Walleye
Indicator #9

Overall Assessment

Status:	**Fair**
Trend:	**Unchanging**
Rationale:	**An exceptionally strong 2003 hatch has bolstered walleye abundance in nearly all of the Great Lakes and should keep them at low to moderate levels for the next several years. Low reproductive success post-2003 will not permit populations to increase in many areas. Fisheries harvests have improved in recent years but remain below targets in nearly all areas.**

Lake-by-Lake Assessment

Lake Superior

Status: Not Assessed Since Last Report
Trend: Undetermined
Rationale: Recent harvest estimates were not available for this report. Through 2003, commercial yields were below the historical average while tribal harvest was above average.

Lake Michigan

Status: Fair
Trend: Undetermined
Rationale: Recreational harvest was below historical levels in 2004-2005. Tribal fishery yields were not available but were well-above average in the four most recent years where data exist (2000-2003). Green Bay stocks appear to be stable, perhaps improving. Fishery yields remain well below targets of 100-200 metric tonnes (110-220 tons) per year.

Lake Huron

Status: Fair
Trend: Unchanging
Rationale: Fishery yields are at historically average levels but far below targets of 700 metric tonnes each year (770 tons). Commercial harvest trends continue to decline while recreational harvest trends are flat or perhaps improving. Reproductive success has greatly improved between 2003 and 2005 in Saginaw Bay and perhaps other parts of the lake, and is attributed to the decline of the alewife population.

Lake Erie

Status: Fair
Trend: Unchanging
Rationale: The fisheries objective of sustainable harvests lake wide has not been realized since the late-1990s but has improved recently with contributions from the strong 2003 hatch. Commercial harvest increased substantially in 2005 while recreational fisheries remained static due to size restrictions. Harvest by both fisheries was expected to increase substantially in 2006. Below average reproductive success in 2004 through 2005 will reduce adult abundance over the next few years, but the 2003 hatch should keep the population at low to moderate levels of abundance.

Lake Ontario

Status: Fair
Trend: Unchanging
Rationale: After a decade long decline, walleye populations appear to have stabilized. Fishery yields are roughly half of the average over the past 30 years. Recent hatches should keep the population at current levels of abundance for the next several years.

Purpose

- To show status and trends in walleye populations in various Great Lakes habitats
- To infer changes in walleye health
- To infer ecosystem health, particularly in moderately productive (mesotrophic) areas of the Great Lakes

Ecosystem Objective

Protection, enhancement, and restoration of historically important, mesotrophic habitats that support natural stocks of walleye as the top fish predator are necessary for stable, balanced, and productive elements of the Great Lakes ecosystem.

State of the Ecosystem

Reductions in phosphorus loadings during the 1970s substantially improved spawning and nursery habitat for many fish species in the Great Lakes. Improved mesotrophic habitats (i.e., western Lake Erie, Bay of Quinte, Saginaw Bay and Green Bay) in the 1980s, along with interagency fishery management programs that increased adult survival, led to a dramatic recovery of walleye populations in many areas of the Great Lakes, especially in Lake Erie. High water levels also may have played a role in the recovery in some lakes or bays.

Trends in annual assessments of fishery harvests generally track walleye population recovery in these areas, with peak harvests occurring in the mid-1980s to early 1990s followed by declines from the mid-1990s through 2000, and increases in most areas after 2000 (Figure 1). Total yields were highest in Lake Erie (annual average of about 4,500 metric tonnes (5,000 tons), 1975 to 2005), intermediate in Lakes Huron (average of 90 metric tonnes (100 tons)) and Ontario (average of 224 metric tonnes (247 tons)), and lowest in Lakes Michigan (average of 14 metric tonnes (15 tons)) and Superior (average of 2 metric tonnes (2.2 tons)). Declines after the mid-1990s were possibly related to shifts in environmental states (i.e., from mesotrophic to less favorable oligotrophic conditions), variable reproductive success, influences from invasive species, and changing fisheries.

Recent improvements in abundance are due to a strong 2003 hatch across the Great Lakes Basin, presumably due to ideal weather conditions. Reproductive success has remained very strong since 2003 in Saginaw Bay, and perhaps other parts of Lake Huron, and is attributed to the decline of alewives in that lake during the same time period. In general, walleye yields peaked under ideal environmental conditions and declined under less favorable (i.e., non-mesotrophic) conditions. Overall, environmental conditions remain improved relative to the 1960s and early 1970s but concerns about food web disruption, pathogens (e.g., botulism, viruses), noxious algae, and watershed management practices persist.

Pressures

Natural, self-sustaining walleye populations require adequate spawning and nursery habitats. In the Great Lakes, these habitats exist in tributary streams and nearshore reefs, wetlands, and embayments, and they have been used by native walleye stocks for thousands of years. Degradation or loss of these habitats is the primary concern for the health of walleye populations and can result from both human causes, as well as from natural environmental variability. Increased human use of nearshore and watershed environments continues to alter the natural hydrologic regime, affecting water quality (i.e., sediment loads) and rate of flow.

Environmental factors that affect precipitation patterns ultimately alter water levels, water temperature, water clarity and flow. Thus, global warming and its subsequent effects on temperature and precipitation in the Great Lakes basin may become increasingly important determinants of walleye health.

Non-native invasive species, like zebra and quagga mussels, ruffe, and round gobies continue to disrupt the efficiency of energy transfer through the food web, potentially affecting growth and survival of walleye and other fishes through a reduced supply of food. Recent experience in Lake Huron has elevated the concern over the predatory and competitive effects of the non-native alewife population on walleye. In their absence, walleye reproductive success has surged, indicating that the deleterious effect of alewife predation on larval walleye populations may have been much greater than previously realized. Alterations in the food web can also affect environmental characteristics (like water clarity), which can in turn affect fish behavior and fishery yields. Pathogens, like viral hemorrhagic septicemia and botulism, may also be affecting walleye populations in some areas of the Great Lakes.

Management Implications

To improve the health of Great Lakes walleye populations, managers must enhance walleye reproduction, growth and survival rates. Most walleye populations are dependent on natural reproduction, which is largely driven by uncontrollable environmental events (i.e., spring weather patterns and alewife abundance). However, a lack of suitable spawning and nursery habitat is limiting walleye reproduction in some areas due to human activities and can be remedied through such actions as dam removal, substrate enhancement or improvements to watersheds to reduce siltation and restore natural flow conditions.

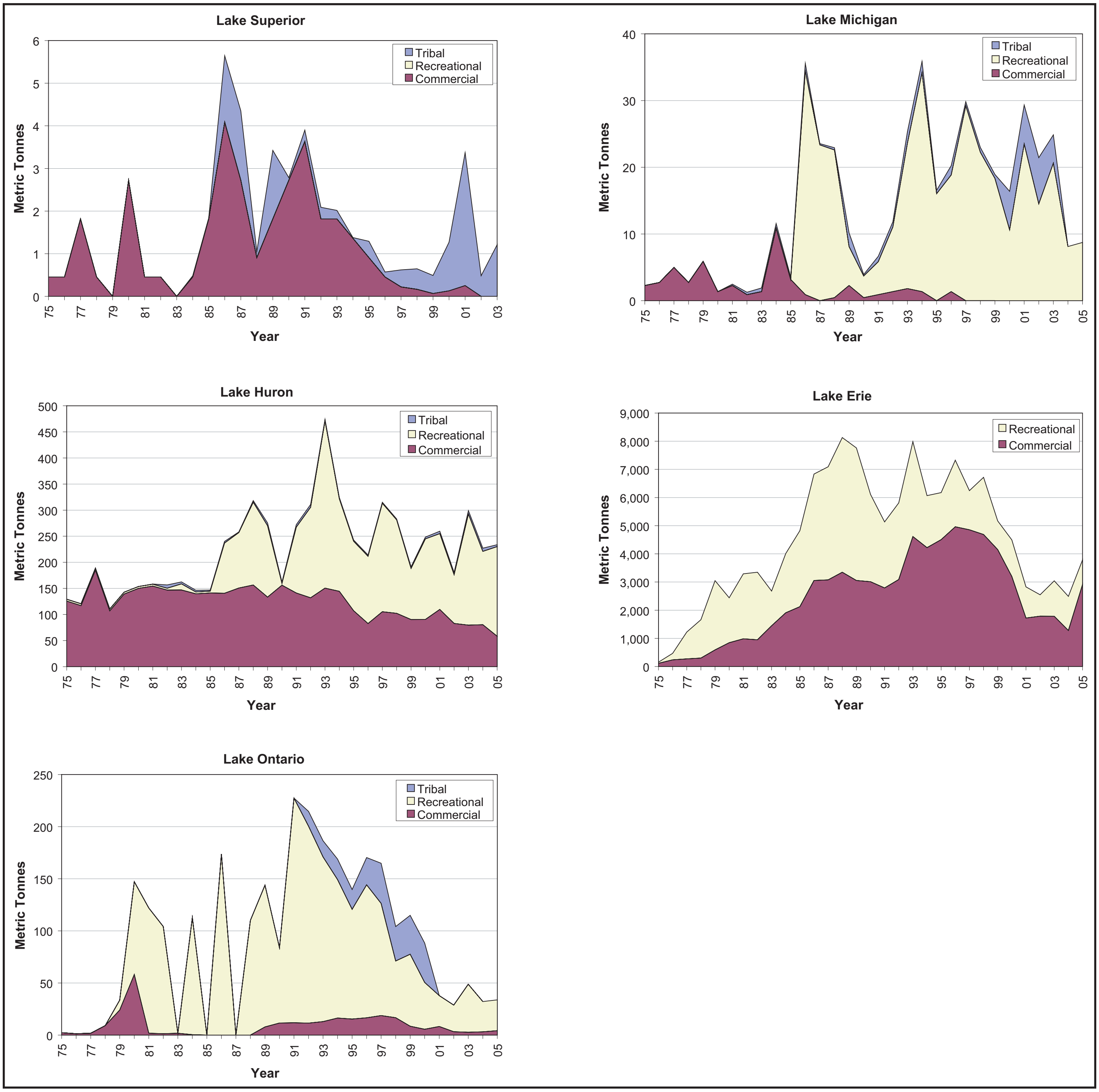

Figure 1. Recreational, commercial, and tribal harvest of walleye from the Great Lakes.

Fish Community Goals and Objectives are: Lake Michigan, 100-200 metric tonnes; Lake Huron, 700 metric tonnes; Lake Erie, sustainable harvest in all basins.

Source: Chippewa Ottawa Resource Authority, Michigan Department of Natural Resources, New York State Department of Environmental Conservation, Ontario Ministry of Natural Resources, Ohio Department of Natural Resources, Wisconsin Department of Natural Resources

Growth rates are dependent on weather (i.e., water temperatures), quality of the prey base, and walleye density, most of which are not directly manageable. Survival rates can be altered through fishery harvest strategies, which are generally conservative across all of the Great Lakes. Continued interactions between land managers and fisheries managers to protect and restore natural habitat conditions in mesotrophic areas of the Great Lakes are essential for the long term health of walleye populations. Elimination of additional introductions of non-native invasive species and control of existing non-native species, where possible, is also critical to future health of the walleye population and other native species.

Comments from the author(s)
Fishery yields are appropriate indicators of walleye health but only in a general sense. Yield assessments are lacking for some fisheries (recreational, commercial, or tribal) or in some years for all of the studied areas. Moreover, measurement units are not standardized among fishery types (i.e., commercial fisheries are measured in pounds while recreational fisheries are typically measured in numbers), which means additional conversions are necessary which reduce accuracy. Also, “zero” values are not differentiated from “missing” data in the figures. Therefore, trends in yields across time (blocks of years) are probably better indicators than absolute values within any year, assuming that any introduced bias is relatively constant over time. Given the above, a 10-year reporting cycle on this indicator is recommended. Many agencies have developed, or are developing, population estimates for many Great Lakes fishes. Walleye population estimates for selected areas (i.e., Lake Erie, Saginaw Bay, Green Bay, and Bay of Quinte) would probably be a better assessment of walleye population health in the Great Lakes than harvest estimates across all lakes, and switching to them as they become available in all areas is recommended.

Acknowledgments
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Sources
Fishery harvest data were obtained from the following sources:
Lake Superior: Ken Cullis, Ontario Ministry of Natural Resources (OMNR), ken.cullis@mnr.gov.on.ca
Lake Superior/Michigan/Huron: Karen Wright, Chippewa Ottawa Resource Authority, kwright@sault.com
Lake Michigan: Kevin Kapuscinski, Wisconsin Department of Natural Resources, Kevin.Kapuscinski@dnr.state.wi.us
Lake Huron: Lloyd Mohr, OMNR, lloyd.mohr@mnr.gov.on.ca
Lake Huron: David Fielder, Michigan Department of Natural Resources, fielderd@michigan.gov
Lake Erie: Roger Knight, ODNR, roger.knight@dnr.state.oh.us
Lake Ontario: Jim Hoyle, OMNR, jim.hoyle@mnr.gov.on.ca
Lake Ontario: Steve Lapan, New York State Department of Environmental Conservation, srlapan@gw.dec.state.ny.us

Various annual Lake Erie fisheries reports from the Ontario Ministry of Natural Resources, Ohio Department of Natural Resources, and the Great Lakes Fishery Commission commercial fishery data base were used as data sources.

Fishery data should not be used for purposes outside of this document without first contacting the agencies that collected them.

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