EXECUTIVE SUMMARY

Prepared by Aaron P. Woldt, James R. Bence, and Mark P. Ebener

In August 2000 the State of Michigan's Department of Natural Resources (MDNR), five tribes of the Chippewa/Ottawa Resource Authority (CORA), and United States Department of Interior's U.S. Fish and Wildlife Service negotiated an agreement (Consent Decree) to resolve issues of allocation, management, and regulation of fishing in 1836 Treaty-ceded waters of lakes Superior, Michigan, and Huron (U.S. v. Michigan 2000). The Consent Decree states that mortality of lake trout shall be regulated with yield and effort limits in 1836 Treaty-ceded waters. In management units where the state and tribes both have commercial whitefish fisheries, the mortality of whitefish shall be regulated with yield limits. The Consent Decree provides specific guidelines on how these yield and effort limits should be calculated. A Modeling Subcommittee (MSC) of the Technical Fisheries Committee (TFC) was established and charged with developing the yield and effort limits required in the Consent Decree.

The MSC assessed population status and mortality rates of 18 different stocks of lake whitefish and nine stocks of lake trout that are within 1836 Treaty-ceded waters. Where feasible we developed and fit statistical catch at age (SCAA) models using a nonlinear modeling and statistics program (AD Model Builder, Otter Research Ltd.) to estimate age- and year-specific population abundance and mortality rates. In three units the available data did not allow us to develop reliable population estimates in this way, and instead we have used a more descriptive approach. SCAA models resulted in estimates of abundance and mortality which were combined with growth and maturity data for whitefish and lake trout in each stock or management unit to project recommended yield levels (upper bounds) for calendar year 2005. Recommended yield limits were obtained by either limiting mortality to a maximum rate, achieving a minimum spawning potential reduction, or projecting harvest for a specified level of fishing effort. The maximum allowable mortality rate (A) on whitefish was 65%, while the maximum mortality rate on lake trout was either 40 or 45%. In some areas the mortality rate was not considered for lake trout, and yields were instead tied to levels of fishing effort as part of a process for "phasing in" total mortality rate targets as specified in the Consent Decree. The target spawning potential reduction for whitefish ranged from 20 to 35%. Harvest limits were allocated to State and CORA fisheries for each stock following the percentages specified in the Consent Decree.

The 2005 MSC recommended harvest and effort limits for whitefish and lake trout are provided in the table below as are the actual harvest and effort limits that were imposed based on terms of the Consent Decree or harvest regulation guidelines (HRGs). Details are given in the text of reports for units where recommended and actual harvest limits differ. The two estimates marked with asterisks in the table below are based on 2006 fully-phased-in mortality rates and are included for comparison only.

Species	Lake	Management unit	MSC recommended yield limit (lb)	Actual yield limit (lb)	Gill net limit (ft)
Lake trout	Superior	MI-5	187,600	187,600	NA
		MI-6	71,800	71,800	5.09 million
		MI-7	132,000	132,000	10.82 million
	Huron	MH-1	194,500	194,500	9.07 million
		MH-2	139,700	139,700	NA
	Michigan	MM-1,2,3	*8,400	462,100	9.36 million
		MM-4	*83,200	130,800	1.03 million
		MM-5	73,800	83,385	0.23 million
		MM-6,7	315,000	367,370	NA
Lake whitefish	Superior	WFS-04	177,000	177,000	NA
		WFS-05	372,000	372,000	NA
		WFS-06	no estimate	210,000	NA
		WFS-07	611,000	611,000	NA
		WFS-08	164,000	164,000	NA
	Huron	WFH-01	348,000	348,000	NA
		WFH-02	298,000	298,000	NA
		WFH-03	no estimate	306,000	NA
		WFH-04	415,000	415,000	NA
		WFH-05	927,000	927,000	NA
	Michigan	WFM-01	1,233,000	1,233,000	NA
		WFM-02	577,000	577,000	NA
		WFM-03	1,970,000	1,970,000	NA
		WFM-04	704,000	704,000	NA
		WFM-05	347,000	347,000	NA
		WFM-06	323,000	323,000	NA
		WFM-07	no estimate	500,000	NA
		WFM-08	1,404,000	1,404,000	NA

In Lake Superior there are self-sustaining stocks of lean lake trout, and the SCAA models and target mortality rates apply to these wild fish in three management areas (MI-5, MI-6, and MI-7). In MI-6 and MI-7 siscowet and lean yield are combined in commercial catch reports, thus allowable total yield (leans and siscowets) can exceed the values in the above table by 21% and 41% respectively. In MI-6 recent mortality rates have been below target, and recreational harvest was well below the harvest limit in 2004. This result was due to a reduction from a 3 fish daily bag limit to a 2 fish daily bag limit starting in 2003 that effectively limited fishery effort (even though size limits were liberalized slightly in 2003) and a steadily increasing harvest limit since 2002. Stricter size limits with a 3 fish daily bag limit in 2001 and 2002 did not significantly lower recreational harvest and keep it below the harvest limit, indicating population size may be larger than the model predicts in MI-6. Due to increasing harvest limits, the 3 fish daily bag limit in MI-6 will be reinstated in

2005. Stability of the MI-6 model was increased by borrowing catchability parameters for the large-mesh survey in MI-5 due to lack of survey data in MI-6. In MI-5 and MI-7 recent mortality rates have been well below targets, and increases in yield are possible. There have been no efforts to fit a stock assessment model for lake trout in MI-8 of Lake Superior because this is a deferred area. There has been a general decline in size-at-age of lake trout across Lake Superior over the past 20 years, and tied to this is a shift toward later maturity. These changes in growth and maturation probably reflect increases in predator fish abundance and declines in the abundance of prey fish, most of which are less abundant than 20 years ago. Competitive effects of siscowet lake trout may also play a role. Lower growth rates have led to decreases in lake trout biomass in all modeled Lake Superior units.

In the Lake Huron and Lake Michigan management areas wild lake trout are scarce, and the assessment models and target mortality rates apply to stocked fish. In MH-1 lake trout mortality rates remain below target rates for the second consecutive year under the 2000 Consent Decree, and in MH-2 mortality rates are again below target rates. Reductions in fishing mortality resulting from reduced commercial effort and an effective size limit (slot limit) in the recreational fishery, coupled with sea lamprey control, should allow spawning stocks to continue to build in MH-1. A drastic decline in sea lamprey-induced mortality in MH-2 is the main reason total mortality remains below target in this area. Continued control of sea lamprey in MH-1 and MH-2 is necessary to keep mortality rates below target and allow potential increases in lake trout yield in Lake Huron. A notable decline in lake trout growth rate is causing size and age of spawning fish to decline compared to 2003. This growth decline could begin to impact harvest limits in future years.

In Lake Michigan units MM-123 and MM-4 lake trout mortality rates are above target rates due to recent substantial increases in sea lamprey-induced mortality. Biomass and spawning stock biomass in both units continue to increase in the face of high total mortality rates, but the majority of harvestable size fish are consumed by sea lamprey. Researchers suspect that another stream(s) like the Manistique River may be producing large numbers of sea lamprey in northern Lake Michigan. It is hoped that treatment of the Manistique River will lead to reduced levels of sea lamprey-induced mortality and subsequent large increases in both lake trout total and spawning stock biomass in northern Lake Michigan in the near future.

In MM-5, mortality rates are less than the target rates for the second year in a row indicating acceptable mortality levels. In MM-6,7, lake trout mortality rates continue to be well below target rates. However, sea lamprey-induced mortality rates increased slightly in both MM-5 and MM-6,7.

In general, fishery exploitation in recent years has not been excessive on lake whitefish stocks, and total mortality is below target rates in all 15 units with functioning stock assessment models. However even though size-at-age stabilized or increased for many stocks in both 2002 and 2003, it has declined for most stocks over the past two decades. In a number of stocks this has been accompanied by a decline in fish condition (weight for a given length).

These patterns are most evident in the Lake Michigan and Lake Huron management areas. Many stocks also experienced a decline in recruitment near the end of the time series used in the assessments, although recruitment levels seemed to stabilize for many stocks in 2002 and 2003. Again this pattern was most prevalent in Lake Michigan and Lake Huron.

Although current total mortality is below target for all whitefish units, mortality rates may become excessive and decrease population abundance if harvest is maintained at recent levels in the face of declining or stable but low recruitment and growth. In addition, widespread declines in growth rates of lake whitefish are a concern, and further research on this is important for supporting management strategies.

In 2005 the WFH-03 HRG was set based on average recent yield levels, and the WFS-06 HRG was set equal to the 2004 model generated harvest limit. A summary report is included for WFM-07, but modeling efforts to describe this stock currently have little utility for estimating allowable harvest due to lack of data. This area was not fished commercially between 1985 and 2000. Since 2001, there has been a small amount of tribal commercial harvest in WFM-07 by the Little River Band of Ottawa Indians. In 2005 the WFM-07 HRG was based on the 2004 HRG which was calculated as the approximate average of the 2004 model-generated harvest limit for WFM-06 and WFM-08.

In addition to providing assessments for each stock, we also provide recommendations to the TFC to improve data collection and to improve the SCAA models. These recommendations include continuing to implement fishery-independent surveys to assess abundance of lake whitefish, better delineating stock boundaries and movement patterns of lake whitefish, improving natural mortality estimates, refining estimates of hooking mortality on lake trout, improving the estimation of selectivity curves, refining our methods of estimating lake trout recruitment, and developing methods of estimating time-varying catchability. The implementation of all these recommendations will take several years and will involve a significant and increased investment in staff, time, and other resources. The MSC has made significant progress this year in estimating throwbacks in the commercial fishery where appropriate (e.g. MH-1), measuring and adding hooking mortalities from the recreational fishery into the models as harvest, conducting fishery-independent lake whitefish surveys, performing sensitivity analyses of stock assessment models, performing retrospective analyses of stock assessment models, and launching studies in lakes Huron and Michigan to assess lake whitefish stock boundaries and movement.

The MSC also continues to recommend a process that will allow us to provide timely stock assessment results and meet the strict deadlines imposed by the Consent Decree. Past TFC approved use of projected commercial fishery yield for the last few months of the year based on historic patterns of the yield has helped the MSC meet deadlines, but more is needed. The MSC will again ask the TFC to consider a proposal for rotation of lake trout stock assessment models. Under this plan, the MSC would rotate updates of stock assessment models by lake on a 3-year cycle. We would still produce harvest limits for each unit in each year, but the

stock assessment models would only be updated once every 3 years and annual harvest limits would be based on multiyear projections in 2 of 3 years. The time savings from not annually updating all stock assessment models could be used to make improvements to models, verify model performance, and conduct adequate model diagnostics. The proposed rotation techniques might also result in more stable harvest limit estimates from year to year.

We also want to urge parties to meet Consent Decree mandated data submission deadlines. Some parties have repeatedly missed data deadlines in the past. Doing so makes it nearly impossible for the MSC to provide yield and effort limits to the TFC and the parties by already short Consent Decree deadlines.