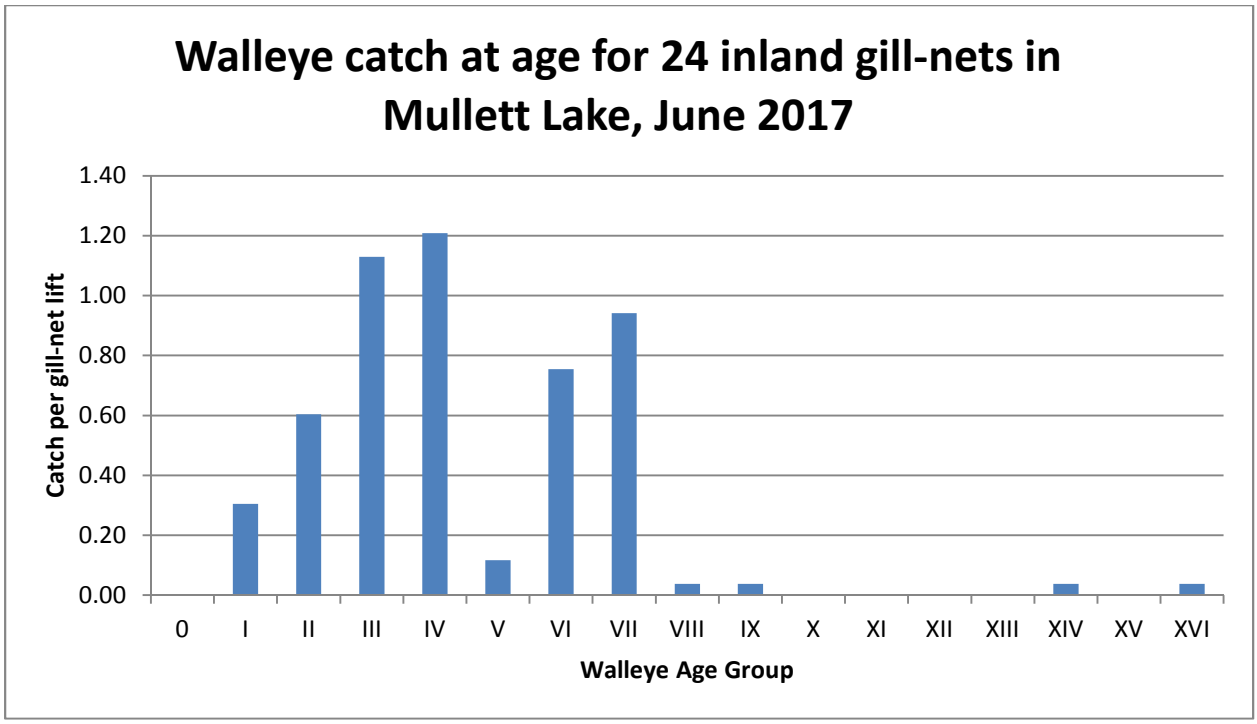


Figure 25.-Catch per unit of effort by age for Walleye from 24 experimental gill-net sets in Mullett Lake in June 2017.

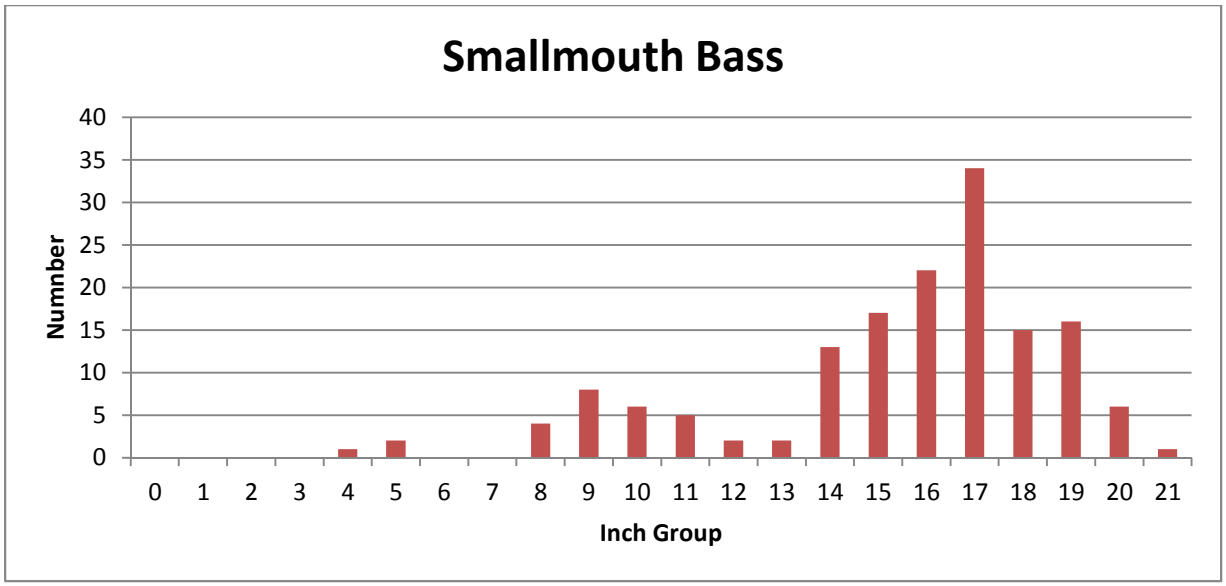


Figure 26.-Length-frequency distribution of Smallmouth Bass collected during the spring 2017 survey at Mullett Lake.

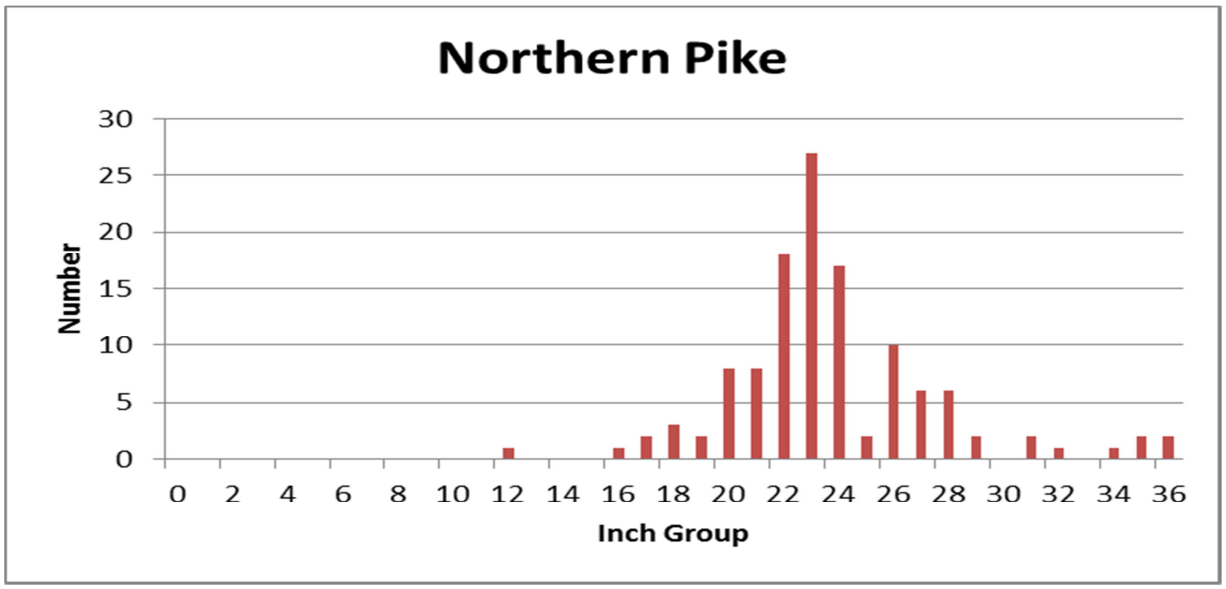


Figure 27.-Length-frequency distribution of Northern Pike collected during the spring 2017 survey at Mullett Lake.

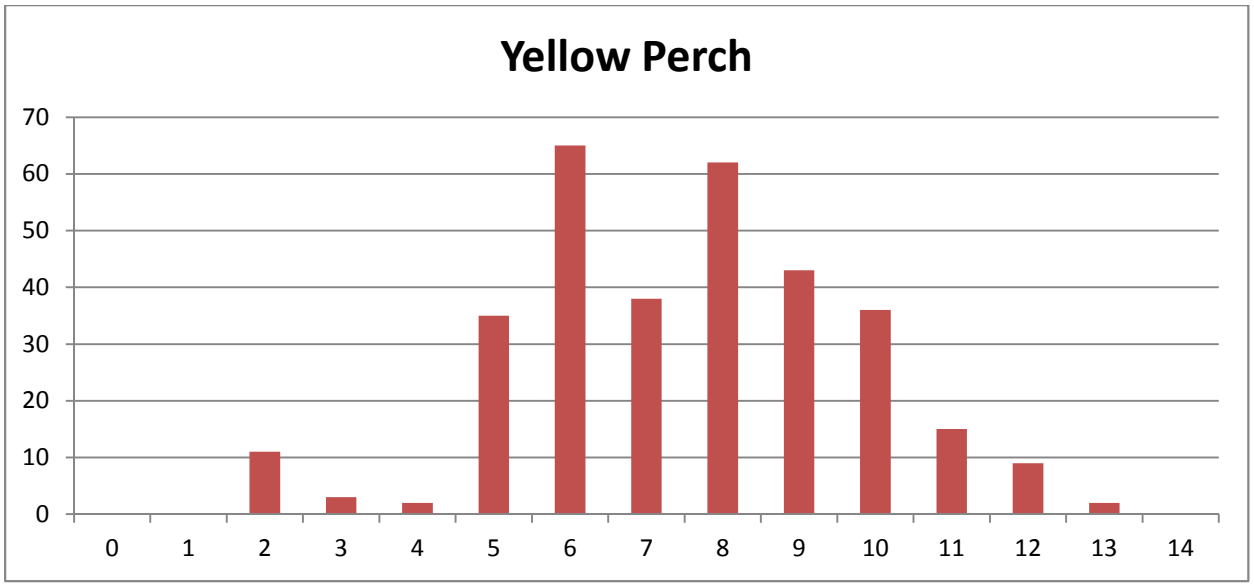


Figure 28.-Length-frequency distribution of Yellow Perch collected during the spring 2017 survey at Mullett Lake.

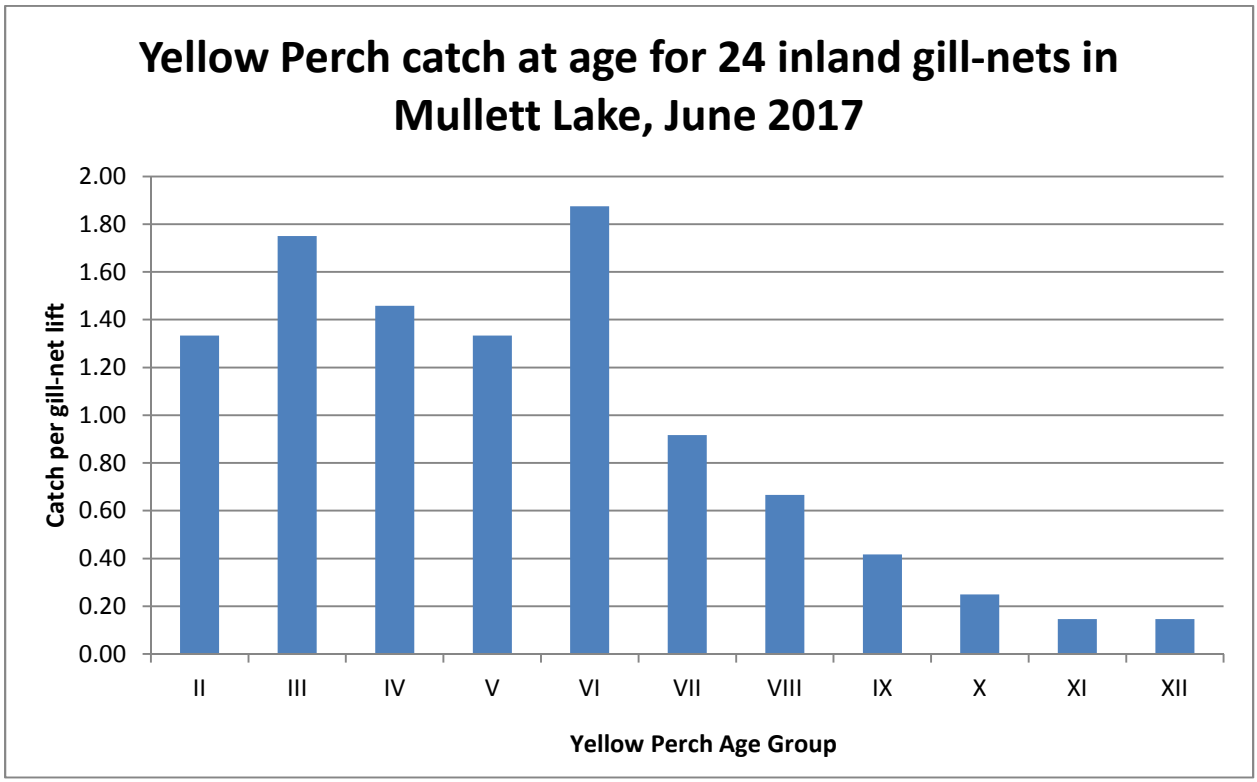


Figure 29.-Catch per unit of effort by age for Yellow Perch from 24 experimental gill-net sets in Mullett Lake in June 2017.

Table 1.-Water temperature and dissolved oxygen profile for Mullett Lake, August 22, 2017.

Depth (ft)	Temperature (F)	Dissolved Oxygen (ppm)
Surface	72	8.5
3	72	8.5
6	72	8.5
9	72	8.4
12	72	8.4
15	72	8.4
18	72	8.4
21	72	8.4
24	71	8.4
27	71	8.3
30	71	8.3
33	71	8.1
36	70	7.6
39	66	7.3
42	64	7.3
45	61	7.5
48	57	8.0
51	55	8.0
54	55	8.0
57	54	8.3
60	54	8.2
63	53	8.3
66	53	8.3
69	52	8.3
72	52	8.3
75	52	8.2
78	51	7.8
81	51	7.6
84	51	7.6
87	51	7.6
90	51	7.4
93	51	7.5
96	51	7.5
99	51	7.4
102	50	7.1
105	50	7.0
108	50	6.9
111	50	6.6
114	50	6.2
117	50	4.6
120	49	0.0

Table 2.-History of fisheries management activities for Mullett Lake.

Year	Month	Management Activity	Reason for the Activity
1887	Unknown	Fish survey and species observations	General understanding of fish community
1931-49	Many	Trap and transfer of Walleye into lake	Bolster Walleye population
1948	Unknown	Temperature and dissolved oxygen profile	Evaluate potential for Lake Trout stocking efforts
1939-56	Unknown	Removal of rough fish with trap nets	Reduce rough fish population
1928-64	Many	General creel census	Angler use assessment through conservation officers
1955	Unknown	Temperature and dissolved oxygen profiles	Assess cold water niche
1956	Unknown	Gill netting	Evaluate fish community
1967	June	Gill netting and electrofishing	Evaluate fish community
1970	Unknown	Angler use mail survey	Evaluate statewide fishing pressure and angler catch
1972	Unknown	Gill netting	Thought to be evaluating the Cisco population
1973	Unknown	Angler use mail survey	Evaluate statewide fishing pressure
1975	September	Gill netting	Evaluate Lake Trout stocking efforts
1981	October	Gill netting	Evaluate Lake Trout stocking efforts
1987	October	Gill netting	Evaluate Lake Trout stocking efforts
1988	June	Trap netting	General fish community survey
1989	September	Gill netting	Evaluate Splake and Lake Trout stocking efforts
1996	September	Fall nighttime shoreline electrofishing	Evaluate Walleye recruitment
1997	September	Fall nighttime shoreline electrofishing	Evaluate Walleye recruitment
1998	April/May	Walleye tagging, trap nets/electrofishing	Evaluate Walleye population
1998	May-Aug	Creel census	Evaluate angler catches and preferences
1998	June	Trap netting and electrofishing	Evaluate fish community
1998	August	Fall nighttime shoreline electrofishing	Evaluate Walleye recruitment
1999	August	Fall nighttime shoreline electrofishing	Evaluate Walleye recruitment and stocking efforts
2000	August	Fall nighttime shoreline electrofishing	Evaluate Walleye recruitment and stocking efforts
2001	August	Fall nighttime shoreline electrofishing	Evaluate Walleye recruitment and stocking efforts

Table 2.-Continued

Year	Month	Management Activity	Reason for the Activity
2002	September	Fall nighttime shoreline electrofishing	Evaluate Walleye recruitment and stocking efforts
2003	August	Fall nighttime shoreline electrofishing	Evaluate Walleye recruitment and stocking efforts
2007	October	Fall nighttime shoreline electrofishing	Evaluate Walleye recruitment
2008	September	Fall nighttime shoreline electrofishing	Evaluate Walleye recruitment
2009	April	Spring netting	Evaluate adult Walleye population
2009	April-October	Creel census	Evaluate angler statistics and Walleye adult estimate
2009	July	Gill netting	Evaluate Lake Sturgeon population and stocking
2010	July	Gill netting	Evaluate Lake Sturgeon population and stocking
2010	January-October	Creel census	Evaluate angler statistics and catch rates
2010	September	Fall nighttime shoreline electrofishing	Evaluate Walleye recruitment and stocking efforts
2011	April	Spring netting	Tagging Walleye for movement study
2011-12	Many	Walleye diet analysis	Studying species interactions
2011	October	Fall nighttime shoreline electrofishing	Evaluate Walleye recruitment and stocking efforts
2012	April	Spring netting	Tagging Walleye for movement study
2012	October	Fall nighttime shoreline electrofishing	Evaluate Walleye recruitment
2013	April/May	Spring netting	Tagging Walleye for movement study
2013	Sept./Oct.	Fall nighttime shoreline electrofishing	Evaluate Walleye recruitment and stocking efforts
2014	Sept./Oct.	Fall nighttime shoreline electrofishing	Evaluate Walleye recruitment
2016	September	Fall nighttime shoreline electrofishing	Evaluate Walleye recruitment
2016	April-October	Creel census	Evaluate angler statistics and catch rates
2017	January-March	Creel census	Evaluate angler statistics and catch rates
2017	May/June	Spring netting	Evaluate entire lake fish community

Table 3.-Known number and size of fish stocked in Mullett Lake from 1891 through 2017.

Species	Year(s)	Size	Number	Source
Yellow Perch	1921-22	fingerling	3,000	State
	1931	unknown	30,000	State
	1939-49	adult	1,013	State
Rock Bass	1939-49	adult	528	State
Largemouth Bass	1908-11	fry	8,800	State
Smallmouth Bass	1913-14	fingerling	9,700	State
	1921-47	adult	427	State
Warmouth	1914	fingerling	1,000	State
Northern Pike	1939-49	adult	47	State
Walleye	1891-1949	Fry	17,685,000	State
	1931-49	Adult	4,973	State
	1999	spring fingerling	100,000*	State
	2000	spring fingerling	100,000*	State
	2001	spring fingerling	100,000*	State
	2002	spring fingerling	13,870*	State
	2003	spring fingerling	100,000	State
	2010	spring fingerling	101,000*	State
	2010	fall fingerling	6,392	Private
	2011	spring fingerling	97,951*	State
	2011	fall fingerling	7,500	Private
	2012	fall fingerling	7,500	Private
	2013	spring fingerling	466,000	State
	2014	fall fingerling	20,000*	Tribal
Brook Trout	1961	fingerling	8,000	State
Brown Trout	1989-91	yearling	60,000	State
Rainbow Trout	1933-38	fingerling	26,700	State
	1935 1971	adults yearling	4,000 1,500	State Private
	1987-92	yearling	75,458	State
Lake Trout	1892-1913	fry	641,000	State
	1937	fry	30,000	State
	1950-51	fingerling	9,400	State
	1965	fry	250,000	State
	1970-83	yearling	818,000	State
	1986	yearling	50,000	State
	1987	fall fingerling	150,653	State
	1996-98	yearling	173,247	State
Splake	1965-73	fingerling/yearling	412,498	State
	1987-95	yearling	431,075	State
Lake Whitefish	1887	fry	3,250,000	State
	1927-28	fry	1,125,000	State
Lake Sturgeon	1983-84	fall fingerling	8,533	State
	1990	fall fingerling	5,137	State
	2003	fall fingerling	1,364	State

Table 3.-Continued

Species	Year(s)	Size	Number	Source
Lake Sturgeon	2005	fall fingerling	350	State
	2006	fall fingerling	1,823	State
	2007	fall fingerling	800	State
	2009	fall fingerling	100	State
	2010	fall fingerling	584	State
	2011	fall fingerling	208	State
	2012	fall fingerling	1,663	State
	2013	fall fingerling	750	State
	2014	fall fingerling	719	State
	2015	fall fingerling	500	State
	2016	fall fingerling	497	State
	2017	Fall fingerling	550	State

*Indicates that walleye fingerlings were marked with the antibiotic oxytetracycline

Table 4.-Number of fish per inch group of various species caught and measured during gill-netting effort in September of 1975. Effort included 23 net-nights of 1000 foot experimental gill-nets.

	Species													
Inch group	Rock Bass	Cisco	Smallmouth Bass	Walleyes	Yellow Perch	Northern Pike	Lake Trout	Coho Salmon	Rainbow Smelt	Lake Whitefish	White Bass	Alewife	Burbot	
2														
4									1					
6	2		1		22				15					
8	2		2		18		3		20					
10		7	1		17		19		2		2	1		
12		17			1		17		1					
14		45	1	20										
16		37		33			13							
18		9		9		4	8							
20				12		2	1	1						
22+				9		4	1			1			2	

Table 5.-Number of fish per inch group of various species caught and measured during gill-netting effort in October of 1981. Effort included 12 net-nights of 500 foot stretch mesh gill-nets with 1.5-6 inch mesh sizes.

	Species													
Inch group	Rock Bass	Cisco	Smallmouth Bass	Walleyes	Yellow Perch	Northern Pike	Lake Trout	Brown Trout	Rainbow Smelt	Lake Whitefish	Alewife	Sucker Sp.	Burbot	
5	2								8					
6	1				8				2		13			
7	3			1	5				1		34	1		
8	4	1			7									
9	8	24			4							1		
10	2	49		6	4							1		
11		40		3								2		
12		17		6	1							4		
13		6		11								5		
14		4		12								6		
15		1		5								6		
16		1		10				1				7		
17		2		5								6		
18		1		4		1	2					2		
19		1		1			1							
20														
21				2			1							
22							2							
23				1			1							
24+						4	70						4	

Table 6.-Number of fish per inch group of various species caught and measured during gill-netting effort in October of 1987. Effort included 12 net-nights of 500 foot stretch mesh gill-nets with 1.6-6 inch mesh sizes.

	Species													
Inch group	Rock Bass	Cisco	Smallmouth Bass	Walleyes	Yellow Perch	Northern Pike	Lake Trout	Bullhead Sp.	Rainbow Smelt	White Bass	Alewife	Sucker Sp.	Burbot	
5					1				2					
6					104						3			
7	4	2		8	60						2	1		
8	7	5			57					1				
9	2	1			10							1		
10	1			1	10			1		1				
11		1		2	2		1			3		1		
12				1	1		1			7		6		
13		3								21		2		
14		3		2						14		3		
15		7		1						2		6		
16		2		12								3		
17		4	1	5		1				3		3		
18		3	1	5								2		
19				8		1						1		
20														
21														
22						1								
23						3								
24+						8								

Table 7.-Length-frequency of fish per inch group of certain species caught and measured during Great Lakes trap-netting effort in June of 1988. Effort included 79 lifts and 134 net-nights. Lengths for some species were subsamples (suckers, White Bass, Rock Bass).

	Species													
Inch group	Rock Bass	Cisco	Smallmouth Bass	Walleyes	Rainbow Trout	Northern Pike	Lake Trout	Brown Trout	Muskellunge	White Bass	Splake	Sucker Sp.		
5														
6	15													
7	56		5											
8	103		26											
9	126		13	1										
10	40		28	4						3				
11	9		42	20						8		3		
12			23	7						50	1	2		
13			38	17						266		13		
14			91	21			1			41	2	24		
15			86	11			1			4	8	51		
16			33	17		1					11	53		
17			25	16		2	1				7	62		
18			14	30		10		1				59		
19			8	16	1	8					1	50		
20			2	23		3						47		
21			1	7		1		1				28		
22				9		6		1				19		
23				3		2						25		
24+				2		24		1	2			66		

Table 8.-Fall juvenile Walleye nighttime electrofishing assessments at Mullett Lake.

Year	Date	Hours	Miles Shocked	Age-0 walleye	No. age-0 per hour	Yearling walleye collected	Adults	% Age-0 Stocked (sample no.)
1996	9/4	2.0	2.0	121	60.5	0	0	NA
1997	9/3,15	2.6	3.5	2	0.8	0	0	NA
1998	8/31	2.0	--	2	1.0	0	0	NA
1999	8/25	8.3	--	11	1.3	--	--	82 (11)
2000	8/30	4.0	--	15	3.8	1	4	60 (15)
2001	8/27	2.3	--	9	4.0	11	0	56 (9)
2002	9/11	2.0	4.0	1	0.5	5	0	100 (1)
2003	8/26	2.0	--	0	0.0	2	1	NA
2007	10/23	4.2	7.8	1	0.2	0	1	NA
2008	9/16	4.0	7.9	4	1.0	1	3	NA
2010	9/16,29	6.1	12.9	19	3.1	2	12	38 (8)
2011	10/4,13	11.0	25.2	59	5.4	22	17	84 (19)
2012	10/1,2	12.7	27.2	34	2.7	21	34	NA
2013	9/30 10/1	13.9	31.0	146	10.4	0	54	NA
2014	9/29 10/1	3.5	9.7	280	79.3	13	10	0 (29)
2016	9/19,20	5.1	11.6	147	28.8	4	5	NA

Table 9.- Estimated harvest, catch-and-release, angling effort, and catch per hour of certain species by boat anglers in Mullett Lake from May 17 through August 31, 1998. Two standard errors are given in parentheses. Table reproduced from Lockwood (2000).

Species	Catch/hour	May	June	July	August	Season
Walleye-harvest	0.0381	112	732	1,573	921	3,338
	(0.0080)	(76)	(310)	(472)	(299)	(643)
Walleye-release	0.0211	11	204	785	844	1,844
	(0.0067)	(15)	(132)	(444)	(321)	(564)
N. Pike-harvest	0.0066	47	163	260	106	576
	(0.0022)	(47)	(94)	(132)	(87)	(190)
N. Pike-release	0.0386	490	1,477	805	609	3,381
	(0.0101)	(264)	(679)	(299)	(296)	(841)
Rock Bass-harvest	0.0108	84	88	575	202	949
	(0.0065)	(80)	(65)	(526)	(190)	(569)
Rock Bass-release	0.0109	107	62	697	84	950
	(0.0042)	(117)	(59)	(324)	(73)	(357)
Y. Perch-harvest	0.1404	184	3,857	5,084	3,161	12,286
	(0.0285)	(111)	(1,477)	(1,510)	(823)	(2,270)
Y. Perch-release	0.2128	74	1,990	10,657	5,905	18,626
	(0.0351)	(68)	(967)	(2,030)	(1,372)	(2,635)
S. Bass-harvest	0.0105	49	520	203	146	918
	(0.0036)	(43)	(230)	(164)	(117)	(309)
S. Bass-release	0.0147	224	569	290	205	1,288
	(0.0043)	(137)	(280)	(139)	(112)	(359)
Lake Trout-harvest	0.0002	0	5	12	0	17
	(0.0003)	(0)	(9)	(23)	(0)	(25)
Lake Trout-release	0.0002	0	0	21	0	21
	(0.0004)	(0)	(0)	(37)	(0)	(37)
Rainbow Trout-harvest	0.0016	14	20	48	54	136
	(0.0012)	(28)	(27)	(63)	(69)	(101)
Rainbow Trout-release	0.0002	3	0	0	16	19
	(0.0002)	(4)	(0)	(0)	(22)	(22)
Cisco-harvest	0.0002	0	0	0	18	18
	(0.0003)	(0)	(0)	(0)	(24)	(24)
Cisco-release	0.0002	0	0	15	0	15
	(0.0003)	(0)	(0)	(22)	(0)	(22)
White Bass-harvest	0.0007	46	14	0	0	60
	(0.0008)	(62)	(28)	(0)	(0)	(68)
White Bass-release	0.0003	2	11	14	0	27
	(0.0004)	(3)	(22)	(29)	(0)	(37)

Table 9.-Continued.

Species	Catch/hour	May	June	July	August	Season
Total Harvest	0.2140	536	5,399	7,795	4,997	18,727
	(0.0336)	(183)	(1,531)	(1,683)	(956)	(2,475)
Total Release	0.3038	920	4,341	13,466	7,861	26,588
	(0.0417)	(328)	(1,224)	(2,134)	(1,451)	(2,875)
Total Catch	0.5178	1,456	9,740	21,261	12,858	45,315
	(0.0616)	(375)	(1,960)	(2,717)	(1,738)	(3,793)
Angler Hours		4,220	21,969	38,557	22,774	87,520
		(1,175)	(4,467)	(4,600)	(3,502)	(7,400)
Angler Trips		1,020	5,309	9,317	5,502	21,148
		(288)	(1,097)	(1,157)	(869)	(1,839)

Table 10.-Species of fish sought by boat anglers (percent of anglers interviewed) at Mullett Lake between May 17 and August 31, 1998. Table reproduced from Lockwood (2000).

Species	Season
Walleye	59.02
Yellow Perch	17.60
Northern Pike	8.91
Smallmouth Bass	7.28
Walleye with other species	1.73
Trout	1.43
Yellow Perch with other species	1.26
Northern pike with other species	0.75
White Bass	0.14
Muskellunge	0.10
Anything or other combination	1.78
Total Anglers Interviewed	**5,097**

Table 11.-Estimated harvest, catch-and-release, angling effort, and catch per hour of certain species by boat anglers in Mullett Lake from April 25 through October 31, 2009. Two standard errors are given in parentheses.

Species	Catch/hour	April/ May	June	July	Aug.	Sept.	Oct.	Season
Walleye-harvest	0.0185	4	310	191	242	90	0	836
	(0.0080)	(8)	(202)	(164)	(193)	(70)	(0)	(331)
Walleye-release	0.0052	14	185	10	23	2	0	234
	(0.0029)	(23)	(118)	(20)	(24)	(3)	(0)	(124)
N. Pike-harvest	0.0051	17	74	87	10	40	0	228
	(0.0032)	(29)	(84)	(94)	(18)	(52)	(0)	(141)
N. Pike-release	0.0306	140	428	380	247	179	7	1,383
	(0.0144)	(147)	(315)	(344)	(325)	(155)	(11)	(607)
Rock Bass-harvest	0.0188	0	276	320	255	0	0	851
	(0.0165)	(0)	(540)	(392)	(293)	(0)	(0)	(729)
Rock Bass-release	0.0112	2	123	0	364	6	9	505
	(0.0165)	(4)	(154)	(0)	(724)	(10)	(20)	(741)
Y. Perch-harvest	0.7153	0	2,345	6,568	5,516	13,909	3,950	32,288
	(0.2149)	(0)	(2,195)	(4,542)	(2,624)	(5,114)	(2,246)	(7,971)
Y. Perch-release	1.8544	44	4,436	13,882	18,599	38,369	8,383	83,714
	(0.5873)	(63)	(2,853)	(10,077)	(11,022)	(15,651)	(4,581)	(22,296)
S. Bass-harvest	0.0090	75	21	163	75	68	5	408
	(0.0052)	(76)	(28)	(174)	(90)	(69)	(9)	(222)
S. Bass-release	0.1085	362	3,575	304	411	218	25	4,896
	(0.0530)	(315)	(2,182)	(279)	(253)	(168)	(29)	(2,243)
Rainbow Trout-harvest	0.0012	0	4	0	29	21	0	54
	(0.0014)	(0)	(8)	(0)	(58)	(27)	(0)	(64)
Rainbow Trout-release	0.0006	0	19	0	0	10	0	29
	(0.0006)	(0)	(18)	(0)	(0)	(20)	(0)	(27)
Cisco-harvest	0.0007	0	0	0	0	29	0	29
	(0.0013)	(0)	(0)	(0)	(0)	(59)	(0)	(59)
Cisco-release	0	0	0	0	0	0	0	0
	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
White Bass-harvest	0.0001	0	0	0	0	4	0	4
	(0.0002)	(0)	(0)	(0)	(0)	(8)	(0)	(8)
White Bass-release	0.0010	0	12	18	14	2	0	45
	(0.0011)	(0)	(20)	(36)	(27)	(3)	(0)	(50)

Table 11.-Continued.

Species	Catch/hour	April/ May	June	July	Aug.	Sept.	Oct.	Season
Total Harvest	0.7689	97	3,032	7,328	6,127	14,169	3,955	34,708
	(0.2211)	(82)	(2,271)	(4,567)	(2,649)	(5,116)	(2,246)	(8,016)
Total Release	2.0171	563	8,853	14,680	19,729	38,808	8,425	91,057
	(0.6053)	(354)	(3,612)	(10,088)	(11,053)	(15,652)	(4,581)	(22,430)
Total Catch	2.7860	660	11,884	22,008	25,856	52,977	12,380	125,765
	(0.7116)	(363)	(4,267)	(11,073)	(11,366)	(16,467)	(5,102)	(23,819)
Angler Hours		2,267	13,456	8,131	7,581	10,663	3,043	45,142
		(1,426)	(4,884)	(3,866)	(2,836)	(3,076)	(1,227)	(7,736)
Angler Trips		544	2,992	2,665	2,390	2,433	780	11,804
		(432)	(1,161)	(1,329)	(1,160)	(756)	(361)	(2,312)

Table 12.-Estimated harvest, catch-and-release, angling effort, and catch per hour of certain species by all modes of anglers (open ice, shanties) on Mullett Lake from January 1 through March 15, 2010. Two standard errors are given in parentheses.

Species	Catch/hour	January	February	March	Season
Walleye-harvest	0.0001	0	4	0	4
	(0.0003)	(0)	(8)	(0)	(8)
Walleye-release	0.0001	0	3	0	3
	(0.0003)	(0)	(7)	(0)	(7)
N. Pike-harvest	0.0026	52	10	5	67
	(0.0021)	(52)	(14)	(9)	(54)
N. Pike-release	0.0058	33	66	52	151
	(0.0048)	(39)	(50)	(105)	(122)
Y. Perch-harvest	1.0701	7,600	17,542	2,786	27,929
	(0.2475)	(2,838)	(3,578)	(2,039)	(5,001)
Y. Perch-release	1.2188	7,804	19,465	4,540	31,810
	(0.3117)	(3,043)	(4,705)	(3,622)	(6,672)
Trout-harvest	0.0005	14	0	0	14
	(0.0011)	(29)	(0)	(0)	(29)
Trout-release	0.0003	0	8	0	8
	(0.0006)	(0)	(16)	(0)	(16)
Cisco-harvest	0.0117	10	297	0	307
	(0.0091)	(19)	(232)	(0)	(233)
Cisco-release	0.0004	0	10	0	10
	(0.0007)	(0)	(19)	(0)	(19)
Total Harvest	1.0893	7,677	17,960	2,792	28,428
	(0.2495)	(2,838)	(3,587)	(2,039)	(5,008)
Total Release	1.2262	7,838	19,751	4,593	32,001
	(0.3124)	(3,044)	(4,705)	(3,624)	(6,673)
Total Catch	2.3154	15,514	37,350	7,384	60,429
	(0.4659)	(4,162)	(5,917)	(4,158)	(8,344)
Angler Hours		7,802	15,142	3,154	26,098
		(2,483)	(1,954)	(2,147)	(3,820)
Angler Trips		1,703	3,743	607	6,053
		(574)	(673)	(461)	(998)

Table 13.-Estimated harvest, catch-and-release, angling effort, and catch per hour of certain species by boat anglers in Mullett Lake from April 24 through October 31, 2010. Two standard errors are given in parentheses.

Species	Catch/hour	April/ May	June	July	Aug.	Sept.	Oct.	Season
Walleye-harvest	0.0177	14	90	185	180	23	17	509
	(0.0070)	(28)	(71)	(117)	(107)	(23)	(26)	(179)
Walleye-release	0.0081	7	32	124	71	0	0	234
	(0.0046)	(13)	(29)	(103)	(64)	(0)	(0)	(125)
N. Pike-harvest	0.0052	32	68	24	21	6	0	87
	(0.0031)	--	(62)	(33)	(31)	(11)	(0)	(4)
N. Pike-release	0.0291	220	218	109	261	12	19	840
	(0.0136)	--	(224)	(69)	(168)	(17)	(28)	(363)
Rock Bass-harvest	0.0092	0	205	41	19	0	0	265
	(0.0098)	(0)	(263)	(83)	(27)	(0)	(0)	(277)
Rock Bass-release	0.0112	7	119	116	77	4	0	322
	(0.0092)	(13)	(187)	(145)	(103)	(8)	(0)	(259)
Y. Perch-harvest	0.7281	69	1,528	2,527	3,952	4,774	8,127	20,796
	(0.2008)	(78)	(940)	(1,339)	(1,660)	(2,034)	(3,202)	4,453)
Y. Perch-release	2.2540	261	2,445	8,179	12,027	13,682	28,344	64,938
	(0.6286)	(287)	(1,484)	(3,986)	(4,466)	(6,095)	(11,046)	(14,046)
S. Bass-harvest	0.0068	3	55	51	68	0	19	196
	(0.0035)	(6)	(52)	(52)	(59)	(0)	(17)	(96)
S. Bass-release	0.0574	390	655	104	161	105	238	1,653
	(0.0262)	(403)	(512)	(82)	(116)	(95)	(171)	(695)
Rainbow Trout-harvest	0.0038	0	10	34	66	0	0	110
	(0.0025)	(0)	(18)	(30)	(59)	(0)	(0)	(69)
Rainbow Trout-release	0.0003	3	2	0	2	0	0	8
	(0.0003)	(7)	(4)	(0)	(5)	(0)	(0)	(9)
Cisco-harvest	0.0002	0	0	0	6	0	0	6
	(0.0003)	(0)	(0)	(0)	(8)	(0)	(0)	(8)
Cisco-release	--	0	0	0	0	0	0	0
	--	(0)	(0)	(0)	(0)	(0)	(0)	(0)
White Bass-harvest	0.0001	0	0	3	0	0	0	3
	(0.0002)	(0)	(0)	(7)	(0)	(0)	(0)	(7)
White Bass-release	0.0016	40	2	3	0	0	0	45
	(0.0019)	(54)	(3)	(6)	(0)	(0)	(0)	(54)

Table 13.-Continued.

Species	Catch/hour	April/ May	June	July	Aug.	Sept.	Oct.	Season
Total Harvest	0.7717	118	1,963	2,871	4,312	4,805	8,163	22,233
	(0.2062)	--	(983)	(1,349)	(1,667)	(2,034)	(3,202)	(4,468)
Total Release	2.3683	942	3,489	8,673	12,679	13,838	28,607	68,229
	(0.6421)	--	(1,598)	(3,992)	(4,473)	(6,096)	(11,048)	(14,071)
Total Catch		1,060	5,452	11,544	16,991	18,643	36,771	90,462
		--	(1,876)	(4,214)	(4,773)	(6,426)	(11,502	(14,763)
Angler Hours		1,660	3,963	5,557	8,788	4,438	4,404	28,809
		--	(2,436)	(2,409)	(2,697)	(1,610)	(1,580)	(5,071)
Angler Trips		454	1,220	2,332	2,281	1,149	1,442	8,878
		--	(1,001)	(1,552)	(897)	(505)	(666)	(2,256)

Table 14.-Estimated harvest, catch-and-release, angling effort, and catch per hour of certain species by all modes of anglers (open ice, shanties) on Mullett Lake from January 1 through March 25, 2011. Two standard errors are given in parentheses.

Species	Catch/hour	January	February	March	Season
Walleye-harvest	0.0005	12	0	5	17
	(0.0006)	(17)	-	(10)	(20)
Walleye-release	0.0022	55	11	10	76
	(0.0033)	(111)	(22)	(20)	(115)
N. Pike-harvest	0.0031	34	43	31	108
	(0.0020)	(36)	(52)	(27)	(69)
N. Pike-release	0.0104	21	90	252	363
	(0.0056)	(25)	(88)	(167)	(191)
Y. Perch-harvest	1.2058	16,163	11,607	14,302	42,072
	(0.2544)	(4,165)	(3,138)	(4,705)	(7,024)
Y. Perch-release	1.1708	14,873	11,166	14,815	40,853
	(0.2464)	(4,095)	(3,476)	(4,160)	(6,794)
Trout-harvest	0.0005	18	0	0	18
	(0.0008)	(27)	-	-	(27)
Trout-release	0.0003	0	0	11	11
	(0.0006)	-	-	(22)	(22)
Cisco-harvest	0.0115	91	194	115	400
	(0.0064)	(93)	(159)	(116)	(218)
Total Harvest	1.2346	16,485	11,942	14,653	43,080
	(0.2570)	(4,168)	(3,148)	(4,714)	(7,036)
Total Release	1.1910	14,986	11,479	15,090	41,556
	(0.2482)	(4,096)	(3,483)	(4,164)	(6,800)
Total Catch	2.4256	31,472	23,421	29,743	84,636
	(0.4202)	(5,844)	(4,695)	(6,289)	(9,785)
Angler Hours		12,434	13,025	9,434	34,892
		(2,584)	(2,777)	(2,423)	(4,501)
Angler Trips		3,190	3,431	1,947	8,569
		(802)	(981)	(574)	(1,391)

Table 15.-Estimated harvest, catch-and-release, angling effort, and catch per hour of certain species by boat anglers in Mullett Lake from May 7 through November 30, 2016. Two standard errors are given in parentheses.

Species	Catch/hour	May	June	July	Aug.	Sept.	Oct.	Nov.	Season
Walleye-harvest	0.0885	306	1,252	1,164	1,267	817	14	0	4,819
	(0.0196)	(170)	(436)	(510)	(516)	(420)	(22)	-	(960)
Walleye-release	0.0416	20	404	406	899	498	21	17	2,264
	(0.0131)	(26)	(203)	(284)	(490)	(315)	(31)	(26)	(681)
N. Pike-harvest	0.0157	92	270	229	194	70	0	0	855
	(0.0062)	(75)	(189)	(177)	(169)	(73)	-	-	(327)
N. Pike-release	0.0549	728	904	513	203	423	184	35	2,990
	(0.0143)	(353)	(445)	(325)	(131)	(254)	(109)	(63)	(725)
Rock Bass-harvest	0.0074	184	70	0	0	149	0	0	402
	(0.0076)	(264)	(101)	-	-	(298)	-	-	(411)
Rock Bass-release	0.0017	55	20	0	17	0	0	0	92
	(0.0014)	(64)	(30)	-	(33)	-	-	-	(78)
Y. Perch-harvest	0.2258	0	475	668	2,283	4,392	4,036	437	12,292
	(0.0641)	-	(352)	(648)	(1,274)	(2,133)	(1,962)	(464)	(3,283)
Y. Perch-release	0.4494	7	278	1,791	3,849	7,337	9,746	1,458	24,466
	(0.1347)	(14)	(217)	(1,561)	(2,913)	(3,385)	(4,723)	(1,882)	(6,948)
S. Bass-harvest	0.0057	47	57	96	56	54	0	0	309
	(0.0038)	(50)	(67)	(154)	(61)	(83)	-	-	(203)
S. Bass-release	0.1043	1,436	2,554	335	294	495	456	107	5,677
	(0.0252)	(776)	(832)	(215)	(248)	(317)	(251)	(135)	(1,258)
Rainbow Trout-harvest	0.0123	6	8	203	264	188	0	0	669
	(0.0056)	(12)	(15)	(158)	(167)	(192)	-	-	(300)
Rainbow Trout-release	0.0023	4	0	30	57	10	23	0	123
	(0.0021)	(8)	-	(59)	(85)	(20)	(45)	-	(115)

Table 15.-Continued.

Species	Catch/hour	May	June	July	Aug.	Sept.	Oct.	Nov.	Season
Total Harvest	0.3554	635	2,132	2,359	4,068	5,670	4,049	437	19,350
	(0.0725)	(327)	(604)	(872)	(1,396)	(2,205)	(1,962)	(464)	(3,480)
Total Release	0.6575	2,330	4,182	3,112	5,349	8,764	10,436	1,620	35,793
	(0.1454)	(860)	(990)	(1,636)	(2,969)	(3,424)	(4,731)	(1,888)	(7,133)
Total Catch	1.0129	2,964	6,314	5,471	9,417	14,434	14,485	2,057	55,143
	(0.1752)	(920)	(1,160)	(1,854)	(3,281)	(4,073)	(5,122)	(1,944)	(7,937)
Angler Hours		5,435	13,892	11,133	10,427	9,552	3,572	427	54,439
		(1,347)	(2,730)	(2,714)	(2,189)	(2,083)	(1,197)	(300)	(5,224)
Angler Trips		784	3,449	3,332	2,890	2,801	715	93	14,065
		(294)	(1,077)	(984)	(751)	(890)	(263)	(72)	(1,909)

Table 16.-Estimated harvest, catch-and-release, angling effort, and catch per hour of certain species by all modes of anglers (open ice, shanties) on Mullett Lake from January 9 through March 31, 2017. Two standard errors are given in parentheses.

Species	Catch/hour	January	February	March	Season
Walleye-harvest	0.0160	49	114	7	169
	(0.0128)	(55)	(116)	(8)	(128)
Walleye-release	0.0074	69	0	9	78
	(0.0127)	(132)	-	(11)	(133)
N. Pike-harvest	0.0263	0	220	58	277
	(0.0188)	-	(176)	(61)	(186)
N. Pike-release	0.0164	107	60	7	173
	(0.0171)	(161)	(70)	(11)	(176)
Y. Perch-harvest	0.4796	670	3,840	545	5,055
	(0.2206)	(540)	(1,849)	(353)	(1,958)
Y. Perch-release	0.0958	108	884	17	1,009
	(0.0626)	(109)	(600)	(27)	(610)
Cisco-harvest	0.0027	17	12	0	29
	(0.0036)	(33)	(17)	-	(37)
Total Harvest	0.5283	751	4,208	609	5,568
	(0.2284)	(544)	(1,861)	(358)	(1,972)
Total Release	0.1220	284	968	33	1,285
	(0.0687)	(235)	(606)	(31)	(650)
Total Catch	0.6502	1,035	5,176	643	6,853
	(0.2546)	593	(1,957)	(359)	(2,076)
Angler Hours		2,167	7,256	1,117	10,539
		(756)	(2,449)	(514)	(2,614)
Angler Trips		688	1,833	268	2,789
		(268)	(895)	(127)	(943)

Table 17.-Species and relative abundance of fishes collected with all survey gear at Mullett Lake during the 2017 Status and Trends DNR survey.

Common Name	Number	Average Size	Weight (lb.)*	Percent by weight
		(inches)		
Rock Bass	1,083	6.7	331.4	13.1
Round Goby	831	1.6	--	--
White Sucker	342	16.2	351.9	13.9
Yellow Perch	321	8.3	87.0	3.4
Walleye	209	14.7	247.7	9.8
Smallmouth Bass	154	14.8	357.8	14.2
Northern Pike	121	24.7	414.4	16.4
Brown Bullhead	109	12.8	103.5	4.1
Black Bullhead	83	13.2	81.9	3.2
Sand Shiner	74	2.2	0.2	0.0
Spottail Shiner	69	3.7	1.1	0.0
Silver Redhorse	53	24.2	234.9	9.3
White Bass	32	15.7	52.3	2.1
Yellow Bullhead	20	11.6	16.7	0.7
Cisco	18	12.1	8.3	0.3
Longnose Gar	15	32.8	56.0	2.2
Bowfin	11	26.2	69.7	2.8
Green Sunfish	11	2.4	0.1	0.0
Johnny Darter	8	1.8	0.0	0.0
Largemouth Bass	7	14.2	14.9	0.6
Pumpkinseed	7	4.0	0.7	0.0
Logperch	6	2.8	0.0	0.0
Lake Sturgeon	6	25.5	26.1	1.0
Blacknose Shiner	5	1.5	0.0	0.0
Common Carp	4	29.0	45.9	1.8
Common Shiner	4	3.7	0.1	0.0
C. Mudminnow	4	2.3	0.0	0.0
Fathead Minnow	3	2.0	0.0	0.0
Sea Lamprey	3	18.2	1.4	0.1
Alewife	2	4.5	0.1	0.0
Black Crappie	2	13.0	2.6	0.1
Banded Killifish	2	1.5	0.0	0.0
Iowa Darter	2	2.5	0.0	0.0
Mimic Shiner	2	2.0	0.0	0.0
Rainbow Trout	2	18.0	5.3	0.2
Bluegill	1	8.5	0.4	0.0
Brown Trout	1	25.5	7.2	0.3
Muskellunge	1	26.5	4.4	0.2
Trout-Perch	1	5.5	0.1	0.1
TOTAL	**3,629**		**2,524.4**	

*Weight was estimated from length-weight equations, and not actually measured. We did not have a length-weight relationship for round goby.

Table 18.-Number of fish per inch group of certain species caught and measured in the 2017 spring netting survey at Mullett Lake.

	Species													
Inch group	Rock Bass	Cisco	Smallmouth Bass	Walleyes	Yellow Perch	Northern Pike	Bullheads (sp)	Brown Trout	Rainbow Trout	White Sucker	White Bass	Muskellunge	Silver Redhorse	Lake Sturgeon
1	16	–	–	–	–	–	–	–	–	204	–		–	
2	20	–	–	–	11	–	–	–	–	–	–		–	
3	63	–	–	–	3	–	–	–	–	1	–	–	–	–
4	82	–	1	–	2	–	–	–	–	1	–	–	–	–
5	114	–	2	1	35	–	–	–	–	–	–	–	–	–
6	182	–	–	1	65	–	1	–	–	–	–	–	–	–
7	262	–	–	6	38	–	1	–	–	1	–	–	–	–
8	213	–	4	–	62	–	1	–	–	–	–	–	–	–
9	100	–	8	10	43	–	4	–	–	–	–	–	–	–
10	23	–	6	14	36	–	14	–	–	1	–	–	–	–
11	8	9	5	22	15	–	54	–	–	2	–	–	–	–
12	–	7	2	36	9	1	52	–	1	3	–	–	–	–
13	–	–	2	21	2	–	38	–	–	1	–	–	–	–
14	–	1	13	13	–	–	31	–	–	2	7	–	1	–
15	–	1	17	15	–	–	11	–	–	2	13	–	–	–
16	–	–	22	12	–	1	–	–	–	11	11	–	–	–
17	–	–	34	10	–	2	–	–	–	13	1	–	3	–
18	–	–	15	12	–	3	–	–	–	38	–	–	1	–
19	–	–	16	22	–	2	–	–	–	31	–	–	–	–
20	–	–	6	7	–	8	–	–	–	24	–	–	1	1
21	–	–	1	5	–	8	–	–	–	4	–	–	–	2
22	–	–	–	1	–	18	–	–	–	3	–	–	8	–
23	–	–	–	–	–	27	–	–	1	–	–	–	9	–
24	–	–	–	–	–	17	–	–	–	–	–	–	10	–
25	–	–	–	1	–	2	–	1	–	–	–	–	8	2
26	–	–	–	–	–	10	–	–	–	–	–	1	5	–
27	–	–	–	–	–	6	–	–	–	–	–	–	5	–
28	–	–	–	–	–	6	–	–	–	–	–	–	2	–
29	–	–	–	–	–	2	–	–	–	–	–	–	–	–
30	–	–	–	–	–	–	–	–	–	–	–	–	–	–
31	–	–	–	–	–	2	–	–	–	–	–	–	–	–
32	–	–	–	–	–	1	–	–	–	–	–	–	–	–
33	–	–	–	–	–	–	–	–	–	–	–	–	–	–
34	–	–	–	–	–	1	–	–	–	–	–	–	–	–
35	–	–	–	–	–	1	–	–	–	–	–	–	–	–
36	–	–	–	–	–	2	–	–	–	–	–	–	–	–
37	–	–	–	–	–	–	–	–	–	–	–	–	–	–
38	–	–	–	–	–	–	–	–	–	–	–	–	–	1
39	–	–	–	–	–	–	–	–	–	–	–	–	–	–
40	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table 19.-Comparison of mean length (inches) at age for various game fishes of Mullett Lake from 1956 to 2017.
Number in parentheses represents number aged.

Species	Age group	July 1956	June 1967	June 1972	Sept. 1975	Oct. 1981	June 1988	May 1998	June 2017
Yellow Perch	I	--	--	--	--	--	--	--	2.8 (11)
	II	--	4.6 (8)	--	5.9 (8)	--	--	5.7 (12)	5.9 (10)
	III	5.6 (13)	5.8 (4)	--	6.5 (17)	6.7 (13)	--	6.5 (7)	6.5 (13)
	IV	7.0 (43)	6.3 (9)	--	8.1 (15)	8.0 (1)	--	7.7 (16)	8.2 (11)
	V	8.4 (36)	8.3 (15)	--	9.2 (10)	8.6 (6)	--	8.6 (10)	8.9 (10)
	VI	9.4 (26)	9.2 (3)	--	10.4 (3)	9.5 (8)	--	9.3 (9)	10.1 (14)
	VII	10.1 (15)	10.4 (6)	--	10.7 (4)	10.5 (2)	--	9.7 (5)	10.4 (7)
	VIII	10.6 (4)	--	--	--	12.4 (1)	--	11.1 (3)	11.7 (5)
	IX	11.4 (3)	--	--	11.7 (1)	--	--	11.5 (1)	11.9 (3)
	X	--	--	--	--	--	--	13.6 (1)	12.2 (2)
	XI	--	--	--	--	--	--	13.5 (1)	13.9 (1)
	XII	--	--	--	--	--	--	--	13.2 (1)
Walleye	I	9.5 (1)	10.2 (1)	--	--	11.2 (10)	10.3 (--)	8.4 (1)	7.1 (8)
	II	11.8 (5)	14.2 (8)	--	13.7 (8)	13.5 (24)	11.7 (15)	11.2 (38)	10.1 (16)
	III	14.3 (10)	16.0 (4)	14.3 (3)	15.4 (42)	15.3 (18)	14.2 (23)	14.8 (31)	12.1 (30)
	IV	15.1 (6)	18.2 (2)	16.7 (3)	16.4 (6)	17.2 (9)	16.4 (22)	16.9 (19)	14.4 (32)
	V	16.3 (5)	18.3 (2)	17.2 (1)	19.0 (8)	18.9 (6)	17.9 (15)	18.3 (28)	16.8 (3)
	VI	18.1 (2)	--	--	20.8 (5)	22.3 (2)	19.9 (10)	19.2 (33)	19.0 (20)
	VII	--	19.9 (3)	--	20.6 (8)	--	20.5 (12)	19.9 (21)	18.7 (25)
	VIII	--	21.9 (2)	21.1 (3)	23.3 (3)	--	22.0 (6)	20.5 (27)	19.8 (1)
	IX	--	--	--	--	--	22.9 (10)	21.4 (31)	20.8 (1)
	X	--	--	--	24.2 (1)	--	24.2 (2)	22.9 (26)	--
	XI	--	--	--	--	--	--	24.3 (20)	--
	XII	--	--	--	--	--	--	26.8 (4)	--
	XIII	--	--	--	--	--	--	--	--
	XIV	--	--	--	--	--	--	--	22.6 (1)
	XV	--	--	--	--	--	--	--	--
	XVI	--	--	--	--	--	--	--	25.2 (1)

Table 19.-Continued.

Species	Age group	July 1956	June 1967	June 1972	Sept. 1975	Oct. 1981	June 1988	May 1998	June 2017
Northern	I	13.9 (11)	--	--	--	19.4 (1)	--	14.1 (2)	12.2 (1)
Pike	II	18.8 (45)	18.2 (8)	--	18.8 (4)	--	18.5 (15)	18.3 (4)	17.8 (4)
	III	20.2 (23)	23.1 (7)	24.0 (1)	21.8 (3)	26.9 (2)	22.8 (18)	21.7 (29)	22.5 (23)
	IV	25.8 (9)	25.9 (6)	25.3 (1)	24.8 (1)	--	24.2 (12)	23.5 (37)	23.2 (29)
	V	26.7 (3)	28.8 (6)	26.2 (2)	28.6 (2)	28.6 (1)	30.2 (8)	26.9 (19)	25.5 (10)
	VI	30.8 (3)	30.1 (2)	--	--	--	34.9 (5)	29.7 (16)	28.2 (9)
	VII	31.1 (1)	34.8 (1)	33.0 (1)	--	--	--	33.3 (8)	31.8 (5)
	VIII	--	--	--	--	36.4 (1)	--	36.1 (3)	30.5 (5)
	IX	--	--	--	--	--	--	--	28.5 (1)
	X	--	--	--	--	--	--	--	--
	XI	--	--	--	--	--	--	--	36.1 (1)
Lake Trout	I	--	--	--	7.5 (2)	--	--	--	--
	II	--	--	--	11.1 (35)	--	--	11.9 (1)	--
	III	--	--	--	16.6 (22)	18.5 (3)	15.8 (3)	--	--
	IV	--	--	--	21.4 (7)	22.0 (3)	--	--	--
	V	--	--	--	--	24.4 (5)	--	--	--
	VI	--	--	--	--	26.4 (10)	--	--	--
	VII	--	--	--	--	27.0 (11)	--	--	--
	VIII	--	--	--	--	28.6 (21)	--	--	--
	IX	--	--	--	--	28.7 (1)	--	--	--
Cisco	I	--	5.1 (2)	--	--		--	--	--
	II	--	7.7 (5)	--	11.1 (14)	9.8 (14)	--	7.7 (1)	--
	III	11.8 (1)	9.1 (6)	10.7 (4)	13.6 (11)	11.2 (22)	--	9.8 (13)	11.8 (21)
	IV	11.0 (6)	10.6 (6)	11.6 (43)	13.3 (10)	12.6 (4)	--	--	12.1 (1)
	V	11.9 (9)	12.9 (4)	12.5 (28)	13.6 (15)	13.4 (10)	--	12.9 (1)	--
	VI	12.9 (6)	14.2 (15)	13.6 (18)	14.5 (18)	14.8 (6)	--	14.8 (7)	15.1 (2)
	VII	13.6 (1)	16.0 (1)	14.2 (17)	15.2 (17)	14.5 (1)	--	--	12.5 (1)
	VIII	15.1 (2)	--	16.1 (4)	16.0 (26)	--	--	16.8 (3)	15.6 (1)
	IX	--	--	--	17.2 (9)	18.1 (3)	--	--	--
	X	--	--	18.2 (1)	17.3 (3)	--	--	--	--

Table 19.-Continued.

Species	Age group	July 1956	June 1967	June 1972	Sept. 1975	Oct. 1981	June 1988	May 1998	June 2017
Smallmouth	I	5.5 (1)	--	--	7.6 (2)	--	--	--	4.8 (3)
Bass	II	9.4 (1)	--	--	10.2 (2)	--	8.4 (19)	7.3 (5)	9.4 (10)
	III	11.8 (3)	12.3 (3)	--	--	--	10.6 (28)	10.8 (33)	12.3 (11)
	IV	--	--	--	15.1 (1)	--	13.1 (25)	13.6 (30)	15.4 (15)
	V	--	--	--	--	--	15.4 (23)	15.5 (10)	16.5 (12)
	VI	--	--	--	--	--	16.9 (5)	16.5 (9)	17.3 (15)
	VII	--	--	--	--	--	17.6 (9)	17.1 (7)	18.1 (4)
	VIII	--	--	--	--	--	18.1 (7)	18.1 (8)	18.2 (3)
	IX	--	--	--	--	--	19.2 (3)	18.5 (5)	19.8 (4)
	X	--	--	--	--	--	20.2 (7)	19.0 (6)	19.2 (7)
	XI	--	--	--	--	--	--	19.9 (7)	19.8 (2)
	XII	--	--	--	--	--	--	20.2 (7)	19.8 (2)
	XIII	--	--	--	--	--	--	--	--
	XIV	--	--	--	--	--	--	--	20.5 (1)
White Bass	I	--	--	--	--	--	--	--	--
	II	--	--	--	--	--	--	--	--
	III	--	--	--	--	--	10.9 (2)	11.5 (3)	--
	IV	--	--	--	--	--	11.1 (6)	--	--
	V	--	--	--	--	--	13.4 (32)	13.6 (19)	--
	VI	--	--	--	--	--	--	14.4 (14)	14.2 (2)
	VII	--	--	--	--	--	15.7 (2)	15.3 (6)	14.6 (3)
	VIII	--	--	--	--	--	--	16.2 (4)	--
	IX	--	--	--	--	--	--	--	15.5 (4)
	X	--	--	--	--	--	--	--	16.2 (4)
	XI	--	--	--	--	--	--	--	15.8 (4)
	XII	--	--	--	--	--	--	--	16.0 (6)
	XIII	--	--	--	--	--	--	--	15.8 (1)
	XIV	--	--	--	--	--	--	--	--
	XV	--	--	--	--	--	--	--	17.0 (1)

Table 20.-Known statistics of lake sturgeon harvested between 1974 and 1999 from Mullett Lake when fish validation was mandatory.

Year (Number Reported)	Length (inches)	Weight (pounds)	Gender	Age
1974 (10)				
1975 (1)				
1976 (7)				
1979 (9)	67.5	--	F	40
	64.0	--	M	--
	69.5	--	F	--
	71.5	--	F	41
	58.5	--	M	25
	76.0	--	F	--
	--	--	--	--
	74.0	--	F	70
	53.5	--	F	25
1980 (6)	84.0	--	F	--
	76.5	--	F	58
	81.0	--	F	73
	69.0	--	M	53
	61.0	--	--	35
	69.0	--	F	--
1981 (3)	79.0	--	--	--
	81.0	--	--	--
	75.0	--	--	--
1982 (12)				
1983 (4)				
1984 (1)	--	126	--	--
1985 (6)	65.0	66	--	--
	76.7	112	--	--
	55.0	40	--	--
	67.0	79	--	--
	61.5	66	--	--
	65.0	78	--	--
1986 (1)	66.0	51	--	--
1987 (2)	80.0	110	--	--
	59.0	54	--	--
1988 (1)	77.5	154	--	--
1989 (3)	--	120	--	--
	77.0	133	--	--
	--	169	--	--
1990 (3)	--	--	--	--
	85.0	178	--	--
	76.5	150	--	--
1991 (4)	--	--	--	--
	--	--	--	--
	--	--	--	--
	--	150	--	--

Table 20.-Continued.

Year (Number Reported)	Length (inches)	Weight (pounds)	Gender	Age
1992 (5)	--	52	--	--
	--	129	--	--
	--	162	--	--
	--	131	--	--
	--	--	--	--
1993 (1)				
1994 (9)				
1995 (2)				
1996 (4)	71.3	115	--	--
	74.0	120	--	--
	73.0	108	--	--
	68.0	98	--	--
1997 (2)				
1998 (2)	78.0	129	--	--
	78.2	137	--	--
1999 (2)				