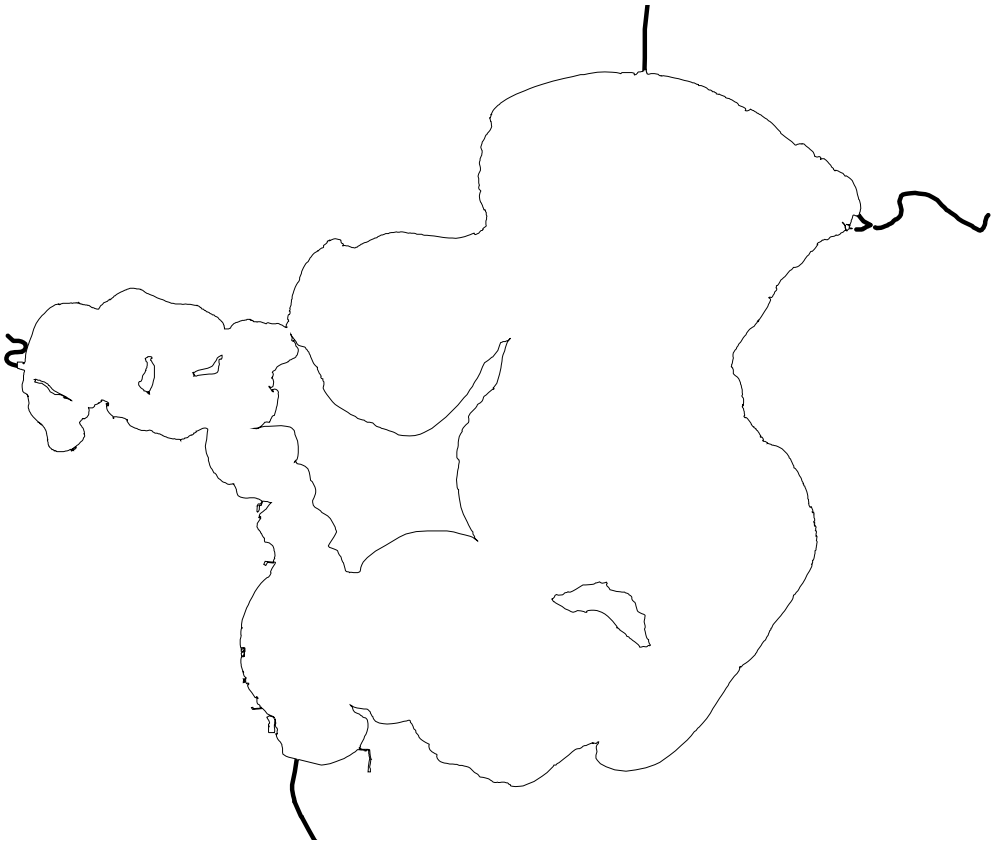
DEPARTMENT OF NATURAL RESOURCES

Fisheries Management Plan for Cass Lake

2019 - 2024 Draft July 2019



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Executive Summary

Cass Lake is a nearly 16,000-acre lake and the largest in a chain of lakes often referred to as the Cass Lake chain. While this management plan focuses on Cass Lake proper, fisheries managers understand that the fish stocks are mobile and that annual sampling on Cass Lake does not sample the full species assemblage within the Chain and fish distribution at the time of sampling may vary from year to year. However, Cass Lake sampling does provide a good barometer of the status of the primary management species in the chain.

As one of the ten largest Walleye Lakes in Minnesota, fish populations in Cass Lake are assessed in accordance with the Large Lake Monitoring Program (LLMP) sampling guide. This guide outlines an intensive, annual sampling regime for gamefish that targets both adult and juvenile stages. Although the LLMP sampling has a Walleye focus, targeted assessments are conducted periodically to sample other species, (e.g., Northern Pike and Muskellunge). Walleye is the primary management species in Cass Lake with secondary consideration given to Yellow Perch, Northern Pike, and Muskellunge. Annual population assessment data are collected using bottom trawls, gill nets and electrofishing surveys. Targeted assessment also employ the use of trap nets. In addition to fish population assessments, periodic creel surveys provide angler catch and harvest information to guide fisheries management.

Cass Lake is a popular destination for both percid and esocid anglers (i.e., Walleye/Yellow Perch and Northern Pike/Muskellunge). Target harvest levels were established for Walleye, Northern Pike, and Yellow Perch in the 1990s using a combination of empirical equations and lake-specific population data. The mean annual harvest estimates for each of these species have been below established target (i.e., maximum potential) harvest levels. Cass Lake proper receives a small amount of fishing pressure targeting panfish species (i.e., Black Crappie and sunfishes) and they are not a primary or secondary management species. However, anglers often access connected waters from Cass Lake to target the quality panfish populations that exist there.

Early stocking records for Cass Lake are vague but over the past 50 years little stocking of any species has occurred in Cass Lake. However, considerable Walleye stocking has and continues to occur in connected waters. In the past, stocking was perceived to have little effect on the Cass Lake Walleye population. However, empirical estimation of wild fry production (and projection of potential fry production based on spawning stock biomass) concluded that Walleye stocking exceeds wild fry production and that this stocking likely plays an important role in supporting this fishery.

Cass Lake has generally been managed using statewide bag and length restrictions, except for a brief period during which the minimum length limit for Muskellunge differed slightly and an extended period where darkhouse spearing was closed (1988-2010). Statewide regulations are recommended to continue, though special regulations for sunfish are being considered for connected waters, where these species are an important component of the fishery, and Cass Lake may be included in this regulation package (five fish bag limit). This proposed special regulation

was recommended by the Cass Lake Fisheries Input Group and will be offered for broader public review in 2020. If enacted, the special sunfish regulation would be implemented in 2021.

Invasive species are playing an increasing role in Cass Lake in recent years. Rusty crayfish have been in the lake for more than two decades, but have recently undergone a range expansion and are now found lakewide. This species is suspected to have had negative impacts on vegetation in the lake, but is also heavily utilized as a forage item and is speculated to be responsible for a recent increase in growth rates for Yellow Perch. Zebra mussels were found in the lake in 2014 and have increased in abundance since that time. This has resulted in increased in water clarity, which has had a profound impact on the Walleye fishery shifting even more targeted fishing pressure to low-light/after dark periods. Starry stonewort was found in 2016 near the Knutson Dam public access, but has not yet become established in Cass Lake though it was also confirmed in Big Wolf Lake in 2018.

In general, fish populations in Cass Lake are near or above average in abundance, composed of fish from broad length and age distributions and providing thriving fisheries. Species-specific goals and objectives are defined in this management plan to ensure data-driven management that will maintain healthy populations and strong fisheries. Failure to meet defined objectives will provide a "red flag" that a fish population or fishery parameter may be trending in an undesirable direction. A red flag for a single parameter may not initiate immediate management action, but multiple red flags for a single species may result in an adjustment to management approach. In contrast, failing to meet a particular objective a number of times with no ill effect on other population parameters or species may indicate a need to revisit that objective rather than initiate corrective action.

The Minnesota Department of Natural Resources (MNDNR) engaged a group of 14 stakeholders to provide input on the management planning process. This group, referred to as the Cass Lake Fisheries Input Group (FIG), provided diverse local and statewide perspectives and made recommendations on Cass Lake fisheries management. The Cass Lake management plan builds upon the successes and knowledge gained from previous plans by recommending specific goals, objectives, and management actions aimed at preserving the high-quality, species-diverse fishery on Cass Lake. Three-year moving averages are used for most parameters to determine how current observations compare to objectives. This approach smooths out year-to-year variability and more closely reflects current trends. In addition to the FIG, the MNDNR's fisheries management of Cass Lake includes coordination with the Leech Lake Band of Ojibwe and the U.S. Forest Service. Public participation in the management process beyond the FIG includes angler cooperation during creel survey interviews and occasional public meetings. This strengthens management and builds relationships between resource managers and resource users.

Fisheries Management Plan for Cass Lake, 2019 – 2014

Lake Characteristics

Cass Lake covers 15,596 acres and is part of the Upper Mississippi River watershed. The lake lies entirely within the Leech Lake Indian Reservation and Chippewa National Forest boundaries. The Mississippi and Turtle rivers are two major sources of inflow to the lake with the Mississippi River as the only outlet. Water levels are affected by the operation of two dams on the Mississippi River: the Ottertail Power Company dam that lies upstream at the Stump Lake outlet and the U.S. Forest Service operated Knutson Dam at the Cass Lake outlet. The Knutson Dam was modified during winter 2015-2016 to a fixed crest rock-arch outlet structure, although the design includes a gated bypass channel capable of moderate water level manipulations.

Cass Lake consists of several deep sub-basins separated by bars and extensive shoal areas. The maximum depth is 120 feet and the mean depth is 25 feet. During the summer, each sub-basin within Cass Lake experiences thermal stratification at varying depths. Scattered stands of bulrush (*Scirpus* spp.) and dense beds of muskgrass (*Chara* spp.) are common throughout the lake, and submerged macrophytes are common in a few localized areas, particularly in Allen's Bay.

Cass Lake's shoreline is irregular with substrates consisting primarily of sand although patches of gravel or cobble exist in some areas. Shorelines are generally gently to moderately sloped, but significant drop-offs exist adjacent to some bars and shoals. Cass Lake contains five islands including Star (980 acres), Cedar (130 acres), East Potato (10 acres), West Potato (19 acres), and Dick's Island (4 acres). The lakeshore is a mix of developed and undeveloped properties with much of the undeveloped area consisting of National Forest land.

Cass Lake is part of a chain of lakes often referred to as the Cass Lake chain. The lakes considered part of the chain varies, depending on the purpose of the classification. For fisheries management purposes, the primary lakes, which are all accessible by boat traffic and considered in this planning process, include Cass Lake, Lake Andrusia, Big Wolf Lake, Kitchi Lake, Little Rice Lake, and Big Rice Lake. Big Lake had representation in the 2019 management planning process due to the importance of the Big Lake Creek egg take location, though the creek connection is not navigable by boat traffic. Pike Bay is accessible through a boat channel, but fish populations appear to function independently, and is managed as such. Buck Lake has a separate Division of Waters (DOW) inventory number but resembles another bay of Cass Lake. Windigo Lake has no navigable connection but is contained on Star Island, and only accessible by portage from Cass Lake.

Summary of the Fisheries

Cass Lake is a popular destination for both percid and esocid anglers (i.e., Walleye/Yellow Perch and Northern Pike/Muskellunge). Walleye has been the primary management species since the first lake management plan while Yellow Perch, Muskellunge, and Northern Pike were given secondary management consideration. The vast majority of fishing pressure and harvest occurs during the open-water period with modest participation in winter angling and darkhouse spearing. Total annual fishing pressure on Cass Lake averages approximately 200,000 angler hours. Walleye are the most sought-after species by open-water anglers followed by Yellow Perch and Muskellunge (Kennedy 2016) whereas Yellow Perch are the most sought after species by ice anglers followed by Walleye (Kennedy 2015).

Potential and target harvest levels were established for Walleye, Northern Pike, and Yellow Perch using a combination of empirical equations and lake-specific population data. The methods used to derive these levels are outlined in MNDNR Special Publication 151 (MNDNR 1997). At that time, fish populations were not showing signs of stress and thus target harvest levels were set equal to the estimated potential harvest. Target harvest levels for Walleye, Northern Pike, and Yellow Perch were set to 31,000 pounds, 14,000 pounds and 37,000 pounds, respectively (Table 1).

The mean annual harvest estimates for each of these species have been below target harvest levels established in Special Publication 151 (Table 1). However, in addition to harvest measured by the daytime creel survey, night fishing for Walleye and subsistence gill netting by Leech Lake Band members represent unmeasured sources of fishing mortality. Efforts to quantify Walleye harvest after dark have resulted in an increased understanding of the extent of night fishing (see Kennedy 2016) but, because methods are still being refined, harvest estimates from these data should be viewed with caution. The extent of subsistence gill netting by Leech Lake Band members has not been quantified and thus the impacts of this activity on game fish populations are unknown. Populations of popular game fishes are currently within acceptable ranges and providing satisfactory angling and spearing opportunities, which suggests that current exploitation levels are sustainable.

Table 1. Mean annual harvest of Walleye, Northern Pike, and Yellow Perch from Cass Lake 1986 to 2015.

Species	Open-water	Winter	Total	Target
Walleye	25,916	433	26,349	31,000
Northern Pike	6,278	3,755	10,033	14,000
Yellow Perch	31,531	3,677	35,208	37,000

Muskellunge fishing is a substantial portion of the Cass Lake fishery with approximately 10% of fishing pressure targeting Muskellunge. Even prior to the implementation of the 54-inch minimum length limit, the targeted Muskellunge fishery had become largely voluntary catch and release. Estimated total annual catch based on creel surveys (Fishing Opener through mid-October) has ranged from 36 (1986) to 915 fish (2002). The average Muskellunge catch during the two most-recent creel cycles was 521 fish, though additional fish were likely caught between the end of the creel survey and freeze up.

Participation in the Cisco and Lake Whitefish sport gill netting season as well as commercial gill netting for non-game species by Band members is thought to be low and thus the impact of gill netting on these species is believed to be minimal.

Cass Lake proper receives a relatively small amount of fishing pressure targeting panfish species (i.e., Black Crappie and sunfishes), but anglers often access connected waters from Cass Lake to target those species. Kitchi Lake, the Rice Lakes, and Buck Lake are popular destinations for quality Bluegill and Black Crappie. Windigo Lake provides a unique portage opportunity for panfish as well. Andrusia and Big Wolf Lakes are better known as seasonal Black Crappie destinations though some limited opportunity to target sunfish exists in these lakes as well. During this management planning process, fisheries input group (FIG) members reported growing interest and fishing opportunities for panfish in the western end of Cass Lake as well.

Survey History

The first lake survey on Cass Lake was conducted in 1936 using hoop nets and gill nets comprised of 1.5- and 2-inch mesh. Experimental gill nets have since been standardized so this initial survey data is not directly comparable with current methods.

Carlander and Hiner (1943) provided the first special investigation of Cass Lake using MNDNR standardized gill nets (250-feet; bar mesh range, 0.75 to 2 inches). This investigation included reference to bullhead removal. Bullhead test netting was conducted by commercial netters in 1944 but results were unsatisfactory and there are no records of any subsequent bullhead removal efforts.

Another lake survey was conducted in 1948 using standard gill nets and hoop nets.

Strand (1980) examined the current status, yield potential of Cass Lake (and connected waters) with emphasis on Walleye. The investigational report included sampling of Cass Lake and connected waters from 1971-1975, and included adult Walleye tagging to describe movement of Walleye captured in riverine spawning migrations.

Annual population assessments began in 1983 with the implementation of the Large Lake Monitoring Program (LLMP; Wingate and Schupp 1985). Standardized LLMP sampling was

developed to monitor Walleye at various life stages and included shoreline seining, bottom trawling, and gill netting. Shoreline seining does not provide a useful measure of gamefish reproduction on Cass Lake and was discontinued in 2011. Bottom trawling is still conducted annually although the utility of continuing this sampling is being evaluated due to the proliferation of zebra mussels. At times, large quantities of mussels clog up the trawl and water clarity has increased which may have increased gear avoidance. Fall electrofishing for Walleye was initiated in 2000 and has been conducted annually since 2003. This sampling provides a better measure of Walleye recruitment potential than either shoreline seining or bottom trawling. Data derived from gill netting provide measures of relative abundance, size distribution, sex and maturity, and age data. Permutations of these data yields additional information including, but not limited to: growth, recruitment, mortality, condition factor, length- and age-at-maturity, and reproductive potential.

Mark-recapture estimates for adult (i.e., sexually-mature) Walleye and Walleye fry were conducted in 2009 and 2010, respectively (Kennedy 2011). These abundance estimates were part of a coordinated assessment of all the lakes in the Cass Lake chain.

An assessment of Walleye fry dispersal from Lake Andrusia to other lakes in the Cass Lake Chain was conducted annually from 2016 to 2018 (Kennedy 2019). Fry stocked into Lake Andrusia were marked with oxytetracycline (OTC), captured from each lake in the Chain via boat electrofishing during late August each year, and subsequently examined for an OTC mark. The 2019 coordinated gill net assessment will examine dispersal of the three marked year classes at ages 1, 2, and 3 throughout the Chain. This work is ongoing and conducted in cooperation with Bemidji State University and two graduate students.

Muskellunge electrofishing surveys to assess the population following the darkhouse spearing ban were conducted each fall from 1988 to 1997. From 1994 to 1997 large-frame trap nets were added to sample Muskellunge during the spawning period to supplement the dataset. As part of the assessment of the spearing ban, ice-out Northern Pike assessments were completed from 1993 to 1997.

In response to the removal of the spearing ban, ice-out assessments of the Northern Pike population were conducted in 2011 and 2016 using trap nets.

More recent Muskellunge assessments in 2011/2012 and 2016/2017 used consecutive year sampling events in order to generate adult population estimates using mark-recapture methods.

Annual zooplankton monitoring throughout the open-water period began in 2012 and remains ongoing.

The first Cass Lake creel survey was conducted in 1971 as part of Investigational Report 368 (i.e., Strand 1980) and included connected waters. Open-water surveys associated with this investigation continued annually 1971-1975, with the winter season surveyed during 1971-1972.

During the Large Lake Program era, open water creel surveys are available for two of every six years beginning in 1986 (1986, 1987, 1993, 1994, 1996, 1997, 2002, 2003, 2008, 2009, 2014, and 2015). Three winter creels have been conducted during this time period (1986-1987, 2011-2012, and 2014-2015).

Stocking History

Early stocking records for Cass Lake during the period 1909 to 1945 are vague and likely incomplete but included the introduction of "trout", Lake Whitefish fry, and Largemouth Bass fingerlings. Walleye fry, which were stocked in the greatest number during this time, were discontinued in 1947. The termination of those early stocking efforts was recommended in the 1948 lake survey report due to the lack of contribution from fry stockings. Specifically, this report references no correlation between the stocking of 69 million Walleye fry between 1940 and 1947 and the subsequent population status. Further, several letters in the Bemidji Area Office files suggest that Walleye fishing in the late 1940s was poor and had declined noticeably despite intensive fry stocking efforts.

Though direct stocking into Cass Lake was discontinued at that time, considerable Walleye stocking has occurred in connected waters on the Cass Lake Chain. Most notably beginning in 1971 when a Walleye egg take station was established at Big Lake Creek a tributary to Lake Andrusia, directly upstream of Cass Lake via the Mississippi River. As a matter of policy, approximately 10% of the number of eggs taken at the station are returned to the source lake as fry (long-term mean = 2.44 million fry; most-recent 10-year mean = 3.75 million fry). Although spawning fish captured in Big Lake Creek likely originate from throughout the chain, Lake Andrusia has always been considered the source lake for fry returns. In addition, there has been some unknown quantity of recruitment from flushing surplus fry from the fry tanks at the Bemidji Area Fish Hatchery into the Mississippi River upstream of Big Wolf Lake. The magnitude of these releases is not known, though occasionally it was estimated and recorded as a half-million fry. Walleye fry stockings into Kitchi Lake, which lies immediately upstream of Cass Lake on the Turtle River, began in 1972 (mean = 800,000 fry) and Big and Little Rice (which are further upstream) were first stocked in 1986 (combined mean = 900,000 fry). These lakes, as well as waters further upstream on the Turtle River have been fry stocked on an every-other-year basis since 1993. As a result, some portion of the Cass Lake Chain has been stocked with Walleye fry nearly every year since 1971.

Northern Pike stocking (yearling and adults) recorded from 1965-1968 were likely from the winter rescue program that was active at that time. A Northern Pike Spawning Area (NPSA) near the old Trees Resort on the north shore of Allen's Bay was acquired in the late 1960s and operated from 1970 to 1986, except when water conditions precluded its use. Adults were attracted to the flow from the outlet structure, captured, and stocked into the spawning area to spawn naturally. The impoundment above the water control structure was drawn down in late

spring and the Northern Pike fingerlings drained to Cass Lake. The use of winter rescue Northern Pike stocking and the NPSA program was discontinued all across Northern Minnesota in the early 1980's as managers gained a better understanding of the consequences of excessive pike densities.

Cass Lake stocking records also include a few years in which Bluegill fingerlings were documented in production reports from the NPSA.

The first records of Muskellunge stocking are from 1969. Muskellunge are native to Cass Lake so these stockings were not introductory. Although fingerlings were stocked in 1969, and 1972-1975, the quantity stocked was likely inconsequential relative to lake size and presence of a native population.

In addition to the early (i.e., pre-1945) Lake Whitefish stockings, the Leech Lake Division of Resource Management stocked Lake Whitefish from 1985 to 1996, and in 2003.

Fishing Regulations

In general, Cass Lake has followed statewide bag limits and length restrictions for most species. Exceptions to this include a darkhouse spearing ban from 1988 to 2010, and a special 48-inch minimum length limit for Muskellunge from 2007 to 2009.

The darkhouse spearing ban on Cass Lake was very controversial and was, in many ways, at the center of the statewide debate about the applicability of spearing bans. The ban was originally enacted under the authority of Minnesota Statute 97C.011 to protect Muskellunge. This statute required a defined end date for the spearing ban (15 January 1998) and could be extended only upon evidence presented by the DNR Commissioner that the Muskellunge population had been enhanced. In addition, this statute required public meetings to weigh public opinion. After evaluation of numerous data sources (e.g., spring trap net assessments, fall electrofishing assessments, angler diaries, and tournament records) and an intense and controversial public input process, the ban was made "permanent" in 1998.

Barnard (1997) reported that comparisons of the Cass Lake Muskellunge population pre- and post-spearing ban confirmed that the Muskellunge population had been enhanced during the period of time the ban was in place, despite increased angling pressure directed at this species. Further, the author suggested that the improving trend observed in the Muskellunge population had not yet leveled off and more restrictive regulations should be considered in an effort to realize the true trophy potential of this fishery.

In response to that recommendation, a total catch-and-release regulation was proposed in 1998. This regulation proposal was met with opposition from both Muskellunge and non-Muskellunge

anglers with 60% of public comments opposing the regulation. As a result, the special regulation proposal was dropped.

Several years later in 2007, Cass Lake was among a number of Muskellunge waters statewide to receive, by special regulation, a 48-inch minimum length limit. Eventually, the 48-inch minimum length limit was adopted as the statewide Muskellunge regulation beginning in 2010.

Controversy surrounding the 1988 spearing ban on Cass Lake never subsided and legislation specific to the removal of the ban from Cass Lake was introduced in both the 2010 and 2011 legislative sessions. This legislation was opposed by DNR Fisheries. The protection afforded to Muskellunge by the spearing ban was likely most effective when initially implemented in 1988. The improvement documented during the 10-year evaluation period suggests that the population was recovering from an overexploited or depleted state. The improvement seen in the Muskellunge population during the evaluation period continued and data suggested that there were many more large individuals present in the population than when the spearing ban was implemented. Thus, the impact of incidental spearing mortality would be proportionally less detrimental to the population as a whole than at the time the ban was implemented.

However, DNR Fisheries was concerned about lifting the spearing ban in 2010 and 2011 due to the potential impact to the quality Northern Pike fishery in Cass Lake. Though Northern Pike protection was not the objective when the spearing ban was initiated it certainly reduced a source of targeted harvest for this species. Northern Pike size distribution was compared between Cass Lake without spearing, and similar lakes where spearing was allowed for DNR testimony at legislative hearings. Mean length of Northern Pike from experimental gill nets, and percent of fish larger than 25, 30, and 36 inches was higher for Cass Lake than both Leech Lake and Lake Winnibigoshish. Further, a population modeling exercise suggested that the removal of the spearing ban would cause a decline in the proportion of Northern Pike in the population greater than 24 (-13%) and 30 inches (-40%) after 10 years (Barnard 2010).

Despite DNR Fisheries opposition, legislation passed in 2011 removing the spearing ban on Cass Lake. In anticipation of this action, a spring ice-out trap netting effort was directed at Northern Pike in April 2011 to gather size and age structure information prior to the removal of the spearing ban (the darkhouse spearing season opened 15 November 2011). Further, a two-year Muskellunge sampling effort was initiated in spring 2011 to gather size and age structure information and mark individuals to facilitate a mark-recapture population estimate. These assessments would provide baseline information to compare to population assessments following the removal of the spearing ban.

Comparable assessments were repeated in 2016, with another set of assessments scheduled for 2021 as part of a ten-year evaluation of the spearing ban removal. However, implementation of the North-Central Zone regulation for Northern Pike in 2018 has impacted angler harvest, and is expected to affect size structure independent of post-spearing ban effects.

Yellow Perch bag limits have always followed statewide limits. A significant change in the statewide daily and possession limits for Yellow Perch was driven by the high profile destination fisheries in Northern Minnesota, like Lake Winnibigoshish, Leech Lake and Cass Lake. Yellow Perch bag limits were incrementally reduced from no limit, to 100 fish in 1979, to 20 fish daily and 50 fish possession limit in 2001, to the current 20 fish daily and 40 fish possession limit in 2002.

Current Fishing Regulations

Walleye: Statewide regulation – 6 fish bag limit with one fish allowed over 20 inches

Northern Pike: North Central Zone regulation

Angling – 10 fish bag limit, 22- to 26-inch protected slot limit, with two fish allowed over 26 inches

Spearing – 10 fish bag limit, only 1 between 22-26 and one over 26, or 2 over 26 inches.

Muskellunge: Statewide regulation – 1 fish bag limit, 54-inch minimum size limit

Yellow Perch: Statewide regulation – 20 fish bag limit, 40 fish possession limit

Sunfish: Statewide regulation – Considering special regulations (recommended by FIG)

Invasive Species

Rusty crayfish (*Orconectes rusticus*) were first discovered in 1998 along the west shore near the now-defunct Tom's Resort. They gradually increased in abundance and distribution until the mid-2010s when their distribution rapidly expanded to an abundant lakewide presence and their number increased to levels that make it no longer feasible to enumerate them in gill nets.

Zebra mussels (*Dreissena polymorpha*) were first documented in fall 2014 and abundance has rapidly increased since that time. Changes in water clarity are noticeable and this is likely affecting fish behavior.

Starry stonewort (*Nitellopsis obtusa*) was discovered near the Knutson Dam public access in the northeast corner of the lake during fall 2016. The detection of the Cass Lake infestation was the result of targeted inspections near lake accesses after this species was found in Big Turtle Lake, Beltrami County. Starry stonewort was also confirmed in Big Wolf Lake in 2018. This appears to be a new point of infestation since the distribution in Cass Lake remains confined to the immediate area around the Knutson Dam public access.

Smallmouth Bass (*Micropterus dolomieu)* is not officially listed as an invasive or nonnative species but is not native to the Upper Mississippi watershed. Smallmouth Bass were first documented in Lake Beltrami in the Turtle River watershed in 2006 and are spreading through

connected basins upstream of Cass Lake. There have been unsubstantiated angler reports of Smallmouth Bass in Cass Lake. There are stocking records for Smallmouth Bass in Windigo Lake on Star Island (most recent 1953), and a single Smallmouth was sampled in a 1985 survey of this lake.

Social Considerations

Cass Lake supports important fisheries, particularly for Walleye, Yellow Perch, and Muskellunge enjoyed by resident as well as a substantial number of non-resident anglers. Inclusion in the Large Lake Monitoring program gives Cass Lake the distinction of being considered one of the 10 most important Walleye destination lakes in Minnesota. Darkhouse spearers also participate in the Northern Pike fishery during the winter months. There are nine active resorts on Cass Lake with several additional operations on connected waters. In addition there are both private and public campgrounds and numerous lakeshore residents and cabin owners. Cass Lake is open to sport gill netting for Cisco and Lake Whitefish. Cass Lake is also open to gill netting by members of the Leech Lake Band of Chippewa Indians for personal use (all species) and commercial purposes (non-game fish).

Cooperators

Given that Cass Lake lies within the boundaries of both the Leech Lake Reservation and Chippewa National Forest, MNDNR communicates regularly with the Leech Lake Division of Resource Management (DRM) and United States Forest Service (USFS). Cooperation with the Leech Lake DRM is primarily through semi-annual coordination meetings that include discussion of fisheries and other natural resource issues effecting Cass Lake. Reoccurring agenda items at these meetings that pertain to Cass Lake include fish population updates and stocking plans for connected waters (e.g., Kitchi, Big Rice, and Little Rice Lakes). Meetings with USFS are typically issue-based and conducted as needed.

A Fisheries Input Group (FIG) was formed in February 2019 with representation consisting of resort owners on Cass Lake and connected waters, local business and commerce interests, and broader statewide interests from Walleye, Northern Pike and Muskellunge advisory groups. The charge of this group was to provide input on a Lake Management Plan Revision for Cass Lake. The intent is to keep this input group active for annual reviews of assessment data as it pertains to the management objectives for each of the primary and secondary species.

Fish Population Summaries

Walleye – The long-term median gill net catch rate for Walleye in Cass Lake is 13.1 fish per net [interquartile range (IQR) = 10.3 to 14.6 fish/net]. Relative abundance has ranged from 9.5 to 16.6 fish per net over the past 10 years. Cass Lake supports a healthy Walleye population that is typically dominated by two to three strong year classes with support from adjacent cohorts. Year classes tend to be either strong or weak, with few cohorts ranking near the numerical average. During spring 2009, Walleye undergoing spawning migrations in the Mississippi River, Turtle River, and Big Lake Creek were captured and given a unique fin clip. A coordinated, Chain-wide gill net assessment was completed in late-August/September 2009 and a mark-recapture estimate for the mature Walleye population was generated (40,999 fish; 95% CI = 27,702 to 71,303 fish).

The mean spawning stock biomass (SSB) since 1983 is approximately 1.5 lbs/acre. However, the context in which to consider this parameter is not clear as the proportion of SSB in the Cass Lake Chain that is present in Cass Lake during the September gill net assessment each year likely varies. Additionally, there is considerable fry stocking in connected waters, which confounds the relationship between SSB and wild fry production. Thus, the relationship between SSB estimates for Cass Lake and year class strength values for subsequent year classes is not well understood. However, a mark-recapture wild fry estimate in 2010 estimated that the Cass Lake Chain produced approximately 1 million fry despite the SSB estimate for Cass Lake that produced these fry measuring 1.8 lbs/acre. This coordinated Chain-wide assessment and associated wild fry estimate (see Kennedy 2011) helped managers realize the importance of fry stocking in connected waters as this stocking, which generally ranges from 3 to 7 million fry, greatly exceeds wild fry production.

Walleye growth rates have been satisfactory with fish typically entering the fishery (≈ 14 inches) during their fourth growing season (i.e., age 3). Recently, a sharp increase in growth rates has been observed for both Walleye and Yellow Perch. This may be related to alterations in the food web due to the addition and expansion of invasive species (zebra mussel and rusty crayfish, respectively). It is too early to determine if this is a short-term anomaly or the beginning of a significant trend.

Annual mortality for fish ages 3 and older is generally greater than 50% as Cass Lake supports a traditional, harvest-oriented fishery. High annual mortality rates for Cass Lake pre-date the inception of the LLMP and were suggested by Strand (1980) to be among the highest in the state. However, recruitment of Walleye to the adult population remains adequate to replace fish lost to the intense fishery under the management approach that has been in place since the early 1970s.

Yellow Perch – The long-term median catch rate for Yellow Perch in Cass Lake is 46.5 fish per net (IQR = 36.6 to 57.1 fish/net). Relative abundance has ranged from 29.2 to 66.6 fish per net over the past 10 years. Relative abundance of Yellow Perch has been near or below the long-term average since 2010.

Mean length of Yellow Perch captured in gill nets has declined since 1983. The bulk of that decline appears to have occurred prior to 1995 suggesting that it may have been harvest induced as mean size rebounded shortly after a substantial bag limit reduction in 2001. However, average size resumed a declining trend through 2015, before a recent rebound.

Historically, growth rates have been moderate with fish entering the fishery (8 to 9 inches) at age 4 or 5. However, length-at-age-3 in 2018 increased sharply to a record-high level. This has resulted in faster growing individuals entering the fishery at age 3 and a larger portion of the age-4 cohort reaching desirable sizes for angler harvest (i.e., > 9 inches). Similar to Walleye, the source of this increased growth rate and its sustainability is not known.

Northern Pike – Cass Lake is known for producing good numbers of medium-sized (22- to 30-inch) and modest numbers of large (> 30 inches) Northern Pike. The long-term median gill net catch rate for Northern Pike in Cass Lake is 3.2 fish per net. Relative abundance historically ranged from 2.0 to 4.0 fish per net but had recently shown a concerning trend of increasing abundance (2006-2014). While abundance has moderated considerably since then, sustained increases in abundance are concerning when managing for preferred-size Northern Pike.

Muskellunge – Muskellunge are native to Cass Lake and the population is maintained through natural reproduction. The population is characterized by a broad size distribution with fish exceeding 50 inches in total length. This broad size and age distribution is the result of consistent recruitment, which distinguishes this population from nearby stocked fisheries that are experiencing recruitment suppression by populations dominated by large, old individuals.

The adult (i.e., sexually mature; > ≈36 inches) Muskellunge population estimate for 2011 was 616 fish (95% CI = 340-1,232 fish) and the estimate for 2016 was 641 fish (95% CI = 302-1,480 fish), which is equal to 0.04 fish/surface acre (Habrat 2013). However, it should be noted that these estimates are based on fish caught during the spring spawning period in Allen's Bay and the western portion of the lake in general. Efforts to sample fish in the main lake and eastern shoreline, have been largely unsuccessful due to sampling gear constraints (e.g., broad shoreline flats; large, off-shore, windswept spawning areas). If the majority of the spawning is occurring in the western portion of the lake then this may be a reasonable estimate of the entire adult population. Conversely, if our sample represents a sub-population exhibiting spawning site fidelity for areas in the western portion of the lake this estimate would not represent a true lakewide mature adult estimate. Additionally, there is likely movement between basins in the Chain and the degree to which these fish are represented in the population estimate is not known.

Sportfish Goals and Objectives

Overall, the Fisheries Input Group was satisfied with the existing fishery on Cass Lake and connected waters, and did not recommend any major changes to the current management. Thus, many objectives delineate the recent conditions we intend to maintain.

Walleye – Walleye are the primary management species in Cass Lake and are managed to provide a harvest-oriented fishery. The objectives for Walleye outlined below are representative of our interest in balancing Walleye abundance relative to forage fish, primarily Yellow Perch, maintaining opportunity to catch quality-sized fish, producing the strong year classes necessary to provide a considerable harvestable surplus and good angler catch rates, and ensuring total mortality does not reach unsustainable levels. Gill net catches of Walleye between 10 and 15 fish/net approximate the 25th and 75th percentile during the Large Lake Monitoring Program and are commensurate with the observed range in catch rate over the past 15 years. Based on observations shared by the FIG, these metrics have supported a good Walleye fishery in recent years. The size structure and total mortality objectives are designed to provide balance to an intense harvest fishery that ensures fish are not removed so efficiently that few fish exceed 17 inches. The recruitment objective represents a reasonable expectation of the production of strong year classes based on historical data, necessary to replace fish removed by the intense Walleye fishery, and provide satisfactory angler catch and harvest rates. Maintaining good angler catch rates is an important fishery objective, but these data are sparser due to the infrequent creel survey schedule. Further, increased water clarity is modifying angler behavior (shifting more targeted Walleye pressure to low light/after dark periods), which may act to reduce overall angler catch rates for Walleye during the traditional daytime creel survey.

Walleye objectives:

1. Abundance: Maintain Walleye catch rates from the September gill net assessment between 10 and 15 fish/net (3-yr moving average; Figure 1)
2. Size structure: Maintain gill net catch rate for Walleye over 17 inches between 2 and 3 fish/net (3-yr moving average; Figure 2)
3. Total mortality: Maintain total annual mortality for fish ages three and older between 50 and 70% (3-yr moving average; Figure 3)
4. Recruitment: Produce a strong year class (back-transformed year class strength index value ≥ 3) at least once every three years (Figure 4)
5. Angler catch rate: Maintain overall angler catch rates during the daytime open-water creel survey that are greater than 0.2 fish/angler hour (Figure 5)

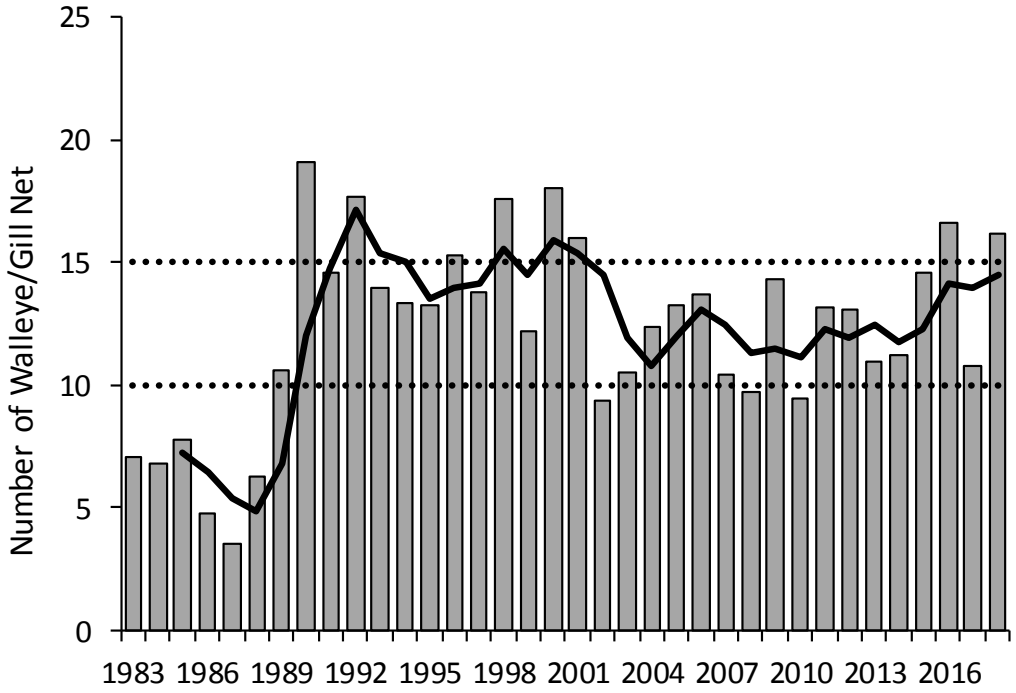

Figure 1. Relative abundance of Walleye in Cass Lake, 1983 – present. The solid line displays the three-year moving average and the dotted lines bracket the management objective for Walleye gill net catch rate (10 to 15 fish/net).

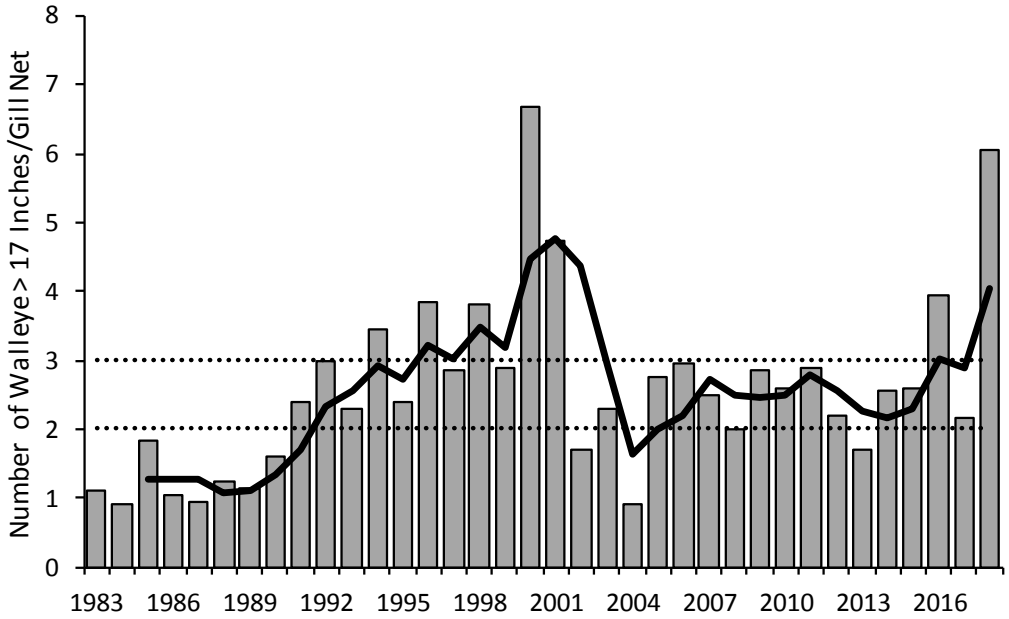

Figure 2. Gill net catch of Walleye by size group. The solid line displays the three-year moving average and the dotted lines bracket the management objective for the gill net catch rate of Walleye greater than 17 inches (2 to 3 fish/net).

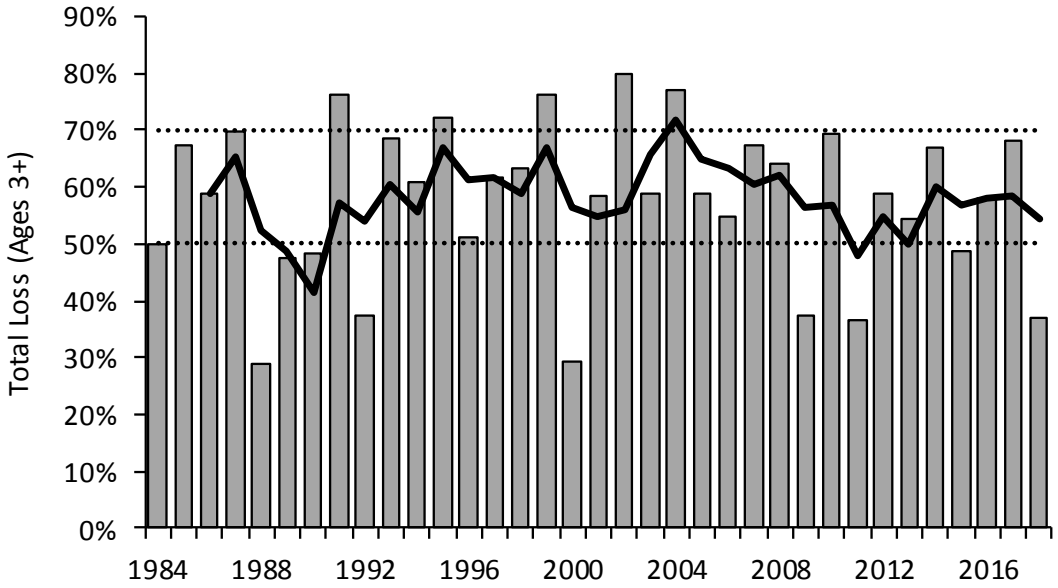

Figure 3. Total annual mortality of Walleye. The solid line displays the three-year moving average and the dotted lines bracket the management objective for total annual Walleye mortality (50 to 70%).

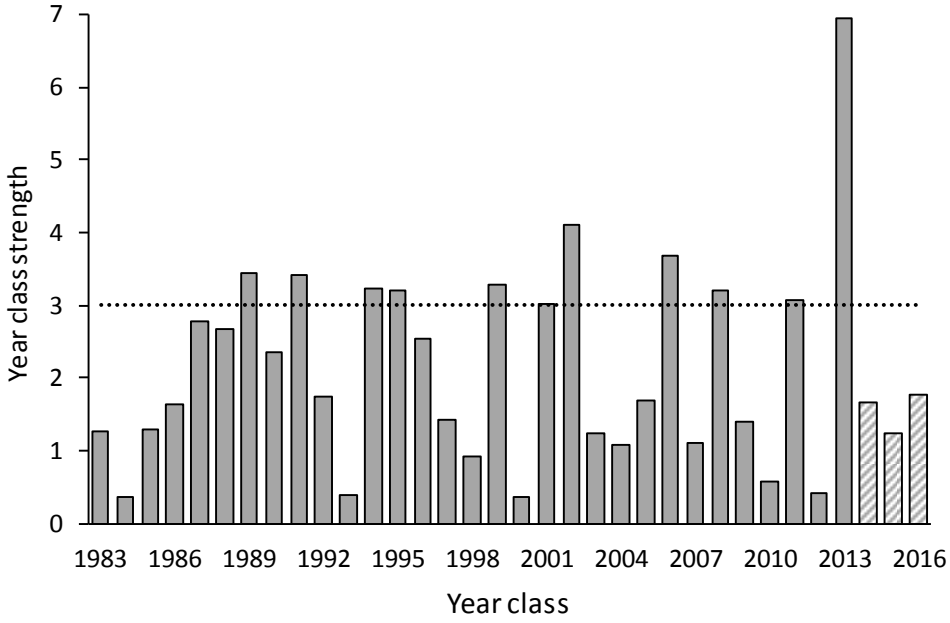

Figure 4. Walleye year class strength for Cass Lake 1978 to 2016. Year class strength index values are derived using gill net catch-per-unit-effort for ages 2 to 5. Year classes greater than the dotted line are considered strong and the management objective is for the year class strength index value to exceed 3 at least one out of every three years. Year class strength values for cohorts for which the bar is crosshatched are not yet complete.

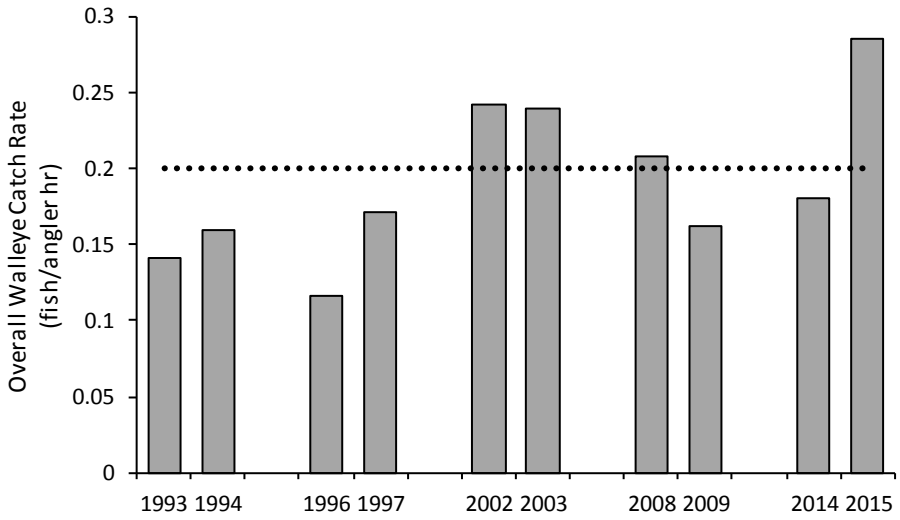

Figure 5. Overall Walleye catch rates during daytime, open-water creel surveys conducted on Cass Lake since 1993 (only harvest rates are available prior to 1993). The dotted line represents the management plan objective (0.2 fish/angler hr).

Yellow Perch – Yellow Perch are given secondary management consideration in Cass Lake and managed as both an important forage fish as well as a valuable component of the Cass Lake fishery. The abundance objective focuses on ensuring that Yellow Perch are present in sufficient quantity to provide adequate forage with enough fish surviving the predation gauntlet to reach harvestable sizes. No maximum threshold is identified since, being an important forage species, there is no downside to higher abundance. The size structure objective represents a minimum abundance level for fish that have reached a size desirable for angler harvest ($\geq$ 9 inches). The target harvest objective reflects the safe annual harvest level outlined in the MNDNR (1997). It is understood that recent creel surveys did not capture total perch harvest as winter surveys did not include the late ice period. When considering both measured and speculated unmeasured harvest, recent annual harvest levels are likely near the 37,000-pound target and appear to be sustainable based on population metrics.

<u>Yellow Perch objectives:</u>

1. Abundance: Maintain Yellow Perch catch rates during the September gill net assessment greater than 40 fish/net (3-yr moving average; Figure 6)
2. Size structure: Maintain Yellow Perch catch rates for fish over 9 inches during the September gill net assessment greater than 4 fish/net (3-yr moving average; Figure 7)
3. Angler harvest: Annual angler harvest of Yellow Perch should be near the target harvest of 37,000 pounds (MNDNR 1997; Figure 8)

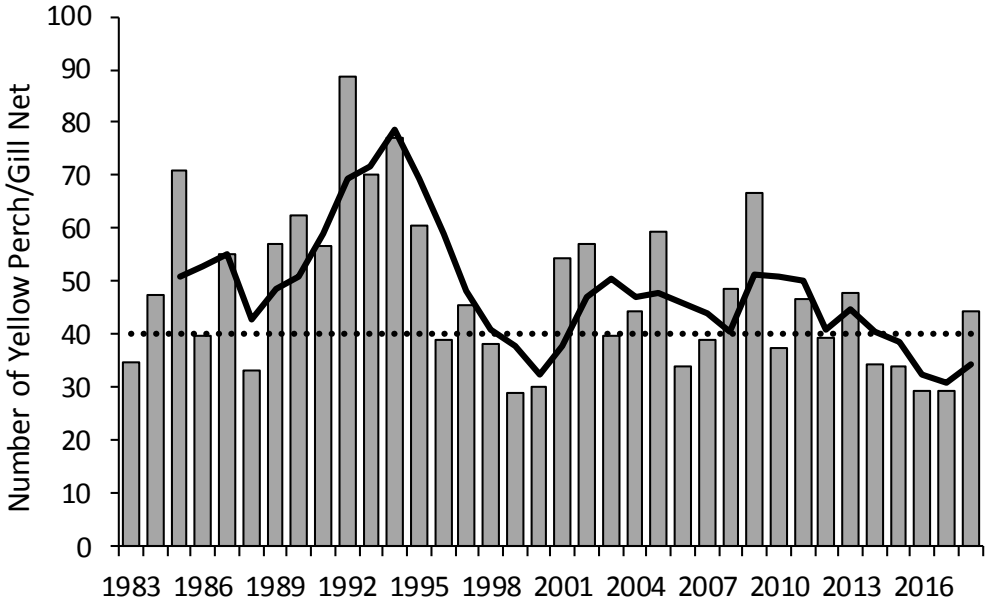

Figure 6. Relative abundance of Yellow Perch in Cass Lake (1983 – present). Solid line displays the three-year moving average and the dotted line represents the lower limit of the management plan objective for Yellow Perch abundance (40 fish/net).

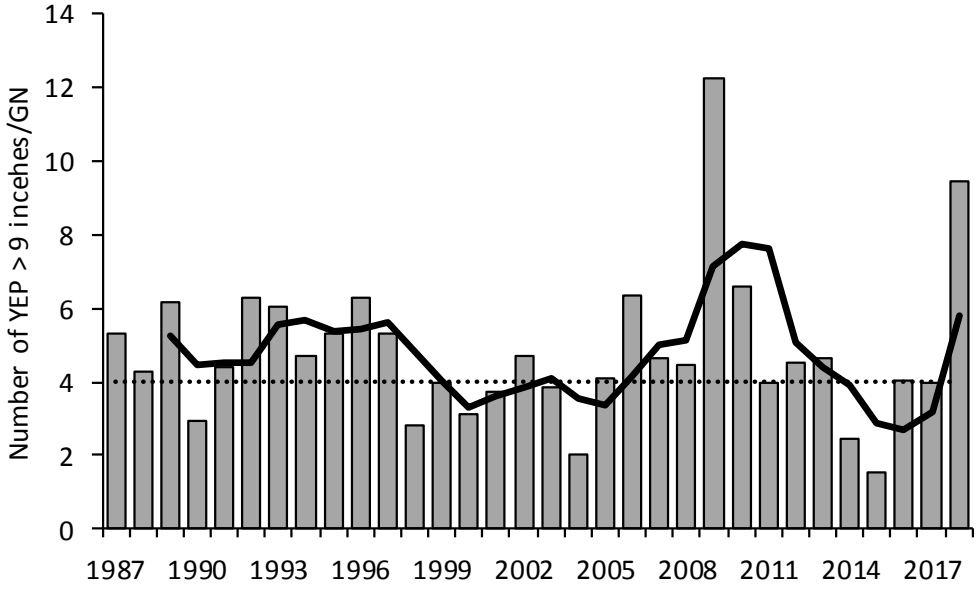

Figure 7. Catch per unit effort of Yellow Perch greater than 9 inches. The solid line displays the three-year moving average and the dotted line represents the lower limit of the management objective for abundance of Yellow Perch over 9 inches (4 fish/net).

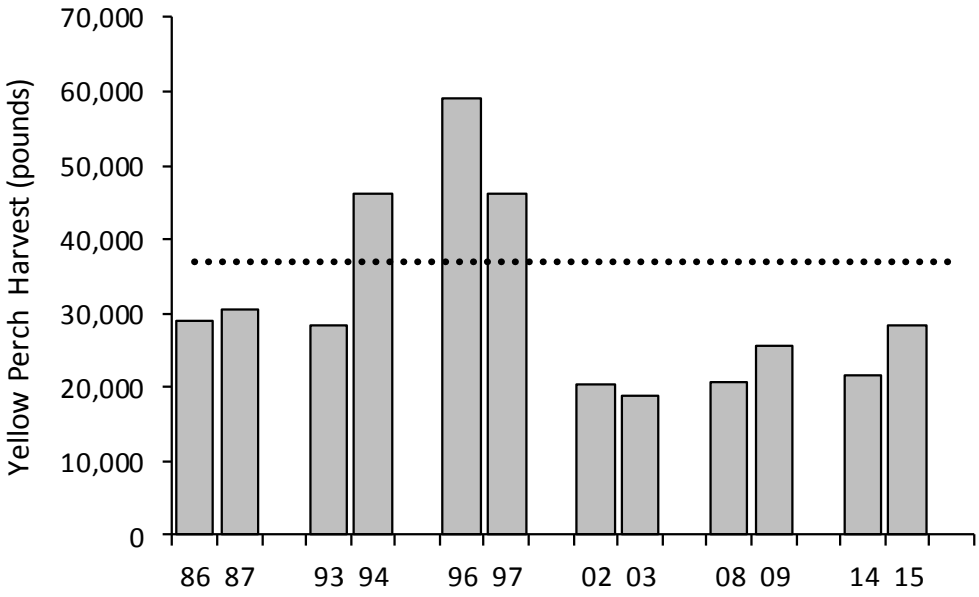

Figure 8. Yellow Perch harvest during open-water creel surveys. The dotted line represents the target harvest level from MNDNR (1997).

Northern Pike – Northern Pike are given secondary management consideration in Cass Lake and managed for a low population density to promote growth rates that provide angling opportunity to catch medium-sized fish (22 to 30 inches). With the implementation of the North-Central Zone Northern Pike regulation in 2018 there is expanded opportunity for anglers to harvest small fish (< 22 inches). In addition, this regulation is expected to, eventually, improve opportunity to catch, and harvest if desired, fish over 26 inches. The abundance objective recognizes that total catch of Northern Pike may increase slightly following implementation of the North-Central Zone regulation as fish in the 22- to 26-inch protected slot limit (PSL) that would have otherwise been harvested will persist in the population. The size structure objective reflects the desire for the relative abundance increase to be comprised of additional fish that are either in the PSL, or have grown through the size regulation and are again available for harvest. Catch rate objectives were identified for both overall abundance and for fish larger than 22 inches. This was done in place of identifying a desired percent of total catch larger than 22 inches to provide independent measures of abundance. The harvest opportunity objective is in place to measure the desired increase in the angler catch of fish over 26 inches in the open-water creel survey. This approach may provide a better measure of improvement in fish over 26 inches because these fish may be removed by anglers as quickly as they are produced and thus the increased production of these fish may not be detected using length frequencies from gill net assessments.

Northern Pike objectives:

1. Abundance: Maintain Northern Pike catch rates during the September gill net assessment less than 4.5 fish/net (3-yr moving average; Figure 9)
2. Size structure: Catch rates for Northern Pike greater than 22 inches should exceed 2.5 fish/net (3-yr moving average; Figure 10)
3. Harvest opportunity: Total catch of Northern Pike over 26 inches should exceed 2,000 fish during open-water creel surveys (Figure 11)

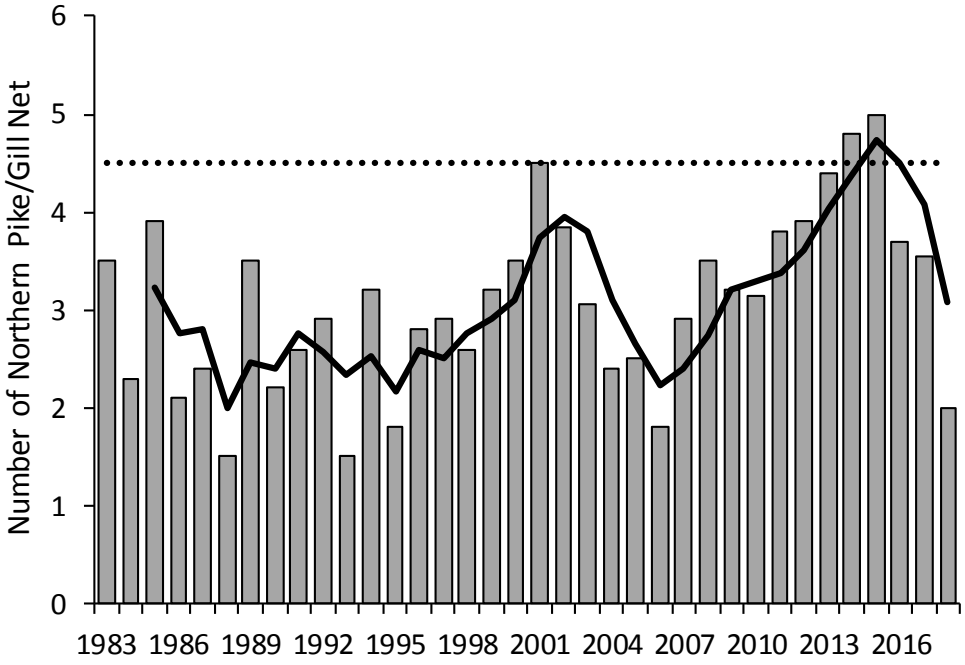

Figure 9. Relative abundance of Northern Pike in Cass Lake (1983 – present). The solid line displays the three-year moving average and the dotted line represents the upper limit of management plan objective for Northern Pike abundance (4.5 fish/net).

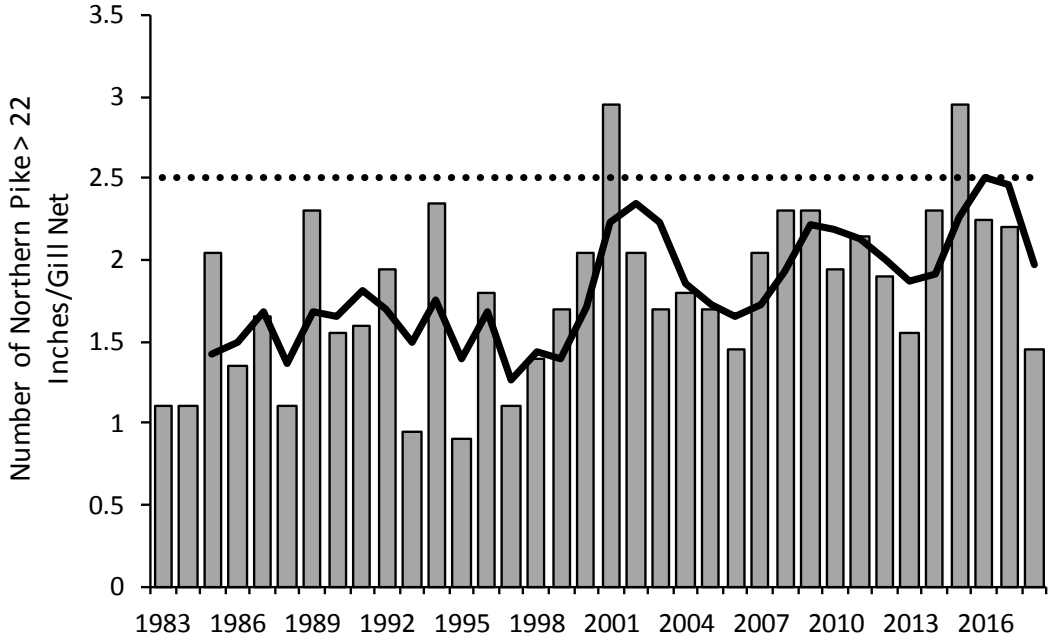

Figure 10. Relative abundance of Northern Pike greater than 22 inches in Cass Lake (1983 – present). The solid line displays the three-year moving average and the dotted line represents the lower limit of the management plan objective for medium-large Northern Pike abundance (2.5 fish/net).

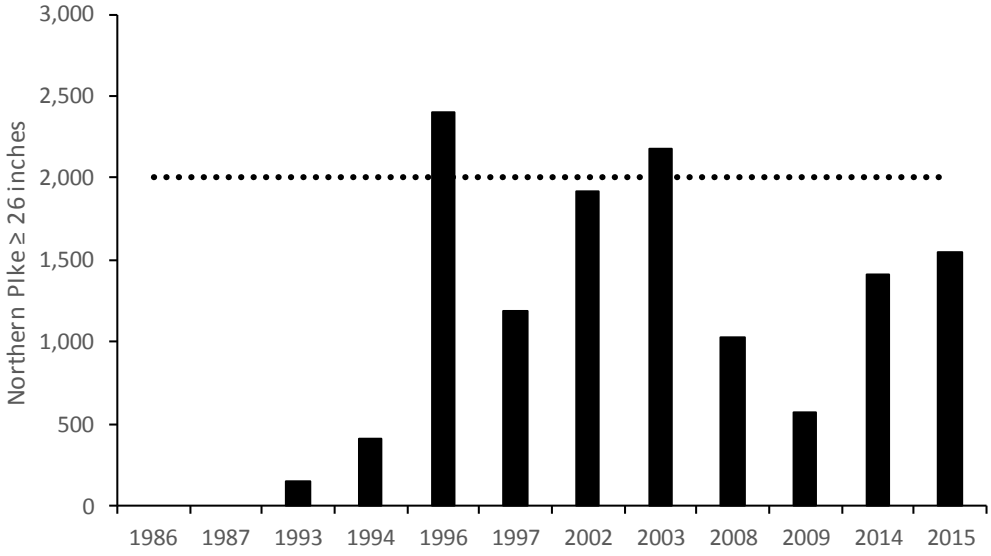

Figure 11. Angler catch of Northern Pike ≥ 26 inches in Cass Lake during open-water creel surveys. Data not available for 1986-1987 surveys. The dotted line represents the lower limit of the management plan objective for angler catch of Northern Pike over 26 inches (2,000 fish). This objective represents an approximate 50% increase in the catch of Pike over 26 inches.

Muskellunge – Muskellunge are given secondary management consideration in Cass Lake and managed to provide a trophy fishery. While the current 54-inch statewide minimum length limit does allow harvest of exceptional fish, most Muskellunge in Cass Lake do not achieve this size. This increases the recycling of large fish and maximizes the opportunity for fish to be caught by multiple anglers. This native population is sustained entirely by natural reproduction and while it is not known how much of the lake's total population is represented in adult population estimates generated from sampling conducted in Allen's Bay and along the western shore, two estimates yielded similar estimates of slightly more than 600 fish. Thus, we set the objective for adult population size (measured in similar fashion) to approximate this number. The well-balanced Muskellunge population in Cass Lake is characterized by a broad length distribution and consistent recruitment into the spawning population. The presence of first- or second-time spawners in spring assessments (generally fish < 42 inches in length) is important to replacing fish that senesce out of the population or are lost to hooking mortality or harvest and these fish should comprise a substantial portion of a healthy population. The recruitment objective is an important parameter to monitor now that the 54-inch minimum size limit is in place, which may increase the potential for recruitment suppression. Cass Lake has demonstrated the ability to produce large fish and our trophy potential objective is for angler-reported catches to include fish 50 inches and larger. While trophy potential is important, it should not be managed for at the expense of recruitment suppression and declining angler catch rates. Catch rates for anglers targeting Muskellunge have generally increased over time, even as targeted angling pressure has increased. Higher catch rates are supported by consistent recruitment and recycling of individuals. The angler catch rate objective is for catch rates to be remain greater than the average observed during previous creel surveys, which is both reasonable and achievable given the increased catch rates observed in recent years when fish have been afforded more protection.

<u>Muskellunge objectives:</u>

1. Abundance: Maintain a naturally reproducing population with a mature adult population estimate of approximately 600 fish
2. Recruitment: At least 40% of fish caught in Spring assessments conducted during the spawning period should be less than 42 inches (Figure 12)
3. Trophy potential: Angler catches should include individuals that are at least 50 inches in length (Figure 13)
4. Angler catch rate: Maintain targeting anglers catch rates greater than 0.015 fish/angler hour during open-water creel surveys (Figure 14)

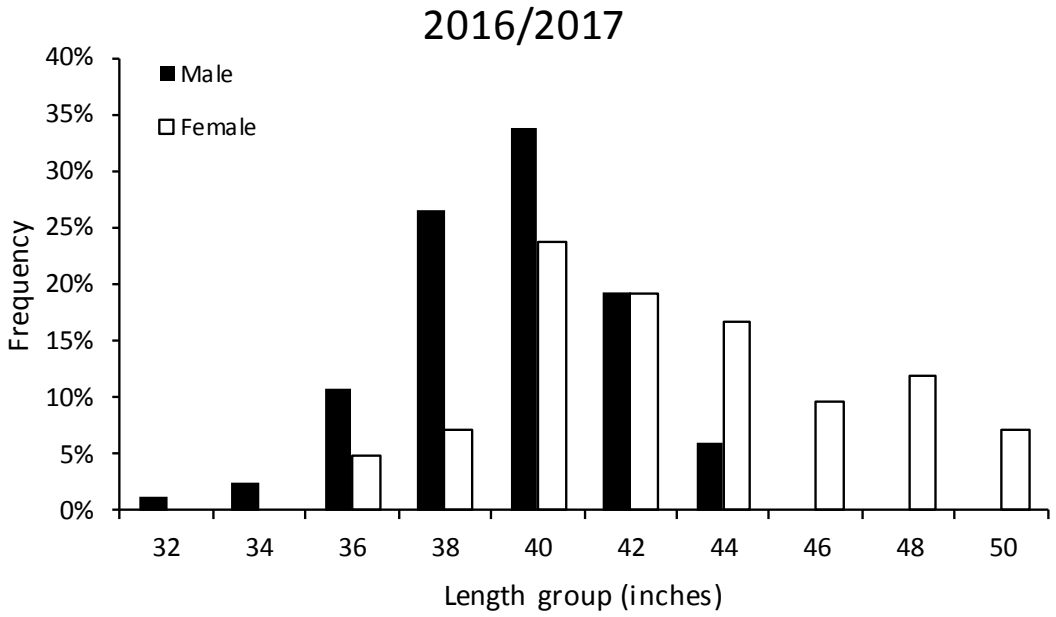

Figure 12. Length frequency distribution during the most recent Muskellunge assessment on Cass Lake. Sixty three percent of fish captured in the 2016-2017 assessment were less than 42 inches. This exceeds the management objective that at least 40% of the length distribution in targeted assessments be comprised of fish less than 42 inches.

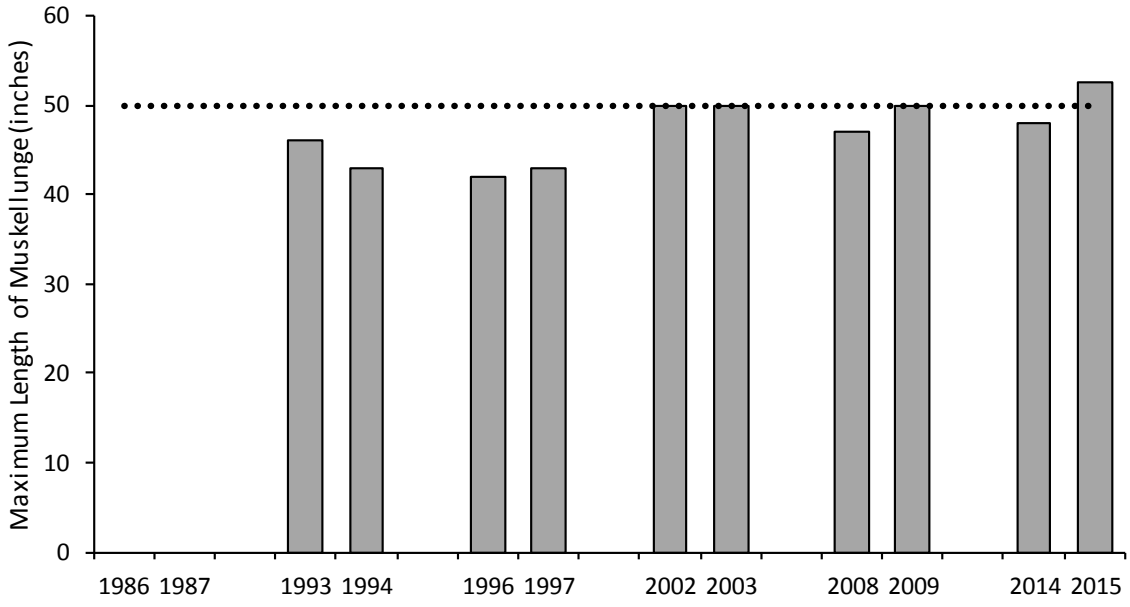

Figure 13. Maximum length of Muskellunge reported to the creel clerk during open-water creel surveys on Cass Lake. The dotted line represents the management objective for the creel survey to contain reports of fish 50 inches or greater in length. Length data are unavailable for 1986 and 1987.

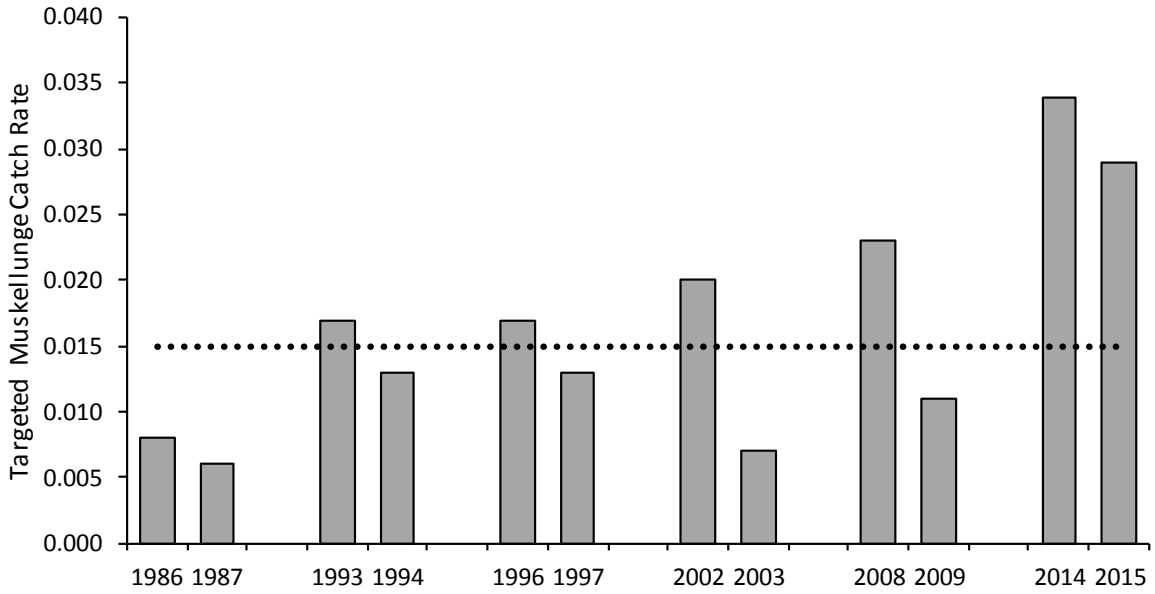

Figure 14. Targeted angler catch rates for Muskellunge during open-water creel surveys on Cass Lake.

Management Actions to Address Sportfish Goals and Objectives

The species-specific objectives defined above are designed to provide a "red flag" that a fish population or fishery parameter may be trending in an undesirable direction. A red flag for a single parameter may not initiate immediate management action, but should be monitored closely. Multiple red flags for a single species, or even across species, like interaction between Walleye and Yellow Perch, would generally be required before considering a management adjustment. Additionally, failing to meet a particular objective a number of times with no ill effect on other population parameters may indicate a need to revisit that objective rather than initiate corrective action.

Current Operational Plan

Assessment

1. Annual sampling on Cass Lake is conducted as part of the Minnesota Department of Natural Resources' Large Lake Monitoring Program.
    a. Zooplankton sampling: May to October.
    b. Water samples: late July/early August
    c. Bottom trawling: late August
    d. Gill net assessment: late September
    e. Age-0 Walleye electrofishing: late Sept/October
    f. Water temperature: continuous collection using dataloggers at two locations
2. Coordinated gill net assessments on connected waters are scheduled every 10 years (2019, 2029…)
    a. Gill net data are used to generate Chain-wide estimates of Walleye population size and spawning stock biomass (SSB).
    b. Wild fry estimates will be generated by stocking OTC-marked fry proportionally throughout the Chain in the spring following coordinated gill net assessments (2020, 2030…).
        i. See *Stocking* section for detail.
        ii. Age-0 Walleye electrofishing in August throughout the chain to collect the recapture sample for mark-recapture estimates.
    c. Wild fry estimates will be used to establish a relationship between total SSB and total wild fry production throughout the chain.
    d. Assessments of connected waters follow MNDNR standard survey protocol which include both gill net and trap net components. However, timing of the sampling is split to complement the species targeted. Trap net sampling is conducted early in June to better sample panfish species for potential regulation evaluation. Gill net sampling is done in August to align closer to large lake sampling, and ease the determination of sex and maturity in the Walleye sample.
3. Targeted trap netting assessments are conducted periodically for Northern Pike and Muskellunge.
    a. Muskellunge trap netting assessments are followed by electrofishing assessments the following spring to produce adult population estimates. The next targeted Muskellunge assessment is scheduled for 2021-2022.
    b. Fisheries objectives for Northern Pike identified within this document rely on gill net and creel data and do not necessitate trap net assessments. Thus, no targeted Northern Pike assessments are scheduled at this time. Targeted assessments in 2011 and 2016 provide baseline data against which to compare future assessments if desired.

4. Creel surveys are scheduled on a one-year-out-of-four rotation beginning in 2020 (previously a two-years-out-of-six rotation).
    a. Open-water creel surveys begin on Fishing Opener and continue through mid-October. Shifts in Walleye fishing practices (i.e., increased after-dark fishing pressure) during the open-water period suggest that the traditional daytime creel survey may be missing a substantial portion of targeted fishing pressure and harvest of Walleye and thus an after-dark component will be included beginning with the next survey.
    b. Winter creel surveys in 2011-2012 and 2014-2015 suggest that winter fishing pressure and harvest are extremely light relative to the open-water season. As a result, winter creel surveys are deemed unnecessary at this time but could be resumed if changes in winter activity are observed.

Stocking

1. No direct Walleye fry stocking into Cass Lake proper is recommended, except for evaluation stocking events to measure wild fry production (see #2 above). Walleye fry stocking occurs in a number of connected waters and an evaluation of the dispersal of stocked fry from the Lake Andrusia put-back stocking throughout the Cass Lake Chain is nearing completion (See Kennedy 2020).
    a. Annual Walleye fry stocking into Lake Andrusia is programmed at a constant 3 million fry, with allowance for stocking up to 1 million additional surplus fry.
        i. This programmed stocking rate deviates slightly from the policy of returning 10% of eggs taken at the Big Lake Creek spawning location as fry into Lake Andrusia each year.
        ii. A stocking rate of 3 to 4 million fry into Lake Andrusia is the equivalent of a 10% put-back stocking for an egg take of 230-300 quarts of eggs (at 130,000 eggs/qt). During a typical year, the number of eggs taken at the Big Lake Creek spawning location would fall within this range.
        iii. The programmed stocking of 3 million fry into Lake Andrusia will continue even if no Walleye eggs were taken at the Big Lake Creek spawning location due to low water, short-term budget constraints or other reasons.
    b. Additional stocking of fry produced by the Big Lake Creek egg take operation into connected waters will continue with Kitchi, Big Rice, and Little Rice Lakes stocked on alternate (even) years and annual stocking of Pike Bay. The stocking rate for these lakes is 1,000 fry/littoral acre. The sum of these programmed stocking events into the Cass Chain will considerably exceed 10% of eggs taken from the Big Lake Creek spawning operation when averaged over multiple years.

c. If insufficient numbers of Big Lake Creek fry are available to reach stocking quotas within the chain, the closest available genetic strain (Cutfoot) should be used to fulfill the stocking quota.
d. Fry stocking quantities and distribution can be altered in years when OTC-marked fry are stocked to facilitate the generation of wild fry estimates.
    i. The total number of marked fry stocked should approximate predicted wild fry production based on the Chain-wide SSB estimate.
    ii. Those fry will be distributed proportionally by the number of littoral acres per basin.

2. Stocking of other species into Cass Lake or connected waters is not recommended.

Regulations

1. Continue to manage primary and secondary species in the Cass Lake fishery using statewide bag limits and length restrictions.
    a. Cass Lake is the only lake in the Large Lake Monitoring Program that remains under the statewide Walleye regulation (six fish daily limit, with only one over 20 inches) and, as such, Cass Lake is frequently used as a reference lake for other lakes in the program. Walleye regulation change will only be considered if key population metrics (e.g., growth, recruitment, size distribution, mortality, etc.) suggest a special regulation is warranted, or if statewide fishing regulations change.
    b. Connected waters of the Cass Lake Chain are being considered for special regulations (five fish bag limit) on sunfish. It has not yet been determined if Cass Lake will be included in this regulation package.
        i. Finalize and submit the special regulation proposal by fall of 2019.
        ii. Post proposed regulations in May 2020.
        iii. Formal public input meetings in September 2020.
        iv. If approved, implement special regulation in March 2021.
        v. Additional targeted sunfish assessments may be included in the special regulation evaluation plans if they are implemented.

Coordination

1. Continue semi-annual meetings with Leech Lake Division of Resource Management (LLDRM) to facilitate coordination of fisheries management activities on the Leech Lake Reservation. Typically, one meeting proposes activities for the upcoming field season and the other reports on the results from the previous year. Discussions at these meetings generally include assessments, surveys, stocking, environmental review, invasive species and other relevant fisheries management issues.

2. Coordinate with the U.S. Forest Service through informal communications and periodic, issue-based meetings as needed. Operation of the Knutson Dam bypass channel is the most commonly discussed issue pertaining to Cass Lake.
3. Continue coordination with Ottertail Power Dam operations on the Mississippi River to stabilize flows near optimal levels for the duration of the Walleye spawning and incubation period.
4. Conduct environmental review of Ecological and Water Resources permit applications on Cass Lake or connected waters as needed.
5. Participate in periodic collaboration with MNDNR Fisheries Research and various universities to conduct research to answer system-specific and broader fisheries science questions. Currently, Bemidji Area Fisheries is working with Fisheries Research and the University of Minnesota to assess thermal-optical habitat for Walleye in Cass Lake.
6. Conduct annual meetings with the Cass Lake FIG to review assessment survey results and compare to management plan goals and objectives. Consider broader public invitation to these meetings.
7. Review Cass Lake Management Plan in 2024.

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