

Fishery Management Plan

Lac Courte Oreilles

Sawyer County, Wisconsin

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FOREWORD AND ACKNOWLEDGMENTS

This is a long-term strategic plan that will guide our fishery management efforts on Lac Courte Oreilles (LCO), Little LCO, and the Billy Boy Flowage for many years to come. We believe our fishery management plans should be based upon a shared vision that is developed by combining information from statewide angler surveys, onsite creel surveys, and interactive input from local stakeholders and tribes. From those sources we determine user preferences in light of ecosystem capability. We believe the goals of a good plan must reflect the shared vision between users and managers; and measurable objectives must be set so we know whether selected strategies are succeeding or failing. We believe in making good tries and learning from failure. Part of that process involves amending strategic plans (like this document) when failure dictates that we either develop more realistic objectives or change our strategies to achieve reasonable objectives. This plan should be updated as needed in the decades that follow.

We call this a “long-term strategic plan” because the goals and objectives are relatively timeless, and because we possess neither the wisdom nor the authority to commit DNR or partner resources to a specific operational schedule of funding and action. Each year will bring its own fiscal constraints and operational priorities, so we must remain flexible in our implementation of proposed actions. Because there are so many complex and inter-related strategies, we have chosen to forego the lengthy process required to secure statewide DNR approval at this time. We will do our best to justify actions we believe necessary to realize our shared vision to DNR leaders and the general public as time and circumstances permit. We promise only to consult this plan at least once annually as we allocate our time and resources to the many important projects before us.

We want to thank the Lac Courte Oreilles Lake Association for hosting our local stakeholder visioning session at Hayward Veteran’s Center on June 11, 2005. We also want to thank the 21 local stakeholders who gave up an entire Saturday afternoon in order to help us develop the vision that forms the backbone of this plan. Finally, we thank the aquatic resource management professionals at LCO Conservation for meeting with us on two occasions to provide input on behalf of the Lac Courte Oreilles Ojibwe Tribe, thus ensuring that all interests are considered in this Plan. We are very pleased to incorporate everyone’s input at this appropriate stage in the planning process; and we look forward to continuing support for the actions we believe will be necessary to achieve the shared vision. We can settle for nothing less in an area where the quality of fishing means so much to our livelihoods and our quality of life.

-- Frank Pratt and Dave Neuswanger

BACKGROUND

Habitat Characteristics and Productivity

Lac Courte Oreilles (LCO) is a large, deep, clear natural drainage lake at the headwaters of the Couderay River in northwestern Sawyer County. LCO receives water from Whitefish Lake via Whitefish Creek and from Grindstone Lake via Grindstone Creek. LCO drains into Little LCO and the Billy Boy Flowage downstream; and the Couderay River outlets the entire system with a normal flow of 26 cubic feet per second. Based upon total phosphorus, chlorophyll *a* and other indicators, LCO is classed as mesotrophic – a moderately productive lake (Table 1). There is enough algal production and subsequent decomposition to deplete dissolved oxygen in the hypolimnion (lower depth zone) during summer stratification.

Table 1. Limnological characteristics of Lac Courte Oreilles. All chemistry data are from the LCO main lake basin (exclusive of Musky Bay).

Limnological Parameter	Absolute or Mean Value (range if known)
Physical Characteristics	
Surface Area	5,039 acres (5,353 with Little LCO & Billy Boy)
Volume	169,000 acre-feet
Water Level Elevation	1286.5 feet above mean sea level
Maximum Depth	90 feet
Mean Depth	34 feet
Littoral Zone	28 % of lake area <20 feet deep
Shoreline Distance	25.4 miles (34.2 with Little LCO & Billy Boy)
Watershed Area (direct drainage)	16.9 square miles
Watershed Area (indirect drainage)	65.8 square miles
Chemistry and Primary Productivity	
Methyl Purple Alkalinity	50 parts per million (range 43-79 ppm)
pH	7.5 (range 6.9-7.9)
Specific Conductance	107 micromhos/cm (range 99-156 μ mhos/cm)
Total Phosphorus	13 parts per billion (range 4-26 ppb)
Chlorophyll <i>a</i>	4 parts per billion (range 2-6 ppb)
Secchi Disk Visibility	11.5 feet (range 9.5-15.8 feet)
Trophic State Index	41 (classed as mid-mesotrophic)

Substrate (bottom type) in the littoral (near-shore) zone of LCO is comprised mostly of sand, gravel, and rock. Notable exceptions are Musky Bay and Stucky Bay, where soft muck rich in detritus (dead organic matter) is the predominant substrate.

The average depth of 255-acre Musky Bay is only 6 feet (maximum 18 feet). High phosphorous concentrations in Musky Bay have caused dense plant growth in recent decades. The constant decay of dead plant matter reduces the amount of dissolved oxygen at the mud-water interface to levels too low for muskellunge eggs to survive.

Musky Bay was named in deference to its historical significance as a muskellunge spawning area before human activity caused it to age prematurely. A lawsuit filed by the State Attorney General's Office on behalf of lakeside landowners alleging pollution of Musky Bay by an adjacent cranberry grower is currently in post-trial deliberation. The court trial was concluded in fall 2005, and the judge is expected to rule on the case in the near future.

Human Development and Public Access

The direct watershed is comprised of 72% upland forest, 11% wild grassland and hay crop, 7% row crop, 8% wild wetland, 2% cranberry bog, and 1% residential development. In summary, 85-90% of the direct watershed is wild, and 10-15% is impacted directly by human development and agricultural activities, not including timber management.

Residential development is moderate. Since the 1960s, there has been a steady transition from small, seasonal residences to large, permanent residences; and the number of resorts has declined markedly (Table 2). In recent years the trend has been for resorts to sub-divide into private, single-family residences or to manage former resort dwellings as condominiums. The increase in private residences has been influenced by this trend, but most of the increase is due to new construction. LCO and Little LCO have a “category 1” (least restrictive) shoreland zoning classification, requiring new residential developments to have a minimum lot width of 100 feet and a minimum structure setback of 75 feet. The Billy Boy Flowage currently has a “category 2” classification (150-foot lot width) and has been proposed by LCO Conservation and Sawyer County for “category 3” protection (200-foot lot width) in order to protect wild rice beds. Since 1998, development has been subject to more rigid zoning and construction site requirements, including a 35-foot shoreline buffer zone. Prior to 1998, buffer zone management was voluntary and not widely practiced. Lakeside landowners are now starting to embrace the buffer zone philosophy, including voluntary restoration of buffers on “grandfathered” developments.

Table 2. Residential shoreline development on Lac Courte Oreilles.

Year	Residences	Resorts
1967	206	18
1998	542	3
2005	651	3

There is approximately 0.9 mile of public frontage on LCO, consisting of 39 undeveloped, platted lots, three developed boat access sites (two Town and one State), and some remnant conservancy parcels on Musky Bay. The State access site off County Highway K on Chicago Bay was developed by the Wisconsin DNR using federal Sport Fish Restoration funds in the late 1970s. It has a double-wide concrete boat ramp, a barrier-free roll-out boarding dock, pit toilets, and a parking area for 50 car-trailer units.

Historical Perspective on the Fishery

Records suggest that muskellunge were native to Lac Courte Oreilles, where a self-sustaining population existed in the absence of northern pike. A one-time world record muskellunge was caught in LCO by Cal Johnson in 1949. That fish weighed 67 pounds, 8 ounces – the second largest muskellunge currently recognized by the National Freshwater Fishing Hall of Fame in Hayward, Wisconsin. Because of their large ultimate-size potential and the ease of capture of wild broodstock in Musky Bay, fish of the LCO strain were the primary source for decades (and still are the ultimate source) of most fish propagated and stocked in northwestern Wisconsin. They were also the source of most muskies stocked in Minnesota during 1982-1987 after the Minnesota DNR realized that the Shoepack Lake strain used in their hatchery program grew much more slowly and achieved a much smaller ultimate size than either the LCO strain or their native Leech Lake strain. Most of the trophy muskies (over 50 inches long) caught in Mille Lacs, Minnesota during the past five years originated in Wisconsin hatcheries and reflect the large ultimate-size potential of Wisconsin fish, which have been heavily influenced by the LCO strain.

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. When submersed plants rooted in soft, organically enriched sediments replaced emergent plants growing on firm substrates in the littoral zone of Musky Bay, the stage was set for pike to gain a reproductive advantage over muskellunge. (Pike eggs can stick to vegetation above the bottom, whereas muskellunge eggs fall to the mucky bottom of Musky Bay and die in the absence of sufficient dissolved oxygen.)

Muskellunge and black bass (largemouth and smallmouth) probably were the main predators in Lac Courte Oreilles before the introduction of other game species. Walleye probably were not native to Lac Courte Oreilles, as they did not appear in significant number until the 1940s after many years of stocking in the mid-1930s. We speculate that walleye were excluded from this system originally by a combination of upstream migration barriers in the Couderay River system, and a fish community dominated by other native predators. We know even less about the appearance of black crappie in this system; we can only surmise that humans transferred them to LCO at some point in time.

The eastern half of LCO lies within the Lac Courte Oreilles Ojibwe Indian Reservation and has always been open to spearing by members of the LCO Tribe. Since the Voight decision in 1985, both on-reservation and off-reservation portions of LCO have been popular locations for Indian spearing. As a result, surveys are performed to estimate population density and set safe harvest levels for the shared walleye and musky fisheries. Game fish population estimates and angler creel surveys were conducted in 1988, 1991, 1996, and 2001.

Off-reservation spearing harvest of walleye has ranged from 3 to 990 fish per year, averaging only 356 fish (0.07 per acre) annually. Tribal harvest typically requires that DNR reduce the sport fishing bag limit from 5 daily to 2 or 3 daily according to a formula that minimizes the risk of exceeding the safe harvest level for the shared fishery. This is a common adjustment in walleye waters of the Ceded Territory. Off-reservation spearing harvest of muskellunge has ranged from 0 to 20 fish, averaging 7 fish annually. The Voight decision did not require tribes to track or report on-reservation harvest during the spring, nor did it require any reporting of winter harvest, so the significance of those sources of mortality is unknown. We believe very little winter spearing effort occurs on Lac Courte Oreilles.

Past management of LCO includes two unsuccessful attempts to establish a two-story trout fishery during the 1970s. The first attempt to introduce lake trout failed because of insufficient dissolved oxygen in the summer hypolimnion. Brown and rainbow trout had a broad band of suitable mid-water habitat, but stocked fingerlings of both species survived poorly because of predation by established coolwater and warmwater game species. LCO occasionally produces a trophy rainbow trout that probably has escaped from an adjacent fish farm.

Lake groups have funded, built, and placed 250 modular plastic fish cribs in Lac Courte Oreilles over the past 20 years. Recent funding for this work was obtained through Walleyes for Northwest Wisconsin's annual ice fishing event, which is held at LCO every winter.

Aquatic Community Overview

Many species of aquatic plants inhabit this moderately productive lake. Weed beds tend to be sparse in the main lake but heavier and denser in the bays, especially Musky Bay. Some of the most common macrophytes include Canada waterweed (*Elodea canadensis*), fern pondweed (*Potamogeton robbinsii*), coontail (*Ceratophyllum demersum*), muskgrass (*Chara sp.*), water buttercup (*Ranunculus sp.*), northern watermilfoil (*Myriophyllum sp.*), bulrush (*Juncus sp.*), and water celery (*Vallisneria americana*). In recent years dense mats of floating filamentous algae have developed in Musky Bay. Planktonic algae is rarely dense enough to create any noticeable “bloom” effect.

Currently the only known invasive species (plant or animal) in the LCO system is curlyleaf pondweed, which was discovered in approximately a one-acre area of Musky Bay by LCO Conservation in summer of 2005. Like all boater-accessible waters in the region, the lake is at constant risk from such exotics, including Eurasian watermilfoil, purple loosestrife, zebra mussel, spiny water flea, rusty crayfish, and fish like European ruffe. The LCO Lake Association began participating in the Clean Lakes Program by inspecting boats at the state access site on summer weekends in 2006.

The most recent fish community survey was performed during 2000-2001 with the primary objective of determining walleye and muskellunge population density for purposes of setting safe harvest levels for the fishery shared with LCO tribal members. Muskellunge density was very low and presumably stable (Table 3). Walleye density was low but probably increasing as natural recruitment begins to occur more frequently. Northern pike density was moderate, but probably high enough to hinder natural recruitment of muskellunge in nursery areas where young adult pike are concentrated. Methods used in this type of survey do not produce good information for species other than musky, walleye, and northern pike; but the presumed status of other species is described subjectively in Table 3. Most anglers agree that smallmouth bass have increased dramatically since the statewide minimum length limit was increased to 14 inches in 1998. Some strong natural year classes in recent years probably have contributed to the perceived increase in bass density.

Table 3: Summary of Lac Courte Oreilles fish community characteristics based upon netting, electrofishing, and angler creel surveys conducted during 2000-2001.

Species	Abundance	Average Size	Population Trend
Muskellunge	1 per 20 acres	40"	Stable?
Smallmouth bass	Common	15"	Increasing
Walleye	1.5 per acre	20"	Increasing
Black crappie	Present	10"	Stable
Northern pike	2-4 per acre	23"	Stable
Yellow perch	Common	9"	Stable
Bluegill	Common	7"	Stable
Largemouth bass	Rare	14"	Increasing?
Whitefish	Present	14"	Stable?
Cisco	Common	7"	Decreasing?

Other fish species known or suspected to inhabit LCO currently include white sucker, greater redhorse, bluntnose minnow, spottail shiner, blacknose shiner, and other small cyprinid species; trout perch, log perch, johnny darter, rainbow darter, and other small darter species; pumpkinseed, rock bass, longear sunfish, tadpole madtom, bullheads (black, yellow, and brown); slimy sculpin, longnose gar, and rainbow trout. Historically lake sturgeon were present in the Couderay River downstream; sightings reported in system lakes are unverified.

An angler creel survey was conducted during 2000-2001 following the region-wide protocol used to estimate angler effort, catch, and harvest on lakes within the Ceded Territory that are shared with tribal harvesters. Total fishing pressure was relatively light (13 hours per acre) during spring/summer/fall 2000 and early winter 2001. Most angling effort was directed toward walleye, muskellunge, northern pike, and smallmouth bass, in that order (Table 4). Specific catch rates (fish caught but not necessarily harvested by anglers fishing for a particular species) were very low for muskellunge, low for walleye and crappie, and high for northern pike and smallmouth bass (Table 4).

Estimated angler harvest of walleye was only 0.2 per acre (Table 4), but that was three times the average annual off-reservation spearfishing harvest of walleye at LCO. A significant number of northern pike were harvested (0.4 per acre), but a high release rate (84%) indicates that pike harvest promotions under the statewide daily bag limit (and no length limit) might be a feasible option for reducing the density of northern pike relative to muskellunge. The creel survey did not document any angler harvest of muskellunge or largemouth bass (Table 4), even though minor harvest may have occurred. The 50-inch minimum length limit protects most muskellunge from harvest; but it does not protect them from accidental kill associated with the use of live bait rigs.

Table 4. Summary of results from the 2000-2001 angler creel survey at Lac Courte Oreilles.

Species	% of Total Angling Effort	Angler Catch Rate Hours per Fish (% Released)	Angler Harvest Total Number (Number per Acre)
Walleye	26	16.7 (39)	1127 (0.2)
Muskellunge	22	66.7 (100)	0 (0)
Northern Pike	20	2.3 (84)	2012 (0.4)
Smallmouth Bass	12	2.4 (95)	575 (0.1)
Largemouth Bass	5	5.6 (100)	0 (0)
Bluegill	5	0.8 (88)	1082 (0.2)
Black crappie	4	5.0 (78)	485 (0.1)
Yellow perch	4	1.4 (84)	516 (0.1)

A Vision for the Lac Courte Oreilles Fishery

On June 11, 2005, DNR representatives Frank Pratt and Dave Neuswanger met with approximately 21 local stakeholders who were willing to volunteer their time to help develop a long-term vision for the fishery of 5,039-acre Lac Courte Oreilles (LCO) in Sawyer County. Objectives of the meeting were to prioritize species of interest, and then to identify for those species the relative importance of numbers versus size and catch versus harvest. Attention was then focused on identifying the desired conditions (goals and objectives) that appear in this plan.

Actual verbiage of goals and objectives was developed by consensus of local stakeholders in consultation with Frank Pratt, who served as technical advisor to the group on what was possible. However, no attention was given to methods for achieving goals and objectives (management strategies such as harvest regulations, fish stockings, and habitat preservation or enhancement). It was understood and generally agreed that professional fishery managers would select the most appropriate strategies once goals and objectives had been developed by local stakeholders and adjusted to incorporate what is known about statewide angler preference and the capacity of LCO to produce what is desired.

Following the general stakeholder visioning session, Frank Pratt and Dave Neuswanger also met with designated representatives of the Lac Courte Oreilles Band of Ojibwe Indians whose reservation surrounds approximately half the lake shoreline. To the best of our ability, the traditional fishing interests of the Tribe have been incorporated into this plan based upon input from their representatives.

Detailed results of the visioning session appear in the Appendix. Muskellunge ranked first among all species of interest among participating stakeholders, reflecting a strong interest in restoring and maintaining a long-standing tradition of quality musky fishing at LCO (Table A1). Interestingly, despite the current existence of a 50-inch minimum length limit, local stakeholders strongly preferred a balance between numbers and size, rather than an emphasis on size over numbers (Table A2). We do not believe this reflects anti-trophy sentiment at LCO, because the vast majority of local stakeholders and musky anglers in general would rarely keep a fish. Rather, it seems to reflect the current perception that muskellunge density has declined to an unacceptably low level; and that low density, despite a reasonable proportion of trophy-size fish (>50 inches), is insufficient to meet most expectations for the fishery.

Smallmouth bass were of high or medium importance to almost all participants in the visioning session (Table A1). DNR lacks good data on the density and size structure of smallmouth bass in area lakes, but several anglers (including one SCUBA diver) attending the session expressed their opinion that LCO had an excellent smallmouth population characterized by high numbers of big fish. Some participants valued size over number, but most desired a balance between numbers and size. As with muskellunge, most local stakeholders enjoyed catching but had little interest in harvesting smallmouth bass (Table A2).

Walleye were very important to local stakeholders who participated in our visioning session (Table A1), as they are to members of the Lac Courte Oreilles Band of Ojibwe who harvest walleye by spear both on and off the Reservation. Though LCO produces many large walleye, participants in our session were not interested in a trophy walleye fishery or one that emphasized size over number. Most preferred balance, but there was a slight bias toward numbers over size, and most viewed walleye as a species to be harvested and eaten, at least sometimes (Table A2).

Black crappies were not thought to be abundant in LCO, but there was substantial interest in maintaining a crappie fishery characterized by balance between numbers and size, even if that means releasing some fish (Tables A1 and A2).

Northern pike present a special challenge at LCO. Visioning session participants, other anglers, and biologists agree that there is a substantial population of northern pike that not only provides good pike fishing, but also may hinder natural recruitment of muskellunge by preying upon young-of-year and yearling muskies. Visioning session participants did not value northern pike as highly as muskellunge, but pike were of medium importance to 11 of 18 participants and of high importance to 3 (Table A1).

Visioning session participants also had low to moderate interest in yellow perch, largemouth bass, and bluegill in LCO, but there was insufficient time to develop specific objectives for these species. We will manage this lake as an ecosystem and consider the role of all species; but we believe the five high-priority goals outlined in this plan will provide a sufficient challenge to fishery management in the years to come.

MUSKELLUNGE

GOAL 1: A muskellunge population of moderate density with a moderate proportion of memorable-size fish and a low-moderate proportion of trophy-size fish.

Objective 1.1: 0.2 to 0.3 adult muskellunge per acre in population estimates

Objective 1.2: Of all muskellunge 20 inches and longer captured by fyke netting in early spring, 30-40% should be 42 inches or longer (RSD-42 = 30-40%).

Objective 1.3: Of all muskellunge 20 inches and longer captured by fyke netting in early spring, 5-10% should be 50 inches or longer (RSD-50 = 5-10%).

Muskellunge Status and Management Strategies

We have been unable to document natural recruitment of muskellunge in LCO since musky spawning habitat deteriorated in Musky Bay and northern pike became well established 30-40 years ago. Stocking has been required in recent decades in order to maintain even a low-density population of 200-600 adult fish (based upon seven mark/recapture population estimates during 1967-1997). Stocking quotas were reduced in 2001 from annual to alternate-year requests for 2,500 large fingerlings (10-12 inches) to reflect the belief that catch-and-release under the 50-inch minimum length limit implemented in 1998 would reduce adult mortality and the need to stock. LCO is one of many local waters currently included in a ten-year (2002-2012) statewide stocking evaluation designed to determine if lower stocking rates can accomplish desired objectives.

In spring of 2001, two of the 35 fish captured in our spring fykenetting survey exceeded 55 inches in length; so we know that fish in LCO have the potential to grow to high-end trophy size. But some of the most proficient anglers and guides in the Hayward area raised concerns in fall of 2002 that they were seeing relatively few muskies of any size in LCO. In 2004, a voluntary angler diary project coordinated by leaders of the Hayward Lakes Chapter of Muskies, Inc. revealed that participants caught only one musky every 76 hours of musky-specific effort in 106 recorded trips, thus confirming either low density or low vulnerability to angling of fish being protected under the high minimum length limit.

Because LCO is one of four lakes in Sawyer County where motor trolling is legal, anglers and guides have fished open-water areas in addition to traditional weed beds and bars, all with limited success. These observations and others raise the possibility that traditional methods used by DNR to estimate musky population density in LCO may not be sensitive to subtle or even moderate changes. It is also possible that reduced angling vulnerability among older, more experienced fish is at least partially responsible for low angler catch rates.

Regardless of cause, low angler catch rates for muskellunge are a problem at Lac Courte Oreilles; and not enough trophy-class fish are being seen or caught by anglers. The following strategies are aimed at helping us to better understand and correct this problem if possible:

Musky Strategy 1A: Characterize the genetic stock of LCO muskellunge and compare today's population with fish captured over the past several decades. This work is currently underway at the University of Wisconsin–Stevens Point in the Conservation Genetics Laboratory of Dr. Brian Sloss. DNA will be extracted from hundreds of spine samples collected over the past 50 years from LCO, originally for age and growth analysis. Those samples and modern samples will be analyzed by using at least 12 recently developed microsatellite DNA markers in order to determine genetic type, health, and variability of the current musky population, and to determine whether LCO muskies have changed over time as a result of mixing fish from other northern Wisconsin populations. Results will help us to decide whether stock transfers from other waters would be a prudent strategy for increasing the adult population quickly, and also whether fish from LCO might still serve as a good source of broodstock for future hatchery operations.

Musky Strategy 1B: Support efforts to restore quality muskellunge spawning habitat in Musky Bay. Early in 2005, Frank Pratt provided testimony vital to a Department of Justice lawsuit on behalf of several lakeside landowners alleging that nutrient effluents from a nearby cranberry farm contributed to the accelerated aging of Musky Bay and the concomitant degradation of muskellunge spawning habitat. We cannot anticipate the outcome of that litigation at this time; but we will support any court-ordered or voluntary attempts to dredge the Bay and enhance the near-shore zone in a manner that tips the balance of habitat back in favor of muskellunge over northern pike. This would require firmer substrates low in decomposing organic matter; more emergent aquatic plants near shore combined with cobble or rubble-sized rock where young muskies could evade predation by northern pike; and fewer submersed aquatic plants rooted in organic-rich sediments – a habitat conducive to northern pike reproduction. If significant areas of littoral zone can be restored for muskellunge reproduction, it will be important in the long term to ensure that near-shore sediments remain relatively free of leaf litter from deciduous trees and other rapidly decaying organic matter such as grass clippings. Therefore, lakeside landowners should be encouraged to protect or plant trees that retain most of their foliage – like white pine, eastern hemlock, and northern white cedar – in a wide buffer strip along a wild shoreline. Some existing deciduous trees could be felled into the water (during the leaf-off stage) to create additional nursery habitat for young muskellunge.

Musky Strategy 1C: Northern pike of all sizes and ages eat young muskellunge until they become too large to consume. Besides restoring the spawning and nursery habitat of Musky Bay to favor muskellunge over northern pike, we should encourage activities (annual fishing events) and public awareness efforts aimed at increasing the harvest of northern pike under liberal harvest regulations (currently 5 pike daily with no length restriction). Reducing the voluntary release rate from 84% to less than 50% would be a good operational target. A celebration of pike harvest at the annual ice-fishing fund-raiser sponsored by “Walleyes for Northwest Wisconsin” is a good example of what can be done when folks pull together. Public awareness efforts should include informing LCO tribal members of the potential benefits of harvesting pike by spear, in hopes that they will perceive value in catching and eating northern pike as their Ojibwe relatives have done at Mille Lacs, Minnesota, where 5,000 pounds of pike were harvested in 1991. We also retain the option to consider physical removal when pike are concentrated to spawn if other methods fail and the cost of such drastic action in time or dollars is not prohibitive.

Musky Strategy 1D: We have considered transferring as many as 500 adult muskellunge (28-38 inches long) from Butternut Lake in Price County to Lac Courte Oreilles in order to quickly tip the esocid community balance back in favor of muskellunge over northern pike. (We do not believe that fingerling stocking alone will accomplish this.) A sample of 20 muskellunge from Butternut Lake was certified free of disease in spring of 2005, paving the way for such a transfer. But action is still pending a comparison of the genetic stocks between the two waters and may not proceed until 2007, pending the results of that analysis. We will not transfer adult muskellunge from Butternut Lake to LCO unless they appear to be very similar genetically. A 50-fish sample has been collected from Butternut Lake, and comparative tests should be run in spring of 2006. The field-transfer project has three main objectives: 1) Reduce the density of adult muskellunge in 1,000-acre Butternut Lake from 1.0/acre to 0.5/acre in order to improve growth rate and size structure there; 2) Increase the density of adult muskellunge in LCO from 0.05/acre to 0.15/acre as soon as possible; and 3) Provide a large pool of marked fish (all those transferred) in order to facilitate accurate estimates of population density, growth rate, and harvest rate. It is our sincere hope that LCO Tribe members will embrace this transfer of muskellunge from a lake they do not usually spear to one they do. If the transfer proceeds, we will encourage our tribal neighbors to utilize this resource and also to report, voluntarily, their harvest of marked and unmarked fish as a check on our netting-based estimates of population density. Additionally, in exchange for infusing LCO with numerous young adult muskies relatively low in mercury, we will suggest that high-mercury, trophy-sized fish be passed over voluntarily during the spearing seasons, except of course for spearers who themselves seek a mounted trophy rather than a fish for consumption.

Musky Strategy 1E: Recently reported research reveals that muskellunge caught on swallowed, single-hook sucker rigs experience an extremely high rate of post-release mortality (83%) which can be delayed for up to a year. We know that local tackle shops have stopped selling such rigs, and most local guides do not use them anymore. But we do not know how many unguided anglers continue to use such rigs that they have made or purchased elsewhere. We also do not know the extent of post-release mortality associated with the use of quick-set live-bait rigs when those rigs are not fished properly. These could be significant sources of mortality that are inconsistent with our goal of maintaining a trophy musky fishery. Therefore, we are interested in participating in the development of a proposal to more closely regulate the use of live bait for muskellunge in order to minimize post-release mortality.

Musky Strategy 1F: Currently Little Lac Courte Oreilles and the Billy Boy Flowage are not included in the 50-inch minimum length limit for Lac Courte Oreilles, despite the fact that these waters are well connected; and we are all but certain that significant movement of muskellunge occurs between lakes in this system. We will propose, as a matter of housekeeping (no voting required at Spring Hearings of the Conservation Congress), that Little Lac Courte Oreilles and the Billy Boy Flowage be included in the 50-inch minimum length limit, so all that fish moving freely within this system are under the same protections.

Musky Strategy 1G: We need to improve the frequency and quality of monitoring. Occasional angler creel surveys performed as part of the Treaty assessment protocol provide little useful information beyond musky fishing effort and catch rate. We need more frequent and better information on angler catch rates and the size distribution of fish caught in order to adequately evaluate effects of the 50-inch minimum length limit (which will remain in effect unless we learn that it must be even higher to achieve Objective 1.3) and other strategies proposed in this Plan. If enough local anglers are interested in helping (at least 30 cooperators who plan to fish for muskies several times in a given year), we are willing to coordinate a voluntary angler diary program like the one piloted in 2004 on a periodic basis – perhaps once every three years at Lac Courte Oreilles.

SMALLMOUTH BASS

GOAL 2: A smallmouth bass population of high density with a high proportion of memorable-size fish.

Objective 2.1: Electrofishing capture rates for 7-inch and longer smallmouth bass of 40-60 per hour during the bass spawning season.

Objective 2.2: Of all smallmouth bass 7 inches and longer captured by electrofishing during the bass spawning season, 30-50% should be 17 inches or longer (RSD-17 = 30-50%).

Smallmouth Bass Status and Management Strategies

Despite the importance of smallmouth bass to local stakeholders and their increasing popularity statewide, we have no estimate or index of smallmouth bass density other than an angler catch rate of 1 fish for every 2.4 hours of directed effort for bass reported in the 2001 creel survey (Table 4). That represents pretty good bass fishing, and observations by anglers and divers suggest that size structure is excellent. Because the smallmouth population seems to be functioning well and poses no known threat to the attainment of other important objectives, we recommend no changes in regulation (statewide 14-inch minimum length limit), stocking, or habitat management. Continued conservation of shoreline buffer zones will ensure good spawning and nursery habitat for young smallmouth bass. Such habitats could be enhanced with shoreline tree drops, which we encourage.

Over the past 15 years, approximately 200 Aqua-Cribs have been installed in off-shore areas as “hyper-habitat” for various species, including smallmouth bass. Large numbers of these modular plastic structures were encouraged over smaller numbers of more traditional and labor-intensive log cribs due to legitimate concerns about the potential for overharvest of congregations of fish attracted to just a few easily located structures. Volunteer groups continue to ask if habitat can and should be improved for smallmouth bass and other species by installing more fish cribs in off-shore areas. Bass populations have increased in northern Wisconsin in lakes with and without such habitat structures since the late 1990s, probably in response to increased regulatory protection and favorable spring spawning conditions. Man-made structures undoubtedly affect fish distribution and daily movement. But to date, there is insufficient evidence to prove or reject the hypothesis that adding man-made off-shore structures will increase smallmouth bass numbers or sizes (or any other fish species) beyond the satisfactory numbers and sizes that exist today.

Volunteer efforts and funds probably are better spent on other important projects, like protecting and enhancing shorelines with natural vegetative buffers, and enhancing near-shore habitat for spawning and young fish (including smallmouth bass and muskellunge) with tree drops. Any group determined to install fish attractors should know that Lac Courte Oreilles is classified as an Outstanding Resource Water (ORW) in Sawyer County. As such, a special permit (including a Public Notice process) is required before anything other than a standard log fish crib can be installed in off-shore areas. The latter can be done under a General Permit, but we strongly discourage placing just a few log fish cribs in off-shore areas, because they could easily become “fish coffins” if installed in low numbers that do little more than concentrate fish for harvest.

We need to implement a monitoring program that allows us to index smallmouth bass density and size structure periodically so we can determine whether Objectives 2.1 and 2.2 are actually being met. This will most likely involve nighttime electrofishing in late spring when all sizes of smallmouth bass can be expected to be vulnerable to capture in the near-shore zone. Modifying our sampling protocol in Treaty assessment surveys might also provide more useful information for smallmouth bass, including obtaining estimated lengths of fish caught and released by anglers during creel surveys. (Currently, only rare harvested bass are measured by the creel clerk.) One alternative method for monitoring smallmouth bass in clear-water lakes like LCO is to perform counts based upon standardized dive transects. We should explore the possibility of contracting such surveys with certified divers in the area.

WALLEYE

GOAL 3: A walleye population of moderate density with a high proportion of quality-size fish and a moderate proportion of preferred-size fish.

Objective 3.1: 3-5 adult walleye per acre in spring population estimates

Objective 3.2: Of all walleye 10 inches and longer captured by fyke netting in early spring, 50-70% should be 15 inches or longer (PSD = 50-70%) and 5-10% should be 20 inches or longer (RSD-20 = 5-10%).

Walleye Status and Management Strategies

We began stocking walleyes at LCO in 1977 with alternate-year stockings of 100,000 (20/acre) 1.5-inch fingerlings in early summer. As in most stocked populations, adult density has been low (below 2/acre). Growth rate has been very fast, resulting in quality size structure, even under the statewide minimum length limit of 15 inches. Recruitment to the LCO walleye population was dependent upon the fingerling stocking program for many years (Table 5). In the non-stocked years of 2000 and 2002, we documented the first significant natural reproduction of walleye in LCO. Fall electrofishing capture rates of young-of-year walleye in 2001 (55 per mile) and 2003 (29 per mile) were so much higher than during previous stocked years (13 per mile) that we think natural reproduction may have been significant in 2001 and 2003 as well (Table 5).

Table 5. History of walleye stocking and natural reproduction in LCO, 1976-2005.
Stocking occurred in June, and electrofishing surveys were done in September.

Stocking and Survey Dates (number of surveys)	Small (<2") Fingerlings Stocked?	Fall Capture Rate of Young-of-Year Walleye (# per mile)	Natural Reproduction?
1976-98 (10)	No (even yrs)	0.3 (range 0-2)	Insignificant
1977-97 (5)	Yes (odd yrs)	13 (range 2-15)	Insignificant
1999	Yes	15	Unknown
2000	No	15	First Significant
2001	Yes	55	Mixed
2002	No	29	Very Significant
2003	Yes	29	Mixed
2004	No	6	Low
2005	No*	2*	Very Low

* The LCO Tribe stocked extended-growth walleye fingerlings in fall 2005, and the few young-of-year captured in 2005 appeared to be stocked fish, judging from their size.

Why the LCO walleye population has taken so long to become self-sustaining is subject to much conjecture. Spawning habitat is not the problem, because quality spawning sites are available and utilized in Whitefish Creek and along rocky lakeshores. (Whitefish Creek is a designated spawning refuge from April 15 to May 15.) One reasonable hypothesis is that ciscoes (lake herring) were once more abundant than they are today (Table 6), and that they repressed walleye reproduction either directly (by eating larval walleye) or indirectly (by competing with larval walleye for zooplankton food at a critical life stage). We think the testing of this hypothesis at LCO and other lakes would make an excellent graduate student research project.

Table 6. Capture rates of ciscoes (lake herring) sampled by electrofishing, seining, and gill netting in LCO, 1976-2005.

Year	Electrofishing Capture Rate Number/Hour (miles shocked)	Seining Capture Rate Number/Seine Haul (number of hauls)	Gill Netting Capture Rate Number/100 Feet (hundreds of feet)
1976-79	0.6 (76)	42 (10)	No Samples
1981-88	0.01 (102)	4 (4)	No Samples
1990-1999	0 (178)	0.3 (3)	0 (7)
2000-2005	0 (127)	0 (3)	7 (15)

To put the data in Table 6 into perspective, capture rate in nearby Whitefish Lake (where ciscoes are considered to be abundant) averaged 163 ciscoes per haul in 90 seine hauls during 1999-2005. And in 1977, ciscoes were captured at a rate of 1,550 fish per hundred feet of gill net in Whitefish Lake.

We believe an increase in walleye density from <2 adults per acre to 3-5 adults per acre (Objective 3.1) is most likely to be achieved if natural recruitment becomes the norm at LCO. (Average adult density of unstocked lakes in the Ceded Territory is 4 per acre compared with only 2 per acre in stocked waters.) On the basis of observations made during 2000-2003 (Table 5), we discontinued stocking 1.5-inch fingerlings and reclassified LCO to “NR” (Natural Reproduction) status for purposes of calculating safe harvest levels for the shared fishery. In cooperation with our colleagues at the LCO Conservation Department, we will monitor natural reproduction carefully.

We think we can use the data in Table 5 and Treaty Assessment protocols in order to monitor trends in natural reproduction and make decisions about the need for supplemental stocking. During years when the capture rate of YOY walleye falls below 12 per mile, we will consider permitting the privately funded or tribally sponsored stocking of extended-growth walleye fingerlings (5-7 inches long) that fall or the following spring at densities up to 1 fingerling per acre (5,000 fish maximum) in order to supplement a presumably weak natural year class. Permit approval will hinge upon the willingness of private sources of extended-growth walleye fingerlings to subject their broodstock and/or fingerlings to genetic testing in order to ensure that fish being stocked are genetically similar to LCO fish and do not possess characteristics that could reverse the 2000-2003 trend toward natural reproduction and recruitment at LCO. We will try to develop a voluntary genetic testing protocol with the assistance of Dr. Anthony Kern, Assistant Professor of Biology and Biochemistry at Northland College in Ashland, Wisconsin. For the cost of primers, reagents, and perhaps a little travel expense, Dr. Kern and his students could perform the testing as a real-world application of genetic science in natural resource management.

We need to develop a monitoring program that does not rely exclusively upon the labor-intensive process of conducting actual mark/recapture population estimates for walleyes, because that can be done only once every 10-12 years under the Treaty Assessment protocol on most waters. The current statewide baseline monitoring program does not help us to assess adult walleye population density or size structure on deep, clear-water lakes like LCO because it involves setting mini-fykenets in shallow water in mid summer and performing shoreline electrofishing in the fall when most adult walleyes are in deep water. We will encourage our central office staff and scientists with our Integrated Science Services Division to examine the large dataset collected during past Treaty Assessment surveys in order to determine if some type of single-trip spring survey could be conducted in a way that would yield useful information about the relative abundance and size structure of adult walleye populations in lakes like LCO. If such a system could be developed, we would revise Objectives 3.1 and 3.2 to reflect the new, more efficient measurement parameters.

CRAPPIE

GOAL 4: A black crappie population of low-moderate density with a high proportion of memorable-size fish.

Objective 4.1: Currently we lack an effective method to assess the relative abundance of black crappie. Until an assessment tool is developed, we will consider a late spring or mid fall fykenet capture rate of 5-10 crappie per net-night to be indicative of the desired low-moderate density.

Objective 4.2: Of all crappie 5 inches and longer captured by fyke netting in late spring or mid fall, 40-60% should be 12 inches or longer (RSD-12 = 40-60%).

Black Crappie Status and Management Strategies

We have no recent fish surveys or creel survey data that would allow us to describe the current status of the crappie population. Anglers and our own anecdotal observations suggest that the population is characterized by low density and excellent size structure. A few 12-14 inch black crappies were harvested during the Family Ice Fishing Contest sponsored by “Walleyes for Northwest Wisconsin” on March 4, 2006. Density may be lower than desired, but until we develop an assessment method for crappie in lakes like LCO, we will not know their true status.

If we achieve walleye management Objective 3.1, the increase in walleye density will probably keep natural recruitment of crappie at a low level. (Walleye are very effective predators on young crappie.) If future monitoring reveals that crappie density and/or size structure are lower than desired because of low recruitment and higher-than-sustainable harvest, we reserve the option to impose more restrictive harvest regulations (both bag limits and length limits) in order to achieve Objectives 4.1 and 4.2. However, no changes will be recommended until we have better information upon which to act.

During winter of 2004 there was a major winterkill of large crappie (and bluegill) in Musky Bay due to dissolved oxygen depletion over an extensive shallow area of decomposing plants. Dredging the bay would reduce biochemical oxygen demand and reduce the likelihood of recurrence of such a winterkill – yet another reason to support habitat restoration in Musky Bay.

NORTHERN PIKE

GOAL 5: A northern pike population of low density with a high proportion of preferred-size fish and a moderate proportion of memorable-size fish.

Objective 5.1: 0.5-1.0 adult northern pike per acre in spring population estimates, or indexed fykenet capture rates indicative of such density

Objective 5.2: Of all northern pike 14 inches and longer captured by fyke netting in early spring, 15-25% should be 28 inches or longer (RSD-28 = 5-10%) and 5-10% should be 34 inches or longer (RSD-34 = 5-10%).

Northern Pike Status and Management Strategies

The moderate-density population of northern pike (2-4 per acre) is at least partially responsible for low or nonexistent natural recruitment of muskellunge at LCO. We do not believe it is possible to create or sustain good fisheries for both species in clear lakes with low alkalinity and stable water level. Therefore, our management strategies must be biased toward the higher-priority species (muskellunge in this case) over a medium-priority species (pike in this case) in such systems. This seems to be reasonably consistent with local stakeholder preference for size over number of pike, and for a moderate level of pike harvest (Table A2). Based upon results of the Family Ice Fishing Contest sponsored by “Walleyes for Northwest Wisconsin” on March 4, 2006, northern pike size structure was very good, but it could be improved. Average length of the first 22 pike registered by participants was 27 inches; and 36% were over 28 inches long. None, however, were over 34 inches long.

Harvesting more pike 24-34 inches long may allow remaining fish to grow faster and attain lengths that would allow us to meet Objective 5.2 (RSD-34 = 5-10%). If the pike population can be reduced to a level compatible with a musky fishery priority (<1 pike per acre) while growing enough large pike to interest pike anglers (>0.5 per acre), we will have reached our objectives and achieved a reasonable compromise between interests. We do not believe that any special pike regulations are needed at this time. Strategies for achieving both muskellunge and pike population objectives appear in the Muskellunge section of this Plan under Strategies 1B, 1C, and 1D.

APPENDIX

Results of Visioning Session for Stakeholders in the Fishery of Lac Courte Oreilles in Sawyer County, Wisconsin

Date: June 11, 2005

Time: 2:00 p.m. to 6:00 p.m.

Place: Veteran's Center in Hayward, WI

Facilitator: Dave Neuswanger, Fisheries Supervisor, Upper Chippewa Basin, WDNR

Technical Advisor: Frank Pratt, Senior Fisheries Biologist, Hayward, WDNR

Profile of 21 Participants:

Lakeside Landowners – 13

Area Anglers – 5

Fishing Guides – 2

Business Owners – 1 (Resort)

Others – counted above (LCO Tribe, Walleyes for NW Wisconsin, Muskies, Inc.)

Table A1. Levels of sport fishing interest among visioning session participants in fish species nominated for consideration at Lac Courte Oreilles.

Fish Species Nominated	Level of Participant Fishing Interest			
	High	Medium	Low	None
Muskellunge	13	2	1	0
Smallmouth Bass	9	6	1	0
Walleye	10	2	1	0
Black Crappie	7	6	2	0
Northern Pike	3	11	2	2
Yellow Perch	3	5	8	0
Largemouth Bass	2	4	9	2
Bluegill	0	6	10	0

Table A2. Preferences for numbers versus size and catch versus harvest among visioning session participants for fish species perceived to be most important at Lac Courte Oreilles.

Important Fish Species	Preference for Numbers versus Size			Preference for Catch-and-Release versus Harvest		
	Emphasis on Number over Size	Prefer Balance	Emphasis on Size over Number	Emphasis on Catch and Release	Prefer Balance	Emphasis on Maximum Sustainable Harvest
Muskellunge	0	13	2	14	1	0
Smallmouth Bass	0	12	4	14	2	0
Walleye	3	13	0	1	9	6
Black Crappie	0	12	4	0	14	2
Northern Pike	0	6	9	2	11	0

