Lake Lac Courte Oreilles Esox Recovery Plan

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Background:

Lake Lac Courte Oreilles (hereafter LCO) is a 5,039 acre natural lake in Sawyer County (Figure 1). This lake is home to a native and world renowned population of muskellunge that have potential to reach record size. At one point this was a top angling destination for muskellunge anglers. The lake also supports a tribal spear fishery for both muskellunge and walleye during winter and spring. However, the current muskellunge population is not meeting is full potential in either abundance or size of fish which has led to a significant decrease in angling interest, and presumably tribal spearing success. Some of the issues facing the LCO musky population can be summarized by this excerpt from the LCO Fishery Management Plan (Pratt and Neuswanger 2006):

"Northern pike first appeared in LCO in the mid-1950s. Pike density increased from 1 adult per acre during the 1960s to 2-3 adults per acre during the 1970s. In concert with the premature aging of Musky Bay, the expansion of northern pike into LCO dramatically reduced or eliminated natural recruitment of muskellunge. No natural reproduction (survival of young to September) was documented during a 1966-1970 experimental period when no muskellunge were stocked. Since that time, estimates of adult musky population density have been less than half the estimated density during the late 1950s and early 1960s…In natural, clear-water lakes with low alkalinity and stable water level, substantial pike populations have all but eliminated natural recruitment of muskellunge."

This plan is not intended to replace the 2006 fishery management plan (FMP) but instead focuses on attainting the specific goals for pike and musky established within that plan using a cooperative effort from the WDNR, the LCO Tribe, Muskies Inc., anglers, resorts, and lakeshore owners on LCO. This plan builds on strategies already incorporated into the FMP and adds new strategies that my increase the odds of attaining shared goals for this fishery. The overall goal of this plan is:

To restore muskellunge as the dominant esox species in LCO and create a more desirable muskellunge fishery for both anglers and tribal harvesters.

To accomplish this goal we must meet the following objectives:

1. **Reduce density of northern pike to acceptable levels**
2. **Increase density of adult muskellunge (to 0.2-0.3 adults per acre)**
3. **Improve muskellunge recruitment and stocking success**

Further discussion of each objective, along with strategies to accomplish each objective are detailed below. Furthermore, roles of individual agencies or organizations will be established.

Figure 1. Aerial photograph of Lac Courte Oreilles, with Little Lac Courte Oreilles visible to the southeast of the main lake

OBJECTIVE 1: Reduce density of northern pike to acceptable levels

Current Status:
Northern pike are not known to be native to LCO and are believed to have entered the system sometime between 1945 and 1950 through illegal introduction. Since their introduction, the abundance of northern pike has been steadily increasing while muskellunge abundance appears to be decreasing. The relationship between pike and muskellunge in Lac Courte Oreilles has been described as “one of the best documented examples of a negative association in abundance {between the two species} (Inskip 1986). A figure from Johnson (1981) illustrates the early increase in pike and coinciding decrease in muskellunge during the first several decades after pike introduction in Lac Courte Oreilles (Figure 2, reproduced from Inskip 1986). It is also possible to compare capture ratios between these two species up to present to further illustrate the shift in dominance that has occurred between muskellunge and pike (Table 1). Both exercises tell

a similar story. In the early 60's, shortly after pike introduction, muskellunge outnumbered pike 10 to 1 in surveys. Pike capture rate in relation to muskellunge increased slightly over the next two decades to the point where they were being captured at a very similar rate. In the early 1990's pike numbers began to balloon to the point that pike outnumbered muskellunge on the order of 50:1. That ratio has stayed relatively constant through present day.

Figure 2.

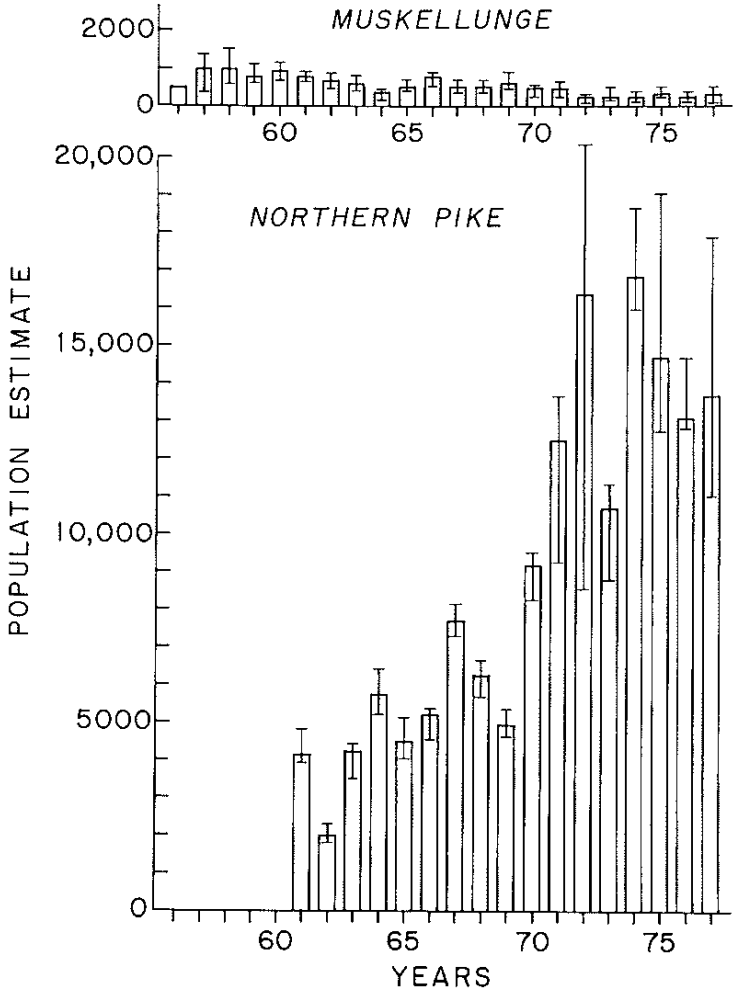

Figure 4. Population estimates for muskellunge and northern pike in Lac Court Oreilles, Wisconsin from 1956 to 1977. Ninety-five percent confidence limits also are shown. Redrawn from Johnson (1981) with permission of the publisher.

From Inskip 1986

Table 1. Ratio of northern pike to muskellunge appearing in fyke netting surveys of Lac Courte Oreilles since 1964

Year	Pike:musky ratio
1964	0.1
1976	3.7
1988	1.0
1991	68.1
2001	56.4
2012	68.5

Research on muskellunge x pike interactions is generally not considered to be conclusive, and there are examples of these two species coexisting. However, the massive fish community shift that has happened in LCO, particularly with respect to esocids, suggests that pike have had detrimental effects on muskellunge early life survival and in turn overall density. Additionally, pike in LCO exhibit generally poor size structure (Figure 2), likely as a result of the population being too dense to support good growth. The end result is a pike fishery that is undesirable to anglers and tribal harvesters because size is poor, and a muskellunge fishery that is undesirable because abundance is low. Accomplishing fishery objectives for both species hinges on reduction in pike abundance.

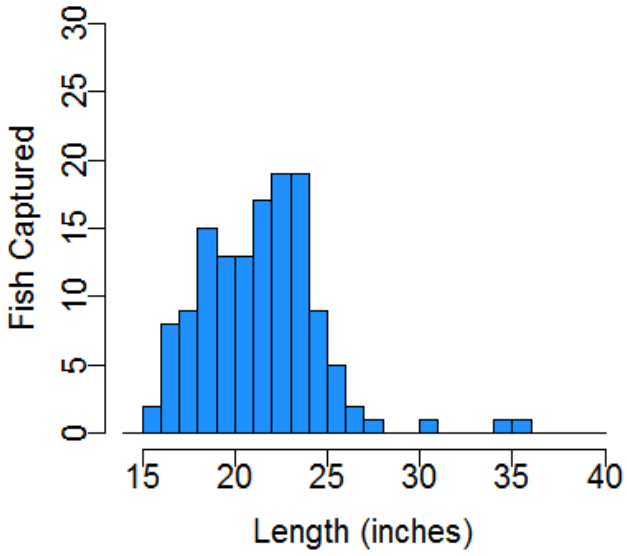

Figure 2. Size histogram of northern pike captured in the most recent (2012) DNR fyke netting survey of Lac Courte Oreilles. Only 2% of northern pike in this survey exceeded 28 inches while nearly half were under 21 inches.

Measure of success:
We will consider our efforts to achieve Objective 1 successful if northern pike relative abundance is decreased by 75% from the current 5 year average of 10 per net night in DNR surveys or northern pike appear in surveys at a ratio to muskellunge that does not exceed 3:1. A secondary measure of success will be improved size structure of northern

pike which is currently poor (<5% of pike exceed 28 inches). Size objectives for pike on LCO are to have 15-25% exceed 28 inches (Pratt and Neuswanger 2006).

Strategies for accomplishing objective:

A. Mechanical removal: Targeting spawning northern pike using fyke nets is likely the most effective way to capture large numbers of individuals in a short amount of time. This had been tried in the past in an isolated effort that removed several thousand pike. Repeated focused removals have a greater likelihood of having an impact on the pike population. These efforts are time intensive and costly and will require multiple agencies/organizations to execute effectively. We propose intensive mechanical removal every other year starting in 2016.
Who is involved: DNR will take lead with LCO Conservation assistance when available. Volunteers will be solicited from the lake association and Muskies Inc. to help with field operations.

B. Increased angling harvest: The most recent DNR creel survey (2001) estimates that **12,830 pike are caught by anglers each year (2.3 per acre) yet only 2,012 are harvested** (0.4 per acre). There are huge gains to be made in pike population control by getting anglers on board with harvesting this species. Outreach campaigns related to this plan (signage, news releases, instructions on Y-bone removal) could be effective to increase angler harvest. Selective harvest tournaments or events could be organized to both drive harvest and awareness. It will be important to stress that all sizes of pike should be harvested, not just large ones. Increasing the daily angling bag limit will likely be infeasible unless changes are made to the statewide possession limit. Removing the closed season for northern pike could be possible and may attract significant angling attention and harvest during late winter.
Who is involved: DNR, lake association, resorts

C. Increased tribal harvest: Northern pike are available for tribal members in the Ceded territory to harvest with little restriction on either spring or winter spear fishing. To further aid this, DNR would waive any trigger limits related to off-reservation pike harvest.
Who is involved: LCO Conservation, tribal members

Note on harvested pike: all harvested pike should be consumed or donated for consumption. In the past, harvested pike were processed and served to LCO Tribal elders. Continuing this program could be possible with financial support from a partner organization such as Muskies Inc. Other harvested fish could be donated to food shelves or served at charity events.

OBJECTIVE 2: Increase density of adult muskellunge

Current Status:
The LCO muskellunge population is characteristically low density but retains world class size potential. Several muskellunge in the mid-50 inch size range have been captured within the last decade indicating that the trophy potential for this lake has not changed. However, recent data suggests that the current abundance of muskellunge in the lake is considerably lower than historical and is having a significant negative impact on fishing success and fishing interest. Creel surveys have found muskellunge catch rates to be one fish per 60-80 hours of targeted effort per fish, far exceeding the average for Wisconsin's Class A and B waters (27 hours per fish). We expect LCO to have lower than average catch rates, but rates that are this low are considered unacceptable to most anglers, even when size may be well above average. Anglers have stopped viewing LCO as a musky fishing destination, as evidenced by the hours of angling per acre of water which in 2001 was 70% lower than the average for other muskellunge lakes in the area (standardized for total acreage). Rough population estimates based on recaptures of PIT tagged fish in 2014 indicate the density of adult muskellunge in LCO is around 0.05 fish per acre (or around 250-300 total adult muskellunge), 4-6 times lower than target levels.

Measure of success:
We will consider our efforts to achieve Objective 2 successful if muskellunge density is increased to 0.2 to 0.3 adult fish per acre, as measured by mark recapture population estimates using PIT tags.

Strategies for accomplishing objective:

A. Stocking: Natural recruitment of muskellunge has been almost non-existent since northern pike became abundant in the lake. As a result muskellunge stocking has been a regular management action on LCO for many years (Appendix A). However, stocking rates were decreased in 2001 under the belief that higher stocking levels were not needed as anglers adopted catch and release ethic. This response from the population did not materialize as planned and stocking rates have since been increased. Keeping stocking rates of fall fingerlings (avg. length 10-13 inches) at a high level is one possible way to execute this strategy. However, stocking success in this predator rich environment may be higher with larger fingerlings (avg. length 13+ inches, Margenau 1992). Producing these larger fingerlings may be made possible through partnerships between DNR and LCO Conservation as well as with Muskies Inc. DNR stocking will likely occur every three years based on broodstock rotation. Stocked muskellunge should be PIT tagged when possible to track stocking success and allow detection of natural recruitment.
   Who is involved: DNR, LCO Conservation, Muskies Inc.

B. Minimize angling mortality: This strategy deals with both direct (harvest) and indirect (catch and release) angling mortality. Several steps have already been taken in Wisconsin to minimize sources of muskellunge mortality related to

angling. LCO is currently regulated with a 50 inch minimum size limit, a one daily bag limit, and restrictive seasons to protect spawning fish. Most (>90%) anglers exclusively practice catch and release anyhow, even when catching a legal fish. However, this does not preclude the possibility that anglers will harvest a trophy size fish for mounting if caught. Additionally, certain types of fishing (live bait) have potential for considerable post-release mortality that often goes undetected by anglers. Eliminating use of single hook sucker rigs in Wisconsin was a major step toward avoiding this type of mortality, but an unknown amount of post-release mortality should still be expected to exist. In the interest of making this plan comprehensive and achieving the greatest likelihood of success all steps to limit adult mortality should be taken. Therefore, through this plan the DNR may propose further restrictive length limits (60 inches) and may also propose eliminating live bait fishing for muskellunge on LCO.
Who is involved: DNR, general public

C. Limit tribal harvest: The rights of Lake Superior Ojibwa people to harvest fish both on and off-reservation has been well established through treaties and upheld in court decisions. Regulated tribal spear fishing harvest has been common practice for Ojibwa tribal members in Wisconsin for several decades. There are numerous safeguards in place to ensure that tribal and sport angling harvest (combined) are sustainable. However, tribal harvest does account for some adult muskellunge mortality on LCO where spring off-reservation harvest averages around 7 fish and winter and on-reservation harvest are not reported. This plan does not question the rights of Ojibwa people to harvest fish nor does it suggest that tribal harvest has led to the exceptionally low numbers of adult muskellunge in LCO (which is believed to be due to lack of natural recruitment and low stocking success over many years). However, as a part of this plan we ask tribal partners to recognize that there is a tremendous amount of unmet potential in this muskellunge fishery and consider self-regulating harvest of muskellunge for a number of years. This concession, in addition to those made by anglers, combined with other strategies outlined in this plan give us the greatest possibility of restoring this muskellunge population to its true potential. This limit on tribal harvest would be considered temporary until abundance based objectives for muskellunge can be attained.
Who is involved: LCO Conservation, tribal members

OBJECTIVE 3: Improve muskellunge recruitment

Current Status:
The ultimate goal for any wild fish population should be for that population to sustain itself naturally without management assistance (stocking). It has been decades since significant muskellunge recruitment was observed in LCO. Two factors are believed to be limiting reproductive success of LCO muskellunge: northern pike abundance and degraded spawning habitat. Northern pike have serious potential to limit survival of young muskellunge directly through predation or indirectly through competition for food at critical early life stages (Inskip 1986). LCO contains some of the most well studied and

historic muskellunge spawning habitat in the world in Musky Bay. While it has been difficult to quantify, the professional opinion of many resource professionals familiar with the area is that this habitat has been degraded by invasive species and sedimentation. The conditions for spawning in Musky Bay are currently more favorable for pike than muskellunge.

Measure of success:
We will consider our efforts to achieve Objective 3 successful if natural recruitment of muskellunge is again observed in LCO during surveys. PIT tagging should be used to determine whether fish appearing in surveys are stocked or natural.

Strategies for accomplishing objective:

A. Limit predation on young muskellunge: This strategy overlaps heavily with those under Objective 1 (A-C). Additionally, largemouth bass abundance should be monitored and controlled as this species has been shown to be another effective predator on young muskellunge (Wahl and Stein 1999).

B. Protect and restore muskellunge spawning habitat: Even recognizing other lofty initiatives in this proposal, this task may be the most ambitious. Protection of existing muskellunge spawning habitat will take a concerted effort by all parties involved in the management of LCO to accomplish. Restoration of degraded habitat will require an even more massive effort and may include large physical transformations of the lake bed which will be expensive and complex. Those efforts may be integral but are outside the scope of this plan. Management agencies and stakeholders should be looking for opportunities and funding to initiate such efforts in the future.

Literature Cited:

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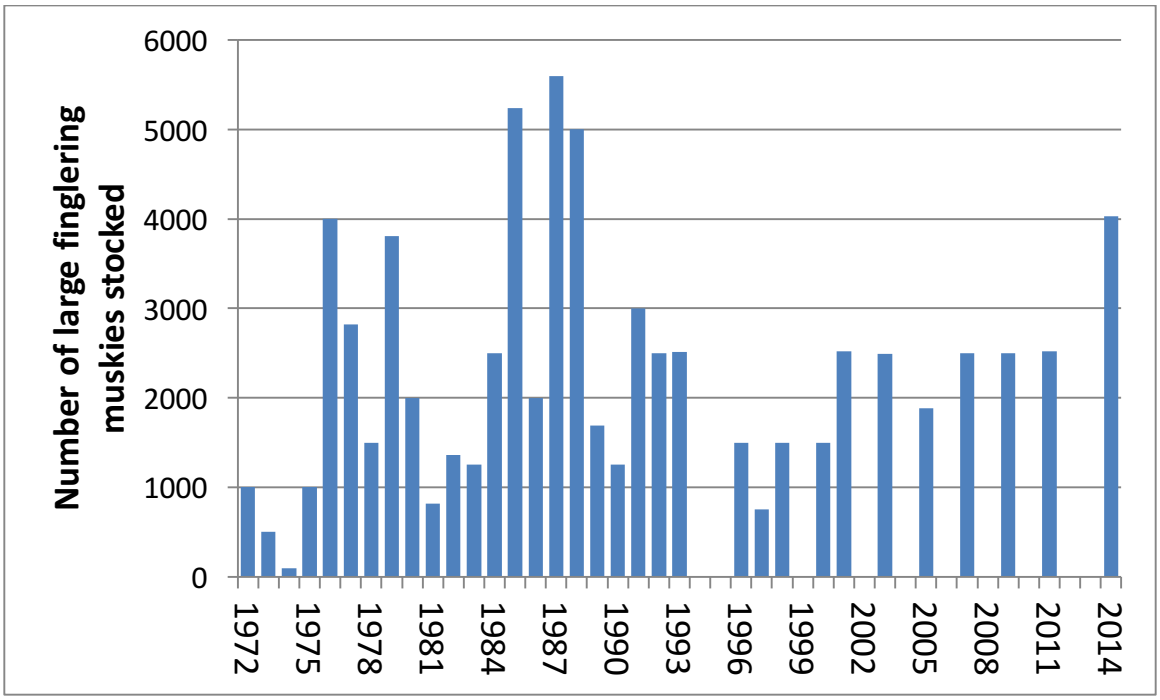
APENDIX A.



Annual muskellunge stocking history in Lac Courte Oreilles dating back to 1972.