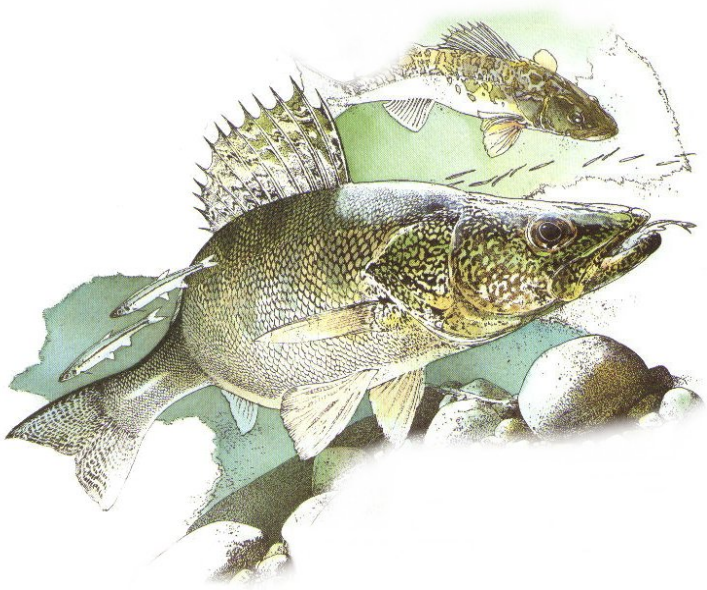
Report for 2007 by the

LAKE ERIE WALLEYE TASK GROUP

March 2008



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Lake Erie Committee
Great Lakes Fishery Commission
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***Note**: Data and management summaries contained in this report are provisional. Every effort has been made to insure their correctness. Contact individual agencies for complete state and provincial data.*

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Charges to the WTG from the STC, 2007-2008

The charges from the Standing Technical Committee (STC) to the Walleye Task Group (WTG) for the period from March 2007 to February 2008 were to:

1. Maintain and update centralized time data base for population modeling; including tagging, fishing harvest and effort by grid, growth, maturity, and abundance indices. Continue development of eastern basin catch-at-age analyses for walleye.
2. Report recommended allowable harvest (RAH) levels for 2008.
3. Review different methods for calculation of lambdas for use in catch-at-age analyses; implement the most scientifically defensible method for weighting data sources used in analyses.
4. Review the results of the Lake Erie Walleye Tagging Study. Provide guidance/recommendations for future tagging strategies to LEC.

Review of Walleye Fisheries in 2007

Fishery effort and walleye harvest data were combined for all jurisdictions and Management Units (Figure 1) to produce lake-wide estimates. The 2007 total estimated lake-wide harvest of walleye was 4.67 million fish (Tables 1 and 2) with a total of 4.49 million fish harvested in the total allowable catch (TAC) area (MUs 1-3). This harvest represents 84% of the 2007 TAC of 5.36 million walleye and includes walleye harvested in commercial and sport fisheries in Management Units 1, 2 and 3. An additional 0.18 million fish were harvested outside of the TAC area in Management Units 4 and 5. The sport fish harvest of 2.50 million fish is considered average for the time series and represents a slight increase from 2006 harvest levels. This increase can be attributed to the large 2003 year-class no longer being restricted to the sport fisheries by the 15" minimum size limit imposed by the Michigan Department of Natural Resources (MDNR) and Ohio Department of Natural Resources (ODNR; Table 2, Figure 2). The 2007 Ontario harvest was approximately 2.17 million fish (Table 2, Figure 2), taken mainly in the commercial fishery. The 2007 commercial harvest was 39% lower than the 2006 harvest, but was the third highest harvest since the Coordinated Percid Management Strategy (CPMS) was implemented during 2001-2003 (LEC 2004, Table 2, Figure 2).

Sport effort increased 12% in 2007, from 2006, to a total 4.4 million angler hours (Table 3, Figure 3). Compared to 2006, Management Unit 1 experienced an 8% increase in effort, while Management Unit 2 effort increased 28%, Management Unit 3 increased 23%, and Management Units 4 and 5 (combined) saw an increase of 12%. Lakewide commercial gill net effort decreased by 26% to 10,484 kilometers (km) of net in 2007 (Table 3, Figure 4).

Over the past 2 years (2006 and 2007), harvest per unit of effort (HUE, walleye/ angler hour) has increased to levels not seen since 1984. Sport HUEs were among the highest ever recorded, and HUE in all management units decreased slightly (7%), from

a total of 0.61 walleye/ hr in 2006, to 0.57 walleye/ hr in 2007. The lakewide average sport catch rate of 0.57 walleye/ hr is 32% higher than the 1975-2007 mean of 0.43 walleye/ hr (Table 4, Figure 5).

Although total commercial gill net catch per unit effort CUE decreased 18%, relative to 2006, the 2007 commercial gill net CUE (207 walleye/ km of net) was second highest on record for all management units combined. The 2007 CUE was 77% above the 1975-2007 average (117 walleye/ km) for all Management Units. The trend of increasing commercial fishery catch rates, since 2000, represents a reversal in the trend of declining CUEs observed since the mid 1980's (Table 4, Figure 5).

Fishing success was largely based on the strong 2003 year-class (age-4 walleye) as evidenced by the age composition in the harvest. Age-4 walleye comprised 78% of the total sport fishery harvest and 83% of the total commercial fishery harvest (Tables 5 and 6). Unlike previous years where older fish (age-7+) made up a larger proportion of the harvest in eastern Management Units 3, 4 and 5, relative to western Management Units 1 and 2, the strength of the 2003 (age-4) walleye dominated the harvest across the entire lake.

The 2001 year-class (age-6 walleye) represented 6% of the total harvest for the sport and commercial fishery. Age-7+ walleye contributed 11% to the sport fishery but only 5% to the commercial fishery (Tables 5 and 6). Lakewide the 2001 and 2003 year-classes contributed 6% and 80%, respectively, to the total harvest.

Across all jurisdictions, the mean age of walleye in the harvest in the sport fishery ranged from 4.4 to 6.8 years old and from 4.2 to 6.5 years old in Ontario's commercial fishery (Table 7, Figure 6). The mean age of fish increased in both the sport and commercial fisheries from 2006 values. The mean age in the sport fishery was 4.7 years, higher than the long-term mean of 4.0 years (1975-2007). In the commercial fishery, the mean age was 4.3 years which was higher than the long-term (1975 - 2007) mean of 3.5 years.

Walleye Management Plan

The Coordinated Percid Management Strategy (CPMS) was used to manage walleye from 2001-2003 (Lake Erie Committee 2004). During 2004-2005, the Walleye Management Plan (WMP) was drafted which includes a strategy to manage walleye from 2005 into the future (Locke et al., 2005). The WMP established quality objectives that the LEC employs as the basis for walleye management. The plan focuses primarily on the walleye stocks that spawn on shoals and in tributaries of the western basin and generally inhabit the west and central basins of Lake Erie. This is the primary population of interest to LEC walleye management as it provides most of the benefits to users throughout Lake Erie. Additional stocks within the lake are found in Presque Isle Bay, the Grand River (Ontario), and New York shoals and tributaries of the eastern basin. Catch-at-age modeling and population estimates for this eastern population are

ongoing but it is clear that the eastern population is small relative to the western population (Ryan et al. 2003). The eastern Lake Erie walleye population is briefly described in the WMP.

Central to the WMP are two main components. The first is a set of population objectives that define the biological and fishery quality characteristics that the LEC has determined, in cooperation with stakeholders, for the Lake Erie walleye population. The second is an exploitation policy that has been designed to help meet these objectives and at the same time recognize the economic and social importance of the walleye fishery to the diverse stakeholders. This exploitation policy does so by joining state of the art population and harvest simulation modeling with lessons learned from other fisheries and the recent history of walleye management on Lake Erie (Wright et al. 2005). All of these components are described in the WMP, as are walleye fishery and population objectives, actions and tasks developed in support of the WMP plan implementation, and measures of success/targets for evaluation.

Catch-at-Age Population Analysis and Relative Abundance

During the past year, the WTG continued to use the Automatic Differentiating Model Builder (ADMB) catch-at-age analysis to estimate walleye population abundance (Walleye Task Group 2001). There were some minor changes in the 2007-2008 model components compared to last year's model. The model continues to include fishery data from the Ontario commercial fishery (west and central basins) and sport fisheries in Ohio (west and central basins) and Michigan (west basin). In addition to fishery data, this model includes assessment data from three index gill net surveys from Michigan (west basin), Ohio (now including west and west-central basins combined) and Ontario (west, west-central, and east-central basins combined). This year, after discussions with Michigan State University's Quantitative Fisheries Center (QFC) during the Lambda Review exercise (see Charge 3 Review of Lambda Weightings), the WTG modelers split out the Ohio and Michigan sport effort and harvest-at-age datasets. The reasoning behind this delineation was due to significant differences in years of sport angler surveys in Ohio (1978 to present) and Michigan (1986 to present), differences in the coefficients of variation (expressed as proportional standard errors) around the Ohio and Michigan sport harvest and effort estimates, and differences in creel survey methodology, administration, and biological sampling efforts. This year we also incorporated a new sport selectivity time block in the model for the last several years that accounts for the recent implementation of a 15-inch minimum size limit in Ohio and Michigan waters.

The catch-at-age model uses natural log (ln)- transformed catch data and survey data for ages 2 through 7+ (seven and older are pooled), along with effort data, to estimate the walleye abundance-at-age. Natural mortality (M) is fixed in the model for all ages and years at 0.32. The solution of the catch-at-age equation is obtained using non-linear sums of squares and a penalized, concentrated likelihood objective function. The weightings (or lambdas) of effort data in the model are calculated by the ratio of the

variance of observed log-catch to log-effort (Quinn and Deriso, 1999). Weightings of fishery catch and survey catch rates are solved iteratively until convergence occurs (*i.e.,* lambdas remain constant within a range less than 0.1). While lambdas within similar parameter groups (i.e., catch, effort and survey) are solved and weighted unequally, the groups themselves are given equal weight (i.e., the maximum lambda value in the catch, effort, and survey groups is 1.0). The walleye population in the east basin was modeled separately (see section: "*Eastern Basin Catch-At-Age Analysis*") using similar model techniques, and includes fishery and survey data from Ontario, New York and Pennsylvania, but incorporates data from ages 2-11+ with a natural mortality rate of M=0.16.

The 2007 population estimate was 33.6 million age-2 and older walleye (Table 8, Figure 7) with approximately 25.9 million age-4+ walleye. The very strong 2003 year-class was estimated to contribute approximately 23.0 million age-3 fish to the population in 2007. Statistical catch at age analysis estimated the abundance of the 2003 year-class to be 55.8 million walleye at age-2, which is higher than the strong 1982 (Year 1984) and 1986 year-classes (Year 1988; Table 8).

Recruitment Estimator for Incoming Age-2 Walleye and 2008 Population Size Projection

A linear regression model was used to estimate age-2 walleye recruitment for 2008 and 2009. This regression utilized estimates of age-2 walleye abundance from catch-at-age analysis and young-of-year walleye catches from pooled Ontario and Ohio trawling (Tables 8 and 9, Figure 8). As in the past, the most recent (2007) age-2 estimate from catch-at-age analysis has the widest error bounds so this value was not used in the linear regression to estimate recruitment. Recent cohort strength appears well below average, based on YOY trawl surveys in 2006 and slightly below average for 2007. The 2006 year-class is expected to contribute only 1.6 million age-2 fish to the 2008 population and the 2007 year-class is expected to contribute 8.6 million age-2 fish to the 2009 year-class. Historically (1978-2007), an average of 13.3 age-2 recruits enter the population annually (Table 9, Figure 9).

The stock size estimate for 2008 was projected using catch-at-age analysis estimates of the 2007 population size, estimated survival rates in 2007, and the age-2 recruitment estimate for 2008 (Table 8). The 2008 estimated abundance of age-2 and older walleye is approximately 22.7 million (Table 8, Figure 10). It is projected that the 2003 year-class will make up approximately 62% (14 million) of the population in 2008.

This 2003 cohort will comprise the majority (84%) of the projected abundance of age-4 and older spawners in 2008 (Table 8). The 2008 spawner abundance is estimated to be 16.6 million age-4 and older walleye; which is the 5th highest spawner biomass value estimated for the time period (1978-2006). However, the spawner/ recruit relationship for Lake Erie walleye is poorly understood. The WTG believes that in addition to spawner biomass, year-class strength is likely influenced by other factors.

Harvest Policy and Recommended Allowable Catch for 2008

The harvest management policy, adopted by the LEC in the Walleye Management Plan is a feedback, or state-dependent, approach that varies targeted fishing mortality rate with population abundance (Figure 11). The policy stipulates that when the walleye abundance is 20-40 million walleye, the targeted fishing mortality rate should be between F=0.20 and F=0.35 (Locke et al., 2005). Based on this harvest policy and the estimated abundance of 22.7 million walleye in 2008 and F=0.22, the recommended allowable harvest (RAH) for 2008 is 3.6 million walleye (Table 10).

Other Walleye Task Group Charges

Centralized Databases

Walleye Task Group members currently manage several databases which consist of harvest and population assessment surveys conducted by the respective agencies that manage the walleye population in Lake Erie. Annually, information from these surveys are compiled to assist WTG members in the decision making process regarding recommend harvest levels and current status and trends of the walleye population.

The Lake Erie Walleye Tagging database consists of biological information collected from walleye tagged in the tributaries and main lake areas of Lake Erie. The tagging program dates back to 1986 and is maintained at the Mt. Clemens Fish Management Station, Michigan Department of Natural Resources. Annually, agencies submit information regarding tagging activities in their jurisdictions. In addition to updating the database with new tagging information, the database also maintains a record of the tagged fish which were reported in a given year. The information is used to estimate the movements of different spawning stocks within the lake proper and connecting waters of Lake Erie. Estimates of survival and exploitation are also generated with this information.

Fishery harvest and population assessment survey information are annually compiled by the WTG and are used for estimating the population abundance of walleye in Lake Erie via catch-at-age analysis (Deriso et al. 1985). A spatially explicit version of agency specific harvest data (e.g., harvest-at-age and fishery effort by management unit; Figure 1) and population assessment (e.g., the interagency trawl program and gill net surveys) databases are maintained by the WTG. Annual population abundance estimates are used to assist Lake Erie Committee members with setting TAC for the upcoming year and to evaluate past harvest policy decisions.

Use of WTG databases by non-members is permitted with permission following protocol established in the 1994 WTG Report and has been reprinted in the 2003 WTG Report (Walleye Task Group, 2003).

Review of Lambda Weightings

In 2005-06, the WTG was charged with reviewing the methodology of assigning weighting factors to data sources in the catch-at-age model. The current weighting methodology is described in Charge 1 of this report. The Lake Erie Walleye and Yellow Perch Task Groups have been working with Drs. James Bence and Travis Brenden of the QFC and Dr. Yingming Zhao of the Ontario Ministry of Natural Resources to resolve the lambda weighting issues in the ADMB catch-at-age models. Previous external reviews by QFC modelers and Myers and Bence (2001) have shown the current methods, while adequate, could be improved.

Task group members and QFC personnel held a workshop at the Great Lakes Fishery Commission office in Ann Arbor, Michigan, on June 14, 2007, to discuss new lambda weighting processes. At this meeting, a Bayesian approach to determining dataset weightings was presented and discussed. This approach is able to approximate uncertainty by providing a posterior distribution of parameters using lengthy runs of Markov Chain Monte Carlo (MCMC) simulations. Since the meeting, the modeling group developed Bayesian models for Lake Erie walleye and yellow perch which weighted datasets based on their relative coefficients of variance. Evaluation of these models using total sums of squares, degree of retrospectivity, and deviance information criteria revealed that further model refinements and testing are still required. The collective group of research modelers has completed a report on their findings (Standing Technical Committee 2007).

The QFC has now appointed a Ph.D. student to investigate the structure of the yellow perch and walleye models including an investigation of dataset weightings. Final results of this investigation are not expected for approximately three years; however, the task groups' modelers can incorporate valuable, substantial model improvements as they become available upon presentation and discussion with the STC and LEC. At this time, the WTG is continuing to utilize the population abundance estimation models which weight datasets by the ratio of variance of observed log-catch to log-effort.

Eastern Basin Catch-At-Age Analysis

The WTG has been developing an ADMB catch-at-age model for eastern Lake Erie's walleye population. This developing stock assessment model incorporates walleye harvest-at-age and fishing effort values from Ontario commercial gill nets, New York and Pennsylvania sport fisheries, and survey data from Ontario and New York. A long-term New York walleye tagging study provided the instantaneous natural mortality estimate (M) of 0.16 used for this model.

The current east basin model description for walleye population dynamics is provided in this report for illustrative purposes only. The most apparent shortcoming for the current configuration of this model is that walleye movements into the basin by the much larger western basin spawning stocks are presently not accounted for which confounds estimates of survival, exploitation, and abundance. These movements must be

incorporated in the model for it to be a viable tool for walleye population assessment and so it cannot yet be used exclusively for stock assessment.

Currently, the 2007 estimate of walleye abundance in the eastern basin model is 5.3 million walleye (Table 11). The east basin model output also estimates that 85% of the east basin abundance is age-4 (2003 year-class) walleye. This estimate of the 2003 year-class is substantially larger than what was estimated in the 2007 NYSDEC survey index (43%) and Ontario partnership index (46%) age-4 contribution to age-2+ abundance in eastern Lake Erie. The model's estimated proportion of the 2003 cohort in 2007is more consistent with representation of this cohort in east basin gill net surveys in 2006 and 2005.

There are a number of uncertainties associated with the east basin model. The model does not quantify variable walleye movement into the east basin from west basin stocks. Also, there may be differing contributions by local spawning stocks in New York waters with an accompanying dissimilar age distribution relative to other parts of the basin. East basin walleye spawning stocks are believed to be most abundant along New York's shoreline. Despite these uncertainties, it is apparent that the most recent 2007 iteration of east basin walleye catch-at-age analysis is strongly influenced by data from 2005 and 2006, in which both east basin gill net surveys were dominated by the 2003 year-class.

During 2008, the Walleye Task Group plans to explore the inter-agency walleye tagging database to assess whether it is possible to model this movement dynamic or to estimate stock-specific abundances for some eastern basin walleye stocks at locations where spawning concentrations have been tagged multiple years with accompanying high tag-recovery rates.

Lake Erie Walleye Tagging Study

In 2005, a lake-wide research tagging initiative was undertaken by the WTG. The project was funded by the United States Fish and Wildlife Services (USFWS) Restoration Act Program through 2006 and an additional year of funding was provided by the respective Lake Erie Committee agencies. The objectives of the study are to: 1) assess the use of Passive Integrated Transponder (PIT) tags as an alternative to jaw tags in estimating walleye exploitation rates in Lake Erie and Saginaw Bay, Lake Huron, in terms of tag retention, cost/benefit analysis, sample size considerations, and precision of exploitation estimates, 2) assess temporal patterns in loss rates of jaw and PIT tags through double-tagging for use in correcting exploitation estimates, 3) determine walleye exploitation rates for different fishery components (i.e., commercial, private, and charter) and determine individual stock contribution to each fishery and 4) obtain additional information regarding walleye movement patterns in each lake through recapture of tagged walleyes by fishers. Since 2005, 31,242 walleye were tagged with PIT tags on Lake Erie. A subset of PIT tagged walleye were double-tagged with jaw tags to assess tag loss rates for both jaw and PIT tags. A total of 263,022 walleye harvested from Lake Erie have been examined for the presence of a PIT tag. The final

report for this project is due to the USFWS during the fall of 2008. Chris Vandergoot, a fisheries biologist with the Ohio Department of Natural Resources, will be evaluating the resultant data to address the project objectives through the QFC.

Acknowledgements

The WTG would like to express its appreciation to the Great Lakes Fishery Commission for it's support during the past year and it's continued to dispersal of reward tag payments. The WTG would also like to thank the QFC at Michigan State University for assistance with the ADMB model currently used to estimate walleye abundance in Lake Erie.

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Table 1. Lake Erie walleye total allowable catch (TAC; top) and measured harvest (Har; bottom, bold), in numbers of fish, from 1980 to 2007. New York and Pennsylvania do not have assigned quotas but are included in the annual total harvest.

	TAC Area (MU-1, MU-2, MU-3)				Non TAC Area (MU-4)				All Areas
Year	Michigan	Ohio	Ontario [a]	Total	NY	Penn.	Ontario	Total	Total
1980 TAC	261,700	1,558,600	1,154,100	2,974,400				0	2,974,400
Har	**183,140**	**2,169,800**	**1,049,269**	**3,402,209**				**0**	**3,402,209**
1981 TAC	367,400	2,187,900	1,620,000	4,175,300				0	4,175,300
Har	**95,147**	**2,942,900**	**1,229,017**	**4,267,064**				**0**	**4,267,064**
1982 TAC	504,100	3,001,700	2,222,700	5,728,500				0	5,728,500
Har	**194,407**	**3,015,400**	**1,260,852**	**4,470,659**				**0**	**4,470,659**
1983 TAC	572,000	3,406,000	2,522,000	6,500,000				0	6,500,000
Har	**145,847**	**1,864,200**	**1,416,101**	**3,426,148**				**0**	**3,426,148**
1984 TAC	676,500	4,028,400	2,982,900	7,687,800				0	7,687,800
Har	**351,169**	**4,055,000**	**2,178,409**	**6,584,578**				**0**	**6,584,578**
1985 TAC	430,700	2,564,400	1,898,800	4,893,900				0	4,893,900
Har	**460,933**	**3,730,100**	**2,435,627**	**6,626,660**				**0**	**6,626,660**
1986 TAC	660,000	3,930,000	2,910,000	7,500,000				0	7,500,000
Har	**605,600**	**4,399,400**	**2,617,507**	**7,622,507**				**0**	**7,622,507**
1987 TAC	490,100	2,918,500	2,161,100	5,569,700				0	5,569,700
Har	**902,500**	**4,433,600**	**2,688,558**	**8,024,658**				**0**	**8,024,658**
1988 TAC	397,500	3,855,000	3,247,500	7,500,000				0	7,500,000
Har	**1,996,788**	**4,890,367**	**3,054,402**	**9,941,557**	**85,282**			**85,282**	**10,026,839**
1989 TAC	383,000	3,710,000	3,125,000	7,218,000				0	7,218,000
Har	**1,091,641**	**4,191,711**	**2,793,051**	**8,076,403**	**129,226**			**129,226**	**8,205,629**
1990 TAC	616,000	3,475,500	2,908,500	7,000,000				0	7,000,000
Har	**747,128**	**2,282,520**	**2,517,922**	**5,547,570**	**47,443**			**47,443**	**5,595,013**
1991 TAC	440,000	2,485,000	2,075,000	5,000,000				0	5,000,000
Har	**132,118**	**1,577,813**	**2,266,380**	**3,976,311**	**34,137**			**34,137**	**4,010,448**
1992 TAC	329,000	3,187,000	2,685,000	6,201,000				0	6,201,000
Har	**249,518**	**2,081,919**	**2,497,705**	**4,829,142**	**14,384**			**14,384**	**4,843,526**
1993 TAC	556,500	5,397,000	4,546,500	10,500,000				0	10,500,000
Har	**270,376**	**2,668,684**	**3,821,386**	**6,760,446**	**40,032**			**40,032**	**6,800,478**
1994 TAC	400,000	4,100,000	3,500,000	8,000,000				0	8,000,000
Har	**216,038**	**1,468,739**	**3,431,119**	**5,115,896**	**59,345**			**59,345**	**5,175,241**
1995 TAC	477,000	4,626,000	3,897,000	9,000,000				0	9,000,000
Har	**107,909**	**1,435,188**	**3,813,527**	**5,356,624**	**26,964**			**26,964**	**5,383,588**
1996 TAC	583,000	5,654,000	4,763,000	11,000,000				0	11,000,000
Har	**174,607**	**2,316,425**	**4,524,639**	**7,015,671**	**38,728**	**89,087**		**127,815**	**7,143,486**
1997 TAC	514,000	4,986,000	4,200,000	9,700,000				0	9,700,000
Har	**122,400**	**1,248,846**	**4,072,779**	**5,444,025**	**29,395**	**88,682**		**118,077**	**5,562,102**
1998 TAC	546,000	5,294,000	4,460,000	10,300,000				0	10,300,000
Har	**114,606**	**2,303,911**	**4,173,042**	**6,591,559**	**34,090**	**124,814**	**47,000**	**205,904**	**6,797,463**
1999 TAC	477,000	4,626,000	3,897,000	9,000,000				0	9,000,000
Har	**140,269**	**1,033,733**	**3,454,250**	**4,628,252**	**23,133**	**89,038**	**87,000**	**199,171**	**4,827,423**
2000 TAC	408,100	3,957,800	3,334,100	7,700,000				0	7,700,000
Har	**252,280**	**932,297**	**2,287,533**	**3,472,110**	**28,599**	**77,512**	**67,000**	**173,111**	**3,645,221**
2001 TAC	180,200	1,747,600	1,472,200	3,400,000				0	3,400,000
Har	**159,186**	**1,157,914**	**1,498,816**	**2,815,916**	**14,669**	**52,796**	**39,498**	**106,963**	**2,922,879**
2002 TAC	180,200	1,747,600	1,472,200	3,400,000				0	3,400,000
Har	**193,515**	**703,000**	**1,436,000**	**2,332,515**	**18,377**	**22,000**	**36,000**	**76,377**	**2,408,892**
2003 TAC	180,200	1,747,600	1,472,200	3,400,000				0	3,400,000
Har	**128,852**	**1,014,688**	**1,457,014**	**2,600,554**	**27,480**	**43,581**	**32,692**	**103,753**	**2,704,307**
2004 TAC	127,200	1,233,600	1,039,200	2,400,000				0	2,400,000
Har	**114,958**	**859,366**	**1,419,237**	**2,393,561**	**8,400**	**19,969**	**29,864**	**58,233**	**2,451,794**
2005 TAC	308,195	2,988,910	2,517,895	5,815,000				0	5,815,000
Har	**37,599**	**610,449**	**2,933,393**	**3,581,441**	**27,370**	**20,316**	**17,394**	**65,080**	**3,646,521**
2006 TAC	523,958	5,081,404	4,280,638	9,886,000				0	9,886,000
Har	**305,548**	**1,868,520**	**3,494,551**	**5,668,619**	**37,161**	**151,614**	**68,774**	**257,549**	**5,926,168**
2007 TAC	284,080	2,755,040	2,320,880	5,360,000				0	5,360,000
Har	**165,551**	**2,160,459**	**2,159,965**	**4,485,975**	**29,134**	**116,671**	**37,566**	**183,371**	**4,669,346**

[a] Ontario sport harvest values were estimated from the most recent creel surveys in each basin; 2005 in Unit 1, 2004 in Unit 2 and 3, 2003 in Unit 4. These values are included in Ontario's total walleye harvest, but are not used in catch-at-age analysis

Table 2. Annual harvest (thousands of fish) of Lake Erie walleye by gear, management unit, and agency. Means include data from 1975 to present.

	Sport Fishery														Commercial Fishery				
	Unit 1				Unit 2			Unit 3			Unit 4 & 5					Unit 1	Unit 2	Unit 3	Unit 4	
Year	OH	MI	ON[a]	Total	OH	ON[a]	Total	OH	ON[a]	Total	ON[a]	PA	NY	Total	Total	ON	ON	ON	ON	Total
1980	2,096	183	57	2,336	49	--	49	24	--	24	--	--	--	0	2,409	953	40	--	--	993
1981	2,857	95	70	3,022	38	--	38	48	--	48	--	--	--	0	3,108	1,037	119	3	--	1,159
1982	2,959	194	49	3,202	49	--	49	8	--	8	--	--	--	0	3,259	1,077	134	2	--	1,213
1983	1,626	146	41	1,813	212	--	212	26	--	26	--	--	--	0	2,051	1,129	167	80	--	1,376
1984	3,089	351	39	3,479	787	--	787	179	--	179	--	--	--	0	4,445	1,639	392	108	--	2,139
1985	3,347	461	57	3,865	294	--	294	89	--	89	--	--	--	0	4,248	1,721	432	225	--	2,378
1986	3,743	606	52	4,401	480	--	480	176	--	176	--	--	--	0	5,057	1,651	558	356	--	2,565
1987	3,751	902	51	4,704	550	--	550	132	--	132	--	--	--	0	5,386	1,611	622	405	--	2,638
1988	3,744	1,997	18	5,759	584	--	584	562	--	562	--	--	85	85	6,990	1,866	762	409	--	3,037
1989	2,891	1,092	14	3,997	867	35	902	434	80	514	--	--	129	129	5,542	1,656	621	386	--	2,663
1990	1,467	747	35	2,249	389	14	403	426	23	449	--	--	47	47	3,148	1,615	529	302	--	2,446
1991	1,104	132	39	1,275	216	24	240	258	44	302	--	--	34	34	1,851	1,446	440	274	--	2,160
1992	1,479	250	20	1,749	338	56	394	265	25	290	--	--	14	14	2,447	1,547	534	316	--	2,397
1993	1,846	270	37	2,153	450	26	476	372	12	384	--	--	40	40	3,053	2,488	762	496	--	3,746
1994	992	216	21	1,229	291	20	311	186	21	207	--	--	59	59	1,806	2,307	630	432	--	3,369
1995	1,161	108	32	1,301	159	7	166	115	27	141	--	--	27	27	1,635	2,578	681	489	--	3,748
1996	1,442	175	17	1,634	645	8	653	229	27	256	--	89	39	128	2,671	2,777	1,107	589	--	4,473
1997	929	122	8	1,059	188	2	190	132	5	138	--	89	29	118	1,505	2,585	928	544	--	4,057
1998	1,790	115	34	1,939	215	5	220	299	5	304	19	125	34	178	2,641	2,497	1,166	462	28	4,153
1999	812	140	34	986	139	5	144	83	5	88	19	89	23	131	1,349	2,461	631	317	68	3,477
2000	674	252	34	961	165	5	170	93	5	98	19	78	29	125	1,354	1,603	444	196	48	2,291
2001	941	160	34	1,135	171	5	176	46	5	51	19	53	15	87	1,449	1,004	310	141	20	1,475
2002	516	194	34	744	141	5	146	46	5	51	19	22	18	59	1,000	937	309	146	17	1,409
2003	715	129	34	878	232	5	237	68	5	73	2	44	27	73	1,261	948	283	182	14	1,427
2004	515	115	34	664	272	2	274	72	0	72	2	20	8	30	1,040	866	334	175	11	1,386
2005	374	38	27	438	110	2	112	126	0	126	2	20	27	49	725	1,878	625	401	15	2,920
2006	1,194	306	27	1,526	503	2	505	170	0	170	2	152	37	191	2,392	2,137	784	545	66	3,532
2007	1,414	166	27	1,606	578	2	580	169	0	169	2	116	29	147	2,502	1,348	450	333	35	2,167
Mean	1,730	304	39	2,073	282	12	288	173	16	183	11	75	38	53	2,570	1,519	469	308	32	2,189

[a] Ontario sport harvest values were estimated from the most recent creel surveys in each basin; 2005 in Unit 1, 2004 in Unit 2 and 3, 2003 in Unit 4. These values are used to determine Ontario's total walleye harvest, but are not used in catch-at-age analysis.

Table 3. Annual fishing effort for Lake Erie walleye by gear, management unit, and agency. Means include data from 1975 to present.

	Sport Fishery [a]															Commercial Fishery [b]				
	Unit 1				Unit 2			Unit 3			Unit 4 & 5					Unit 1	Unit 2	Unit 3	Unit 4	
Year	OH	MI	ON[c]	Total	OH	ON[c]	Total	OH	ON[c]	Total	ON[c]	PA	NY	Total	Total	ON	ON	ON	ON	Total
1980	3,938	624	92	4,654	237	--	237	187	--	187	--	--	--	0	5,078	6,229	1,565	--	--	7,794
1981	5,766	447	138	6,351	264	--	264	382	--	382	--	--	--	0	6,997	6,881	2,144	622	--	9,647
1982	5,928	449	108	6,484	223	--	223	114	--	114	--	--	--	0	6,821	10,531	2,913	689	--	14,133
1983	4,168	451	118	4,737	568	--	568	128	--	128	--	--	--	0	5,433	11,205	5,352	5,814	--	22,371
1984	4,077	557	82	4,716	1,322	--	1,322	392	--	392	--	--	--	0	6,430	11,550	6,008	2,438	--	19,996
1985	4,606	926	84	5,616	1,078	--	1,078	464	--	464	--	--	--	0	7,158	7,496	2,800	2,983	--	13,279
1986	6,437	1,840	107	8,384	1,086	--	1,086	538	--	538	--	--	--	0	10,008	7,824	5,637	3,804	--	17,265
1987	6,631	2,193	84	8,908	1,431	--	1,431	472	--	472	--	--	--	0	10,811	6,595	4,243	3,045	--	13,883
1988	7,547	4,362	87	11,996	1,677	--	1,677	1,081	--	1,081	--	--	462	462	15,216	7,495	5,794	3,778	--	17,067
1989	5,246	3,794	81	9,121	1,532	77	1,609	883	205	1,088	--	--	556	556	12,374	7,846	5,514	3,473	--	16,833
1990	4,116	1,803	121	6,040	1,675	33	1,708	869	83	952	--	--	432	432	9,132	9,016	5,829	5,544	--	20,389
1991	3,616	440	144	4,200	1,241	79	1,320	724	155	880	--	--	440	440	6,840	10,418	5,055	3,146	--	18,619
1992	3,955	715	105	4,775	1,169	81	1,249	640	145	786	--	--	299	299	7,109	9,486	6,906	6,043	--	22,435
1993	3,943	691	125	4,759	1,349	70	1,418	1,062	125	1,187	--	--	305	305	7,669	16,283	11,656	7,420	--	35,359
1994	2,808	788	125	3,721	1,025	65	1,090	599	130	729	--	--	355	355	5,894	16,698	9,968	6,459	--	33,125
1995	3,188	277	125	3,589	803	65	868	355	130	485	--	--	259	259	5,201	20,521	12,113	7,850	--	40,484
1996	3,060	521	125	3,706	1,132	65	1,197	495	130	625	--	316	256	572	6,101	19,976	15,685	10,990	--	46,651
1997	2,748	374	88	3,210	864	45	909	492	91	583	--	388	273	661	5,363	15,708	11,588	9,094	--	36,390
1998	3,010	374	103	3,487	635	51	686	409	55	464	217	390	280	887	5,524	19,027	19,397	13,253	818	52,495
1999	2,368	411	--	2,779	603	--	603	323	--	323	--	397	171	568	4,699	21,432	10,955	7,630	1,444	41,461
2000	1,975	540	--	2,516	540	--	540	281	--	281	--	244	177	421	3,757	22,238	11,049	7,896	1,781	43,054
2001	1,952	362	--	2,314	697	--	697	261	--	261	--	241	163	404	3,676	9,372	5,746	5,021	639	20,778
2002	1,393	606	--	1,999	444	--	444	246	--	246	--	130	132	262	2,951	4,431	4,212	4,427	445	13,515
2003	1,719	326	--	2,045	675	--	675	236	--	236	30	159	162	351	3,307	4,476	3,946	3,725	365	12,512
2004	1,257	504	--	1,761	736	27	763	178	7	185	--	88	101	189	2,898	3,875	2,977	2,401	240	9,493
2005	1,180	212	40	1,392	573	--	573	261	--	261	--	109	142	251	2,477	7,083	4,174	4,503	174	15,934
2006	1,757	587	--	2,344	899	--	899	260	--	260	--	239	137	376	3,879	5,689	4,008	3,589	822	14,107
2007	2,076	448	--	2,524	1,147	--	1,147	321	--	321	--	232	135	367	4,358	4,509	2,927	2,665	383	10,484
Mean	3,398	798	104	4,274	798	60	818	452	114	497	124	244	262	255	5,781	10,032	6,122	5,122	711	20,701

[a] Sport units of effort are thousands of angler hours.
[b] Estimated Standard (Total) Effort in kilometers of gill net = (walleye targeted effort * walleye total harvest) / walleye targeted harvest.
[c] Ontario sport fishing effort was estimated from the most recent creel surveys in each basin; 2005 in Unit 1, 2004 in Unit 2 and 3, 2003 in Unit 4.

Table 4. Annual harvest per unit effort for Lake Erie walleye by gear, management unit, and agency. Means include data from 1975 to present.

	Sport Fishery [a]														Commercial Fishery [b]				
	Unit 1				Unit 2			Unit 3			Unit 4 & 5					Unit 1	Unit 2	Unit 3	Unit 4	
Year	OH	MI	ON[c]	Total	OH	ON[c]	Total	OH	ON[c]	Total	ON[c]	PA	NY	Total	Total	ON	ON	ON	ON	Total
1980	0.53	0.29	0.62	0.50	0.21	--	0.21	0.13	--	0.13	--	--	--		0.47	153.0	25.3	--	--	127.3
1981	0.50	0.21	0.51	0.48	0.14	--	0.14	0.12	--	0.12	--	--	--		0.44	150.7	55.4	4.9	--	120.1
1982	0.50	0.43	0.45	0.49	0.22	--	0.22	0.07	--	0.07	--	--	--		0.48	102.2	45.9	2.8	--	85.8
1983	0.39	0.32	0.34	0.38	0.37	--	0.37	0.20	--	0.20	--	--	--		0.38	100.7	31.2	13.7	--	61.5
1984	0.76	0.63	0.48	0.74	0.60	--	0.60	0.46	--	0.46	--	--	--		0.69	141.9	65.3	44.4	--	107.0
1985	0.73	0.50	0.68	0.69	0.27	--	0.27	0.19	--	0.19	--	--	--		0.59	229.6	154.5	75.6	--	179.1
1986	0.58	0.33	0.49	0.52	0.44	--	0.44	0.33	--	0.33	--	--	--		0.51	211.0	99.0	93.7	--	148.6
1987	0.57	0.41	0.61	0.53	0.38	--	0.38	0.28	--	0.28	--	--	--		0.50	244.2	146.5	133.1	--	190.0
1988	0.50	0.46	0.21	0.48	0.35	--	0.35	0.52	--	0.52	--	--	0.18	0.18	0.46	249.0	131.4	108.2	--	177.9
1989	0.55	0.29	0.17	0.44	0.57	0.45	0.56	0.49	0.39	0.47	--	--	0.23	0.23	0.45	211.1	112.7	111.2	--	158.3
1990	0.36	0.41	0.29	0.37	0.23	0.42	0.24	0.49	0.28	0.47	--	--	0.11	0.11	0.34	179.1	90.7	54.5	--	120.0
1991	0.31	0.30	0.27	0.30	0.17	0.30	0.18	0.36	0.28	0.34	--	--	0.08	0.08	0.27	138.8	87.0	87.1	--	116.0
1992	0.37	0.35	0.19	0.37	0.29	0.69	0.32	0.41	0.18	0.37	--	--	0.05	0.05	0.34	163.1	77.3	52.3	--	106.8
1993	0.47	0.39	0.30	0.45	0.33	0.37	0.34	0.35	0.09	0.32	--	--	0.13	0.13	0.40	152.8	65.4	66.8	--	106.0
1994	0.35	0.27	0.17	0.33	0.28	0.31	0.28	0.31	0.16	0.28	--	--	0.17	0.17	0.31	138.2	63.2	66.9	--	101.7
1995	0.36	0.39	0.25	0.36	0.20	0.12	0.19	0.32	0.21	0.29	--	--	0.10	0.10	0.31	125.7	56.2	62.2	--	92.6
1996	0.47	0.34	0.13	0.44	0.57	0.13	0.55	0.46	0.21	0.41	--	0.28	0.15	0.22	0.44	139.0	70.6	53.6	--	95.9
1997	0.34	0.33	0.10	0.33	0.22	0.04	0.21	0.27	0.06	0.24	--	0.23	0.11	0.17	0.28	164.6	80.1	59.8	--	111.5
1998	0.59	0.31	0.33	0.56	0.34	0.10	0.32	0.73	0.08	0.65	0.09	0.32	0.12	0.18	0.48	131.3	60.1	34.8	34.2	79.1
1999	0.34	0.34	--	0.34	0.23	--	0.23	0.26	--	0.26	--	0.22	0.14	0.18	0.27	114.8	57.6	41.6	47.4	83.9
2000	0.34	0.47	--	0.37	0.31	--	0.31	0.33	--	0.33	--	0.32	0.16	0.24	0.34	72.1	40.2	24.8	27.1	53.2
2001	0.48	0.44	--	0.48	0.25	--	0.25	0.18	--	0.18	--	0.22	0.09	0.16	0.38	107.1	54.0	28.1	32.1	71.0
2002	0.37	0.32	--	0.36	0.32	--	0.32	0.19	--	0.19	--	0.17	0.14	0.15	0.32	211.5	73.4	33.0	37.4	104.3
2003	0.42	0.40	--	0.41	0.34	--	0.34	0.29	--	0.29	0.07	0.28	0.17	0.22	0.37	211.8	71.7	48.9	38.4	114.1
2004	0.41	0.23	--	0.36	0.37	0.06	0.37	0.40	--	0.40	--	0.23	0.08	0.16	0.35	223.5	112.2	73.0	45.3	146.0
2005	0.32	0.18	0.67	0.30	0.19	--	0.19	0.48	--	0.48	--	0.18	0.19	0.19	0.28	265.2	149.8	89.1	86.4	183.2
2006	0.68	0.52	--	0.64	0.56	--	0.56	0.65	--	0.65	--	0.63	0.27	0.45	0.61	375.7	195.6	151.9	80.8	250.4
2007	0.68	0.37	--	0.63	0.50	--	0.50	0.53	--	0.53	--	0.50	0.22	0.36	0.57	298.9	153.8	125.1	92.0	206.6
Mean	0.48	0.37	0.40	0.46	0.32	0.27	0.32	0.35	0.19	0.34	0.08	0.30	0.14	0.19	0.43	165.1	82.7	64.5	52.1	116.8

[a] Sport CPE = Number harvested/angler hour

[b] Commercial CPE = Number/kilometer of gill net

[c] Ontario sport fishing CPE was estimated from the most recent creel surveys in each basin; 2005 in Unit 1, 2004 in Unit 2 and 3, 2003 in Unit 4.

Table 5. Catch at age of walleye harvest by management unit, gear, and agency in Lake Erie during 2007. Units 4 and 5 are combined in Unit 4.

		Commercial	Sport					All Gears	
Unit	Age	OMNR	OMNR[a]	ODNR	MDNR	NYDEC	PA	Total	OMNR	Total
1	1	0		1,480	0	--	--	1,480	0	1,480
	2	70,377		32,252	0	--	--	32,252	70,377	102,629
	3	29,113		42,954	5,177	--	--	48,131	29,113	77,244
	4	1,124,387		1,114,943	139,321	--	--	1,254,264	1,124,387	2,378,651
	5	0		811	1,781	--	--	2,592	0	2,592
	6	63,762		75,343	7,290	--	--	82,633	63,762	146,395
	7+	60,293		145,756	11,982	--	--	157,738	60,293	218,031
	Total	1,347,932	26,650	1,413,539	165,551	--	--	1,605,740	1,374,582	2,953,672
2	1	557		1016	--	--	--	1,016	557	1,573
	2	14,065		10,822	--	--	--	10,822	14,065	24,887
	3	9,616		13,111	--	--	--	13,111	9,616	22,727
	4	379,095		445,762	--	--	--	445,762	379,095	824,857
	5	1,739		0	--	--	--	0	1,739	1,739
	6	23,423		35,617	--	--	--	35,617	23,423	59,040
	7+	21,532		71,657	--	--	--	71,657	21,532	93,189
	Total	450,027	1,672	577,985	--	--	--	579,657	451,699	1,029,684
3	1	325		91	--	--	--	91	325	416
	2	2,057		3,515	--	--	--	3,515	2,057	5,572
	3	14,596		2,915	--	--	--	2,915	14,596	17,511
	4	269,221		126,623	--	--	--	126,623	269,221	395,844
	5	7,270		159	--	--	--	159	7,270	7,429
	6	32,144		12,303	--	--	--	12,303	32,144	44,447
	7+	7,748		23,327	--	--	--	23,327	7,748	31,075
	Total	333,361	322	168,933	--	--	--	169,255	333,683	502,616
4	1	0		--	--	0	63	63	0	63
	2	0		--	--	329	2,416	2,745	0	2,745
	3	253		--	--	661	2,003	2,664	253	2,917
	4	16,707		--	--	14,530	87,021	101,551	16,707	118,258
	5	434		--	--	0	109	109	434	543
	6	3,376		--	--	3,383	8,455	11,838	3,376	15,214
	7+	14,435		--	--	10,231	16,032	26,263	14,435	40,698
	Total	35,205	2,361	--	--	29,134	116,099	147,594	37,566	182,799
All	1	882		2,587	0	0	63	2,650	882	3,532
	2	86,499		46,589	0	329	2,416	49,334	86,499	135,833
	3	53,578		58,980	5,177	661	2,003	66,821	53,578	120,399
	4	1,789,410		1,687,328	139,321	14,530	87,021	1,928,200	1,789,410	3,717,610
	5	9,443		970	1,781	0	109	2,860	9,443	12,303
	6	122,705		123,263	7,290	3,383	8,455	142,391	122,705	265,096
	7+	104,008		240,740	11,982	10,231	16,032	278,985	104,008	382,993
	Total	2,166,525	31,005	2,160,457	165,551	29,134	116,099	2,502,246	2,197,530	4,668,771

[a] Ontario sport harvest values were estimated from the most recent creel surveys in each basin; 2005 in Unit 1, 2004 in Unit 2 and 3, 2003 in Unit 4. These values are included in Ontario's total walleye harvest, but are not used in catch-at-age analysis.

Table 6. Percent age composition of walleye harvested by management unit, gear, and agency in Lake Erie during 2007. Units 4 and 5 are combined in Unit 4.

		Comm'l	Sport						All Gears
Unit	Age	OMNR	OMNR[a]	ODNR	MDNR	NYDEC	PA	Total	Total
1	1	0.0	--	0.1	0.0	--	--	0.1	0.1
	2	5.2	--	2.3	0.0	--	--	2.0	3.5
	3	2.2	--	3.0	3.1	--	--	3.0	2.6
	4	83.4	--	78.9	84.2	--	--	79.4	81.3
	5	0.0	--	0.1	1.1	--	--	0.2	0.1
	6	4.7	--	5.3	4.4	--	--	5.2	5.0
	7+	4.5	--	10.3	7.2	--	--	10.0	7.4
	Total	100	--	100	100	--	--	100	100
2	1	0.1	--	0.2	--	--	--	0.2	0.2
	2	3.1	--	1.9	--	--	--	1.9	2.4
	3	2.1	--	2.3	--	--	--	2.3	2.2
	4	84.2	--	77.1	--	--	--	77.1	80.2
	5	0.4	--	0.0	--	--	--	0.0	0.2
	6	5.2	--	6.2	--	--	--	6.2	5.7
	7+	4.8	--	12.4	--	--	--	12.4	9.1
	Total	100	--	100	--	--	--	100	100
3	1	0.1	--	0.1	--	--	--	0.1	0.1
	2	0.6	--	2.1	--	--	--	2.1	1.1
	3	4.4	--	1.7	--	--	--	1.7	3.5
	4	80.8	--	75.0	--	--	--	75.0	78.8
	5	2.2	--	0.1	--	--	--	0.1	1.5
	6	9.6	--	7.3	--	--	--	7.3	8.8
	7+	2.3	--	13.8	--	--	--	13.8	6.2
	Total	100	--	100	--	--	--	100	100
4	1	0.0	--	--	--	0.0	0.1	0.0	0.0
	2	0.0	--	--	--	1.1	2.1	1.9	1.5
	3	0.7	--	--	--	2.3	1.7	1.8	1.6
	4	47.5	--	--	--	49.9	75.0	69.9	65.5
	5	1.2	--	--	--	0.0	0.1	0.1	0.3
	6	9.6	--	--	--	11.6	7.3	8.2	8.4
	7+	41.0	--	--	--	35.1	13.8	18.1	22.6
	Total	100	--	--	--	100	100	100	100
All	1	0.0	--	0.1	0.0	0.0	0.1	0.1	0.1
	2	4.0	--	2.2	0.0	1.1	2.1	2.0	2.9
	3	2.5	--	2.7	3.1	2.3	1.7	2.7	2.6
	4	82.6	--	78.1	84.2	49.9	75.0	78.0	80.2
	5	0.4	--	0.0	1.1	0.0	0.1	0.1	0.3
	6	5.7	--	5.7	4.4	11.6	7.3	5.8	5.7
	7+	4.8	--	11.1	7.2	35.1	13.8	11.3	8.3
	Total	100	--	100	100	100	100	100	100

Table 7. Annual mean age (years) of Lake Erie walleye by gear, management unit, and agency. Means include data from 1975 to present.

	Sport Fishery															Commercial Fishery				
	Unit 1				Unit 2			Unit 3			Unit 4 & 5					Unit 1	Unit 2	Unit 3	Unit 4	
Year	OH	MI	ON	Total	OH	ON	Total	OH	ON	Total	ON	PA	NY	Total	Total	ON	ON	ON	ON	Total
1980	3.00	3.00	2.84	3.00	2.92	--	2.92	2.65	--	2.65	--	--	--	--	2.99	2.96	2.96	--	--	2.96
1981	3.61	2.97	3.47	3.59	2.62	--	2.62	2.72	--	2.72	--	--	--	--	3.56	3.00	3.00	2.99	--	3.00
1982	3.25	3.25	2.76	3.24	2.58	--	2.58	2.51	--	2.51	--	--	--	--	3.23	2.81	2.81	2.81	--	2.81
1983	3.03	3.03	3.17	3.03	2.25	--	2.25	2.07	--	2.07	--	--	--	--	2.94	3.47	3.47	3.47	--	3.47
1984	2.64	2.64	2.90	2.64	2.61	--	2.61	2.68	--	2.68	--	--	--	--	2.64	2.89	2.89	2.89	--	2.89
1985	3.36	3.36	3.17	3.36	3.24	--	3.24	3.58	--	3.58	--	--	--	--	3.35	3.04	3.04	3.04	--	3.04
1986	3.73	3.61	3.54	3.71	3.69	--	3.69	4.08	--	4.08	--	--	--	--	3.72	3.61	3.70	4.22	--	3.71
1987	3.83	3.32	3.78	3.73	3.68	--	3.68	4.10	--	4.10	--	--	--	--	3.73	3.71	3.47	3.40	--	3.61
1988	3.97	3.43	4.58	3.78	3.81	--	3.81	5.37	--	5.37	--	--	4.87	4.87	3.93	3.27	3.15	3.89	--	3.32
1989	4.48	3.75	4.29	4.28	4.65	4.29	4.64	5.13	4.29	5.00	--	--	5.59	5.59	4.44	3.49	3.51	4.22	--	3.60
1990	4.44	4.64	5.00	4.52	5.31	5.41	5.31	6.41	5.41	6.36	--	--	5.70	5.70	4.90	3.91	3.90	4.60	--	3.99
1991	4.91	5.29	5.01	4.95	6.22	6.03	6.20	6.70	5.91	6.58	--	--	6.36	6.36	5.41	4.21	4.63	5.14	--	4.41
1992	4.60	3.49	3.45	4.43	4.89	6.72	5.15	5.67	6.42	5.73	--	--	6.35	6.35	4.71	4.03	4.23	5.49	--	4.27
1993	4.60	4.41	4.09	4.57	5.79	6.45	5.83	5.98	6.17	5.99	--	--	6.15	6.15	4.96	3.64	4.38	5.21	--	4.00
1994	4.53	4.19	5.84	4.49	5.38	6.41	5.45	6.22	6.85	6.28	--	--	6.49	6.49	4.93	3.65	4.36	5.60	--	4.03
1995	4.04	3.55	4.74	4.02	6.07	7.29	6.12	6.08	7.17	6.33	--	--	6.80	6.80	4.48	3.38	4.63	5.92	--	3.94
1996	3.98	3.46	4.31	3.93	4.22	7.22	4.26	6.06	7.57	6.22	--	--	6.47	6.47	4.35	3.57	3.36	5.21	--	3.73
1997	4.21	3.99	4.21	4.18	5.30	5.30	5.30	6.27	6.27	6.22	--	--	6.25	6.25	4.67	3.87	3.68	4.83	--	3.96
1998	3.74	3.13	3.15	3.69	4.66	8.09	4.74	4.64	7.81	4.69	9.55	--	10.13	9.92	4.32	3.26	4.00	5.26	7.00	3.72
1999	3.72	3.16	3.43	3.63	5.35	9.17	5.48	5.95	10.00	6.18	8.15	--	10.29	9.32	4.55	3.41	4.29	5.28	6.76	3.81
2000	3.94	3.27	--	3.76	4.12	--	4.12	6.36	--	6.36	--	--	9.75	9.75	4.55	3.69	4.67	5.65	6.46	4.11
2001	3.66	3.02	--	3.57	4.09	--	4.09	6.14	--	6.14	--	7.70	9.09	8.01	3.99	3.19	3.77	5.52	6.00	3.57
2002	3.80	3.83	--	3.81	4.57	--	4.57	5.46	--	5.46	--	6.59	8.05	7.25	4.21	3.22	3.50	5.37	5.80	3.54
2003	4.67	4.16	--	4.59	4.67	--	4.67	5.87	--	5.87	3.35	7.50	10.01	8.45	4.90	3.68	4.36	5.58	6.59	4.09
2004	4.77	4.41	--	4.70	5.11	6.56	5.11	6.42	--	6.42	--	5.86	11.11	7.41	5.01	2.96	2.59	3.49	6.07	2.96
2005	5.33	4.26	3.35	5.23	4.21	--	4.21	5.53	--	5.53	--	6.61	6.72	6.68	5.22	3.61	3.16	4.64	4.70	3.66
2006	3.86	3.24	--	3.73	3.68	--	3.68	4.57	--	4.57	--	4.10	6.38	4.55	3.85	3.19	3.19	3.44	4.82	3.26
2007	4.64	4.42	--	4.62	4.79	--	4.79	4.89	--	4.89	--	4.89	6.80	5.27	4.71	4.20	4.29	4.25	6.55	4.26
Mean	3.84	3.54	3.66	3.80	4.00	6.58	4.02	5.00	6.72	5.02	7.02	6.18	7.47	6.88	4.02	3.33	3.52	4.50	6.08	3.48

Table 8. Estimated abundance at age, survival (S) and maximum exploitation (u) for Lake Erie walleye, 1980 – 2007 from the 2008 catch-at-age analysis model in ADMB, M=0.32. West and central basin population modeled, east basin stock excluded. 2008 projected abundance of ages 3 to 7+ is based on survival from 2007, and projected 2008 age-2 abundance is based on regression of pooled trawl YOY data and ADMB age 2 abundance (see Table 9).

	Age								
Year	2	3	4	5	6	7+	Total	S	u
1980	10,751,700	9,886,950	558,426	1,028,600	195,503	35,947	22,457,126	0.576	0.263
1981	6,834,490	6,982,690	5,032,090	282,072	519,567	117,007	19,767,916	0.463	0.403
1982	11,000,700	4,097,250	2,744,820	1,960,650	109,903	248,315	20,161,638	0.539	0.343
1983	7,166,530	6,840,620	1,813,060	1,204,150	860,133	157,819	18,042,312	0.566	0.261
1984	45,113,600	4,660,820	3,512,450	919,286	610,547	516,858	55,333,561	0.618	0.276
1985	5,752,340	29,110,900	2,331,210	1,736,500	454,480	559,488	39,944,918	0.609	0.158
1986	17,555,800	3,924,910	17,370,000	1,382,120	1,029,520	602,666	41,865,016	0.598	0.210
1987	16,436,400	11,663,500	2,177,870	9,544,830	759,472	899,186	41,481,258	0.598	0.207
1988	43,422,800	10,920,200	6,489,530	1,202,470	5,270,010	918,515	68,223,525	0.613	0.227
1989	13,715,300	28,474,700	5,891,950	3,472,430	643,422	3,314,270	55,512,072	0.583	0.206
1990	10,644,500	9,097,920	15,867,500	3,257,670	1,919,910	2,198,420	42,985,920	0.609	0.167
1991	5,934,390	7,204,230	5,362,360	9,281,690	1,905,570	2,415,950	32,104,190	0.621	0.145
1992	12,701,400	4,068,770	4,388,650	3,238,670	5,605,810	2,618,960	32,622,260	0.614	0.181
1993	19,691,200	8,564,400	2,356,990	2,515,330	1,856,230	4,725,380	39,709,530	0.592	0.240
1994	3,387,520	12,916,900	4,559,870	1,234,870	1,317,830	3,476,650	26,893,640	0.555	0.229
1995	12,648,900	2,234,990	7,014,150	2,433,130	658,925	2,581,500	27,571,595	0.580	0.252
1996	14,145,100	8,260,340	1,173,730	3,608,280	1,251,670	1,686,560	30,125,680	0.536	0.330
1997	1,625,970	8,853,280	3,809,610	527,396	1,621,320	1,334,380	17,771,956	0.513	0.277
1998	14,627,700	1,047,660	4,466,900	1,879,700	260,223	1,468,870	23,751,053	0.554	0.340
1999	6,872,990	9,105,980	474,978	1,970,070	829,020	775,394	20,028,432	0.543	0.290
2000	5,611,720	4,399,380	4,505,810	229,433	951,620	781,449	16,479,412	0.536	0.295
2001	16,358,800	3,578,000	2,157,540	2,157,930	109,880	836,355	25,198,505	0.612	0.239
2002	1,470,460	10,738,100	1,906,740	1,133,470	1,133,680	501,579	16,884,029	0.611	0.150
2003	12,037,400	1,004,640	6,498,180	1,143,890	679,989	982,878	22,346,977	0.625	0.186
2004	514,423	8,100,200	578,440	3,697,070	650,804	950,825	14,491,762	0.620	0.133
2005	55,814,800	363,224	5,006,870	355,160	2,269,990	986,171	64,796,215	0.650	0.246
2006	1,881,290	37,414,800	192,688	2,601,310	184,523	1,699,370	43,973,981	0.619	0.135
2007	6,367,860	1,333,470	23,028,200	117,964	1,592,530	1,157,270	33,597,294	0.627	0.140
2008	1,595,698	4,492,766	816,179	14,000,106	71,715	1,675,129	22,651,592		

Table 9. Data used to estimate the abundance of age-2 walleye by simple linear regression where Y=ADMB AGE-2 and X=Pooled ON-OH YOY Trawl. Values in bold are regression estimates and used for RAH projections 2008-2009, respectively. Regression statistics are given at the bottom of the page.

Year Class	Year of Recruitment to Fisheries	Pooled ON and OH YOY Trawl	LN Pooled ON and OH YOY Trawl	ADMB Estimated Age 2 walleye (millions)	LN Estimated Age 2 walleye (millions)
1987	1989	9.22	2.221050	13.715	2.618512
1988	1990	20.70	3.030037	10.645	2.365043
1989	1991	5.60	1.722767	5.934	1.780764
1990	1992	47.03	3.850722	12.701	2.541712
1991	1993	68.02	4.219831	19.691	2.980172
1992	1994	4.64	1.534714	3.388	1.220098
1993	1995	97.78	4.582730	12.649	2.537570
1994	1996	62.15	4.129615	14.145	2.649368
1995	1997	2.67	0.980954	1.626	0.486105
1996	1998	93.13	4.533964	14.628	2.682917
1997	1999	24.75	3.208825	6.873	1.927599
1998	2000	13.67	2.615130	5.612	1.724857
1999	2001	58.14	4.062785	16.359	2.794766
2000	2002	3.19	1.161274	1.470	0.385575
2001	2003	31.16	3.439264	12.037	2.488018
2002	2004	0.17	-1.748700	0.514	-0.664709
2003	2005	204.02	5.318223	55.815	4.022039
2004	2006	6.96	1.940453	1.881	0.631958
2005	2007	10.71	2.371551	6.368	
2006	2008	1.52	0.420280	**1.596**[1]	
2007	2009	23.31	3.149066	**8.638**[2]	

[1]This regression estimate was used for 2008 age 2 projection.
[2]This regression estimate was used for 2009 age 2 projection.

Note: The regression equation, with standard errors in parentheses, was,

$$Y = 0.6189\ (0.0636)\ X + 0.2072\ (0.2087)$$

with n=18, F=95, $p<0.0001$ and an $r^2=0.86$. Both parameters were transformed by natural logarithm (LN).

Table 10. Estimated harvest of Lake Erie walleye for 2008 and projections for 2009 and 2010. Fishing mortality for the fully-selected age groups is derived from the Harvest Policy as shown in Figure 11. Abundance of age-2 and older walleye is from ADMB catch-age results and trawl regressions. Stock size and catch in numbers are in millions of fish.

	2008 Stock Size (millions)		Rate Functions					2008 RAH (millions of fish)	2009 Stock Size (millions)
Age	**Mean**	**F**	**s(age)**	**(F)**	**(Z)**	**(S)**	**(u)**	**Mean**	**Mean**
2	1.596		0.162	0.036	0.356	0.701	0.030	0.048	8.638
3	4.493		0.962	0.212	0.532	0.588	0.164	0.738	1.118
4	0.816		1.000	0.220	0.540	0.583	0.170	0.139	2.640
5	14.000		1.000	0.220	0.540	0.583	0.170	2.380	0.476
6	0.072		1.000	0.220	0.540	0.583	0.170	0.012	8.159
7+	1.675		0.973	0.214	0.534	0.586	0.166	0.278	1.024
Total	22.652	0.220					0.159	3.594	22.054
(3+)	21.056								13.416

	2009 Stock Size (millions)		Rate Functions					Projected 2009 RAH (millions of fish)	Projected 2010 Stock Size (millions)
Age	**Mean**	**F**	**s(age)**	**(F)**	**(Z)**	**(S)**	**(u)**	**Mean**	**Mean**
2	8.638		0.162	0.035	0.355	0.701	0.029	0.253	*
3	1.118		0.962	0.207	0.527	0.590	0.161	0.180	6.058
4	2.640		1.000	0.215	0.535	0.586	0.167	0.440	0.660
5	0.476		1.000	0.215	0.535	0.586	0.167	0.079	1.546
6	8.159		1.000	0.215	0.535	0.586	0.167	1.358	0.279
7+	1.024		0.973	0.209	0.529	0.589	0.162	0.166	5.381
Total	22.054	0.215					0.112	2.477	*
(3+)	13.416								13.924

* No estimate of the 2008 year class recruiting in 2010 is available.

Table 11. East basin walleye ADMB catch-age model results in numbers of fish (a), and biomass (b) by age, based on PA, NY and ONT Units 4 and 5 data; M=0.16.

(a)

	Age										
Number	2	3	4	5	6	7	8	9	10	11+	Total
1993	230,284	377,739	168,748	265,847	59,553	200,730	107,141	142,756	20,867	42,888	1,616,553
1994	96,917	195,992	315,336	125,667	193,008	43,236	145,732	77,785	103,643	46,572	1,343,889
1995	339,314	82,404	159,937	196,965	77,051	118,341	26,510	89,354	47,693	92,796	1,230,365
1996	622,329	288,671	68,810	122,789	142,083	55,582	85,367	19,123	64,457	101,607	1,570,817
1997	48,878	528,661	235,154	44,876	73,060	84,540	33,072	50,794	11,378	99,726	1,210,139
1998	383,714	41,596	440,658	173,258	32,206	52,433	60,672	23,734	36,453	80,451	1,325,175
1999	104,560	326,480	34,576	319,774	121,598	22,603	36,799	42,581	16,658	82,652	1,108,281
2000	446,665	88,908	270,073	24,888	214,601	81,605	15,169	24,696	28,577	67,127	1,262,308
2001	361,935	379,619	72,527	172,986	15,094	130,155	49,493	9,200	14,978	58,836	1,264,824
2002	63,944	307,867	313,819	50,529	116,462	10,162	87,627	33,321	6,194	50,250	1,040,174
2003	521,010	54,424	257,362	236,337	37,058	85,413	7,453	64,265	24,438	41,697	1,329,456
2004	28,286	443,355	45,211	183,809	165,633	25,971	59,860	5,223	45,039	46,732	1,049,120
2005	6,328,960	24,091	374,530	36,390	146,370	131,896	20,681	47,668	4,159	73,223	7,187,968
2006	45,252	5,391,320	20,408	306,777	29,622	119,146	107,364	16,835	38,802	63,155	6,138,679
2007	237,139	38,514	4,495,620	14,989	221,218	21,361	85,916	77,420	12,140	74,014	5,278,331

(b)

Biomass	Age										
(kgs)	2	3	4	5	6	7	8	9	10	11+	Total
1993	131,492	404,936	181,404	391,061	97,905	454,452	254,244	423,558	69,195	149,250	2,557,497
1994	66,485	205,595	391,331	240,275	511,278	98,492	394,934	226,044	311,861	162,072	2,608,367
1995	234,806	88,007	211,916	383,096	137,691	243,545	75,898	273,424	143,509	313,928	2,105,820
1996	397,668	268,464	109,132	222,248	283,171	114,387	220,416	55,572	193,950	353,591	2,218,599
1997	31,233	491,655	372,955	81,225	145,609	173,983	85,391	147,606	34,238	347,048	1,910,942
1998	245,193	38,684	698,883	313,597	64,186	107,907	156,654	68,972	109,687	279,969	2,083,733
1999	90,445	352,925	57,086	627,716	245,020	48,100	97,113	117,312	42,344	271,180	1,949,240
2000	322,492	118,425	421,314	42,060	447,872	188,017	38,378	80,460	81,700	208,764	1,949,482
2001	249,735	431,247	103,424	331,613	24,106	276,579	156,992	27,904	49,023	193,806	1,844,429
2002	35,936	379,600	444,682	89,335	243,872	19,847	218,716	94,232	16,296	164,721	1,707,237
2003	363,665	76,684	396,080	367,741	69,187	213,874	20,928	152,244	59,506	123,756	1,843,664
2004	18,980	517,396	57,373	352,914	350,148	58,383	148,992	13,110	110,841	116,083	1,744,220
2005	3,499,910	23,971	508,611	67,468	306,352	296,634	53,523	126,605	10,236	191,697	5,085,007
2006	61,361	9,742,110	37,836	781,054	66,620	236,385	467,892	59,645	202,195	233,988	11,889,086
2007	142,520	40,016	5,048,580	21,269	332,490	42,379	211,268	154,144	22,240	172,157	6,187,063

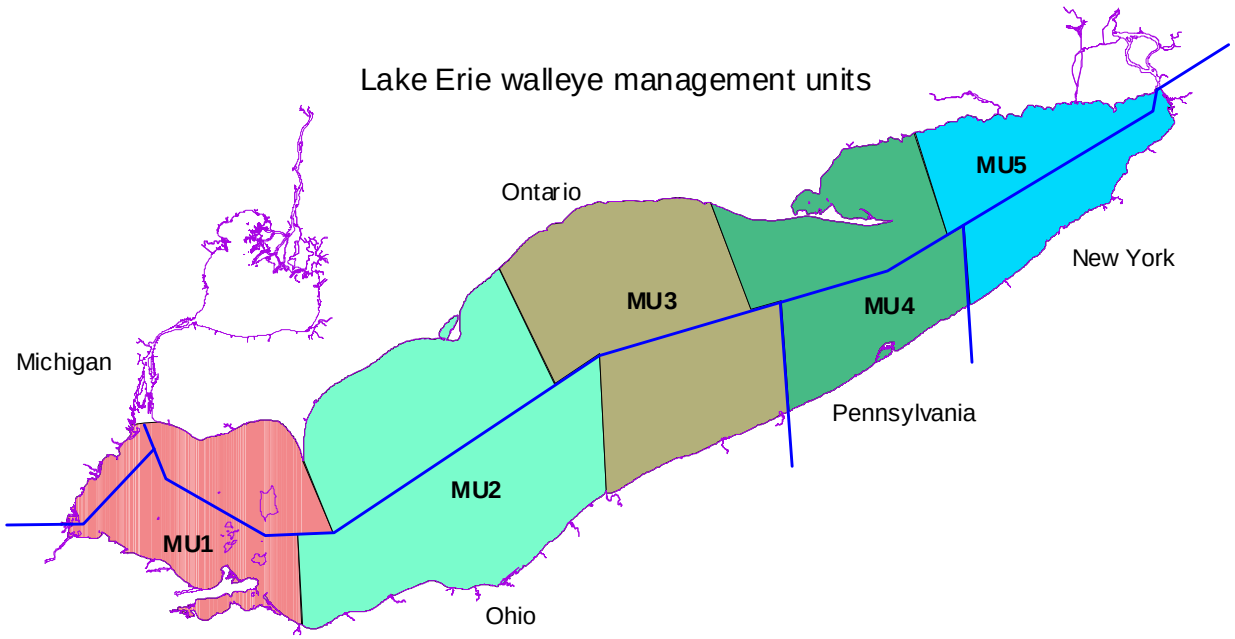

Figure 1. Map of Lake Erie with management units recognized by the Walleye Task Group for interagency management of walleye.

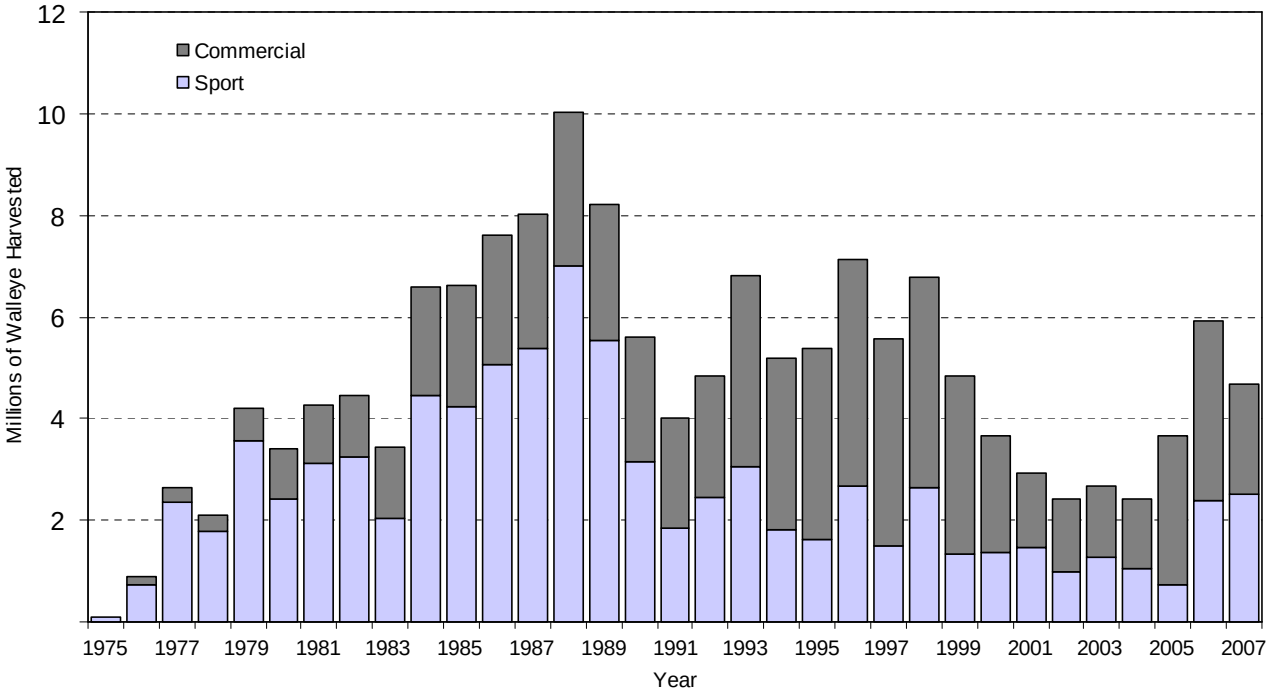

Figure 2. Lakewide harvest of Lake Erie walleye by sport and commercial fisheries, 1975 - 2007.

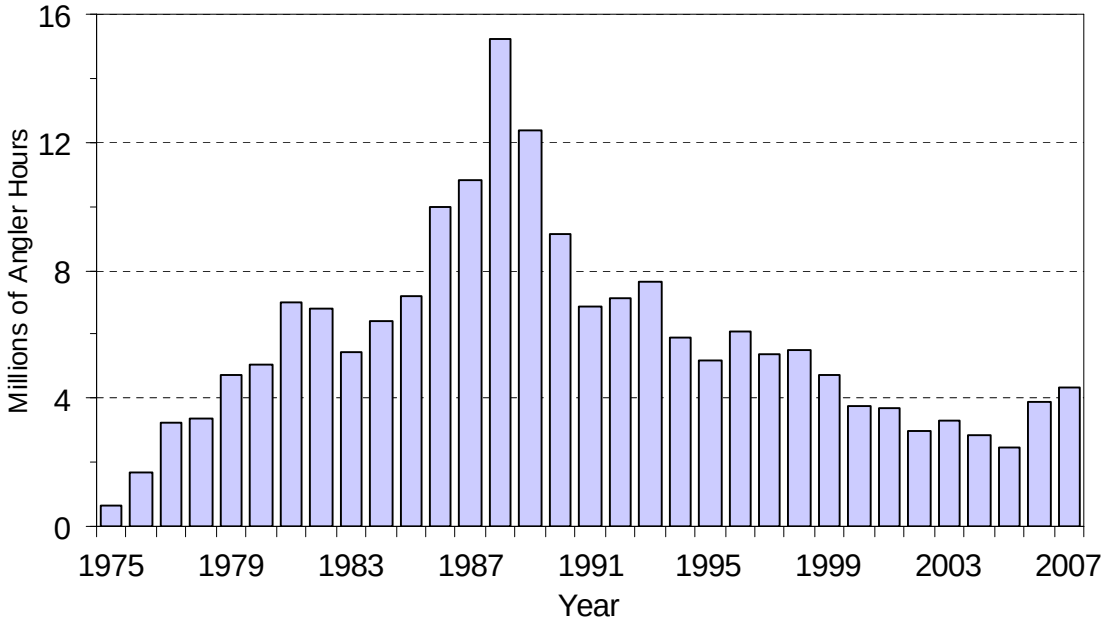

Figure 3. Lakewide total effort (angler hours) by sport fisheries for Lake Erie walleye, 1975-2007 (1999-2007 excludes Ontario sport effort).

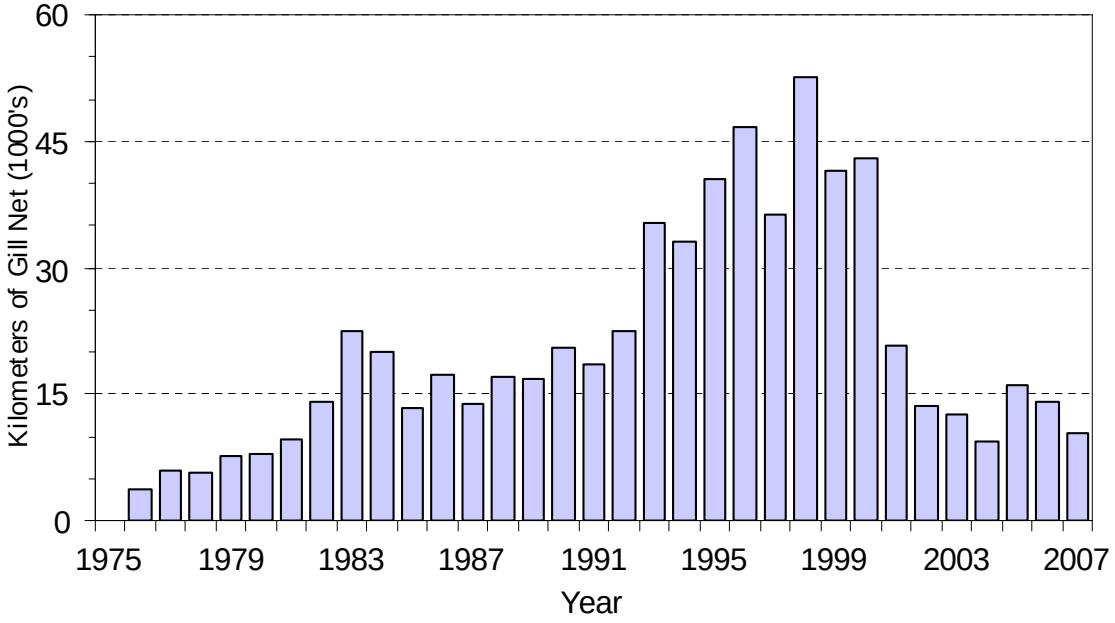

Figure 4. Lakewide total effort (kilometers of gill net) by commercial fisheries for Lake Erie walleye, 1975-2007.

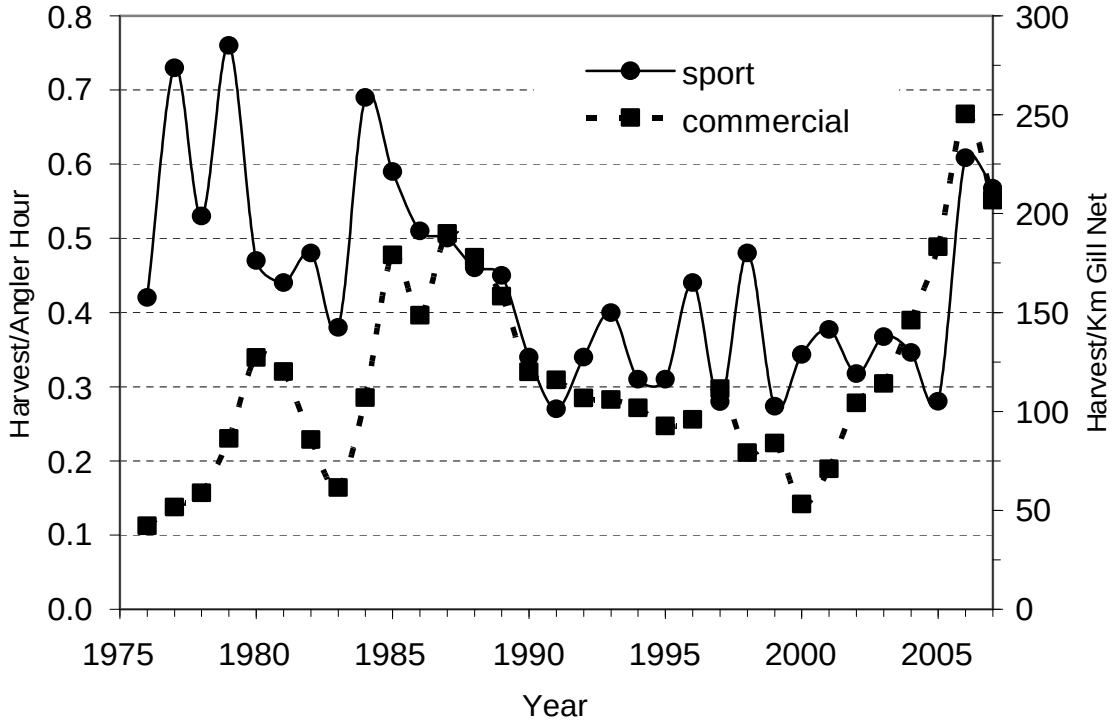

Figure 5. Lakewide harvest per unit effort (HPE) for Lake Erie sport and commercial walleye fisheries, 1975-2007.

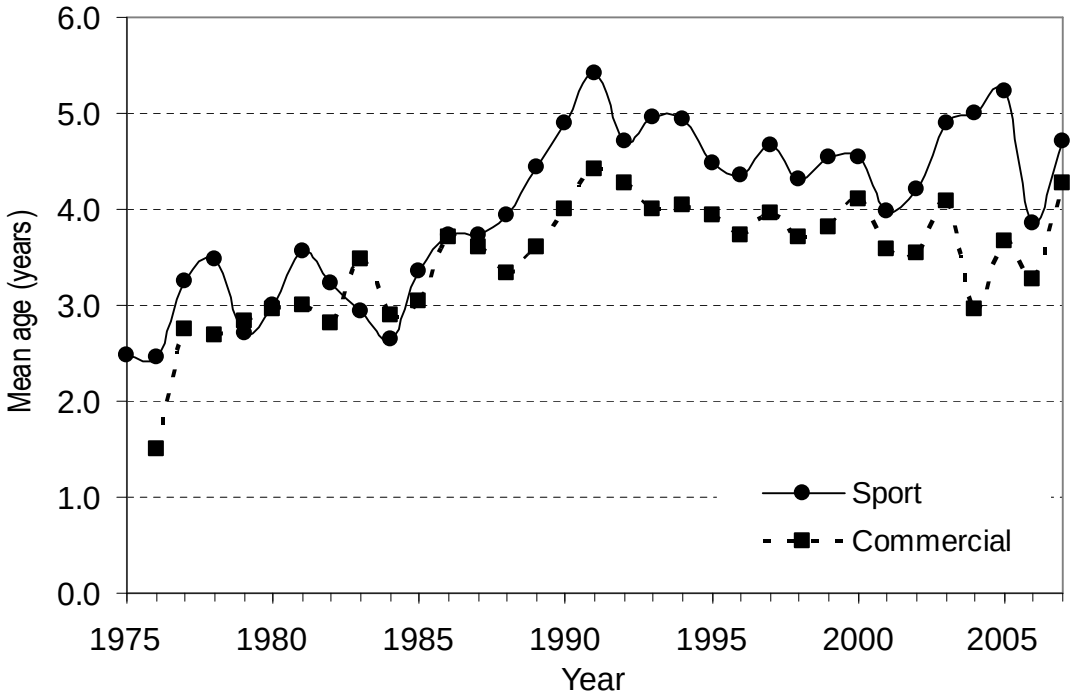

Figure 6. Lakewide mean age of Lake Erie walleye in sport and commercial harvests, 1975-2007.

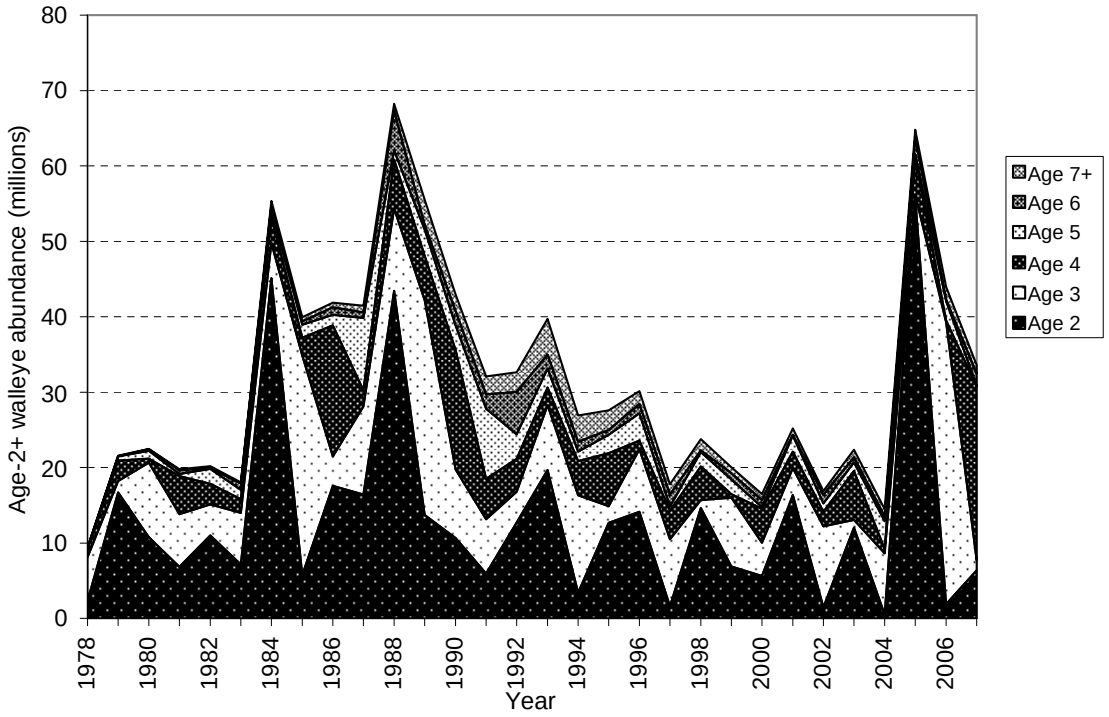

Figure 7. Age class composition of Lake Erie walleye 1978-2007. Data are from Table 8 in this document.

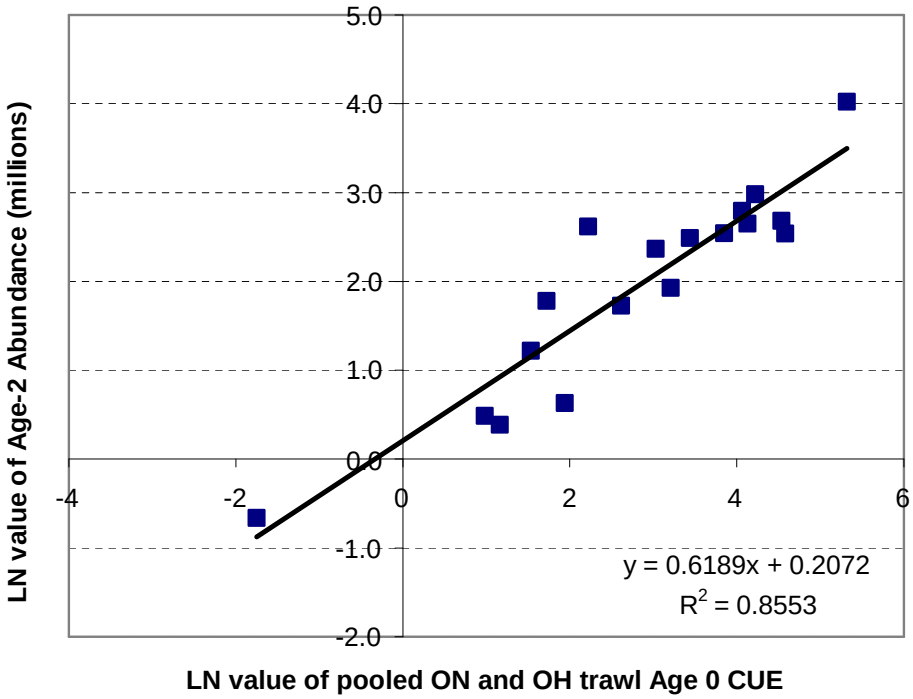

Figure 8. Regression estimates of abundance for age-2 Lake Erie walleye using natural logarithm transformed ADMB 2008 model catch-at-age estimates (y) and pooled Ontario and Ohio young-of-the-year trawl indices (x).

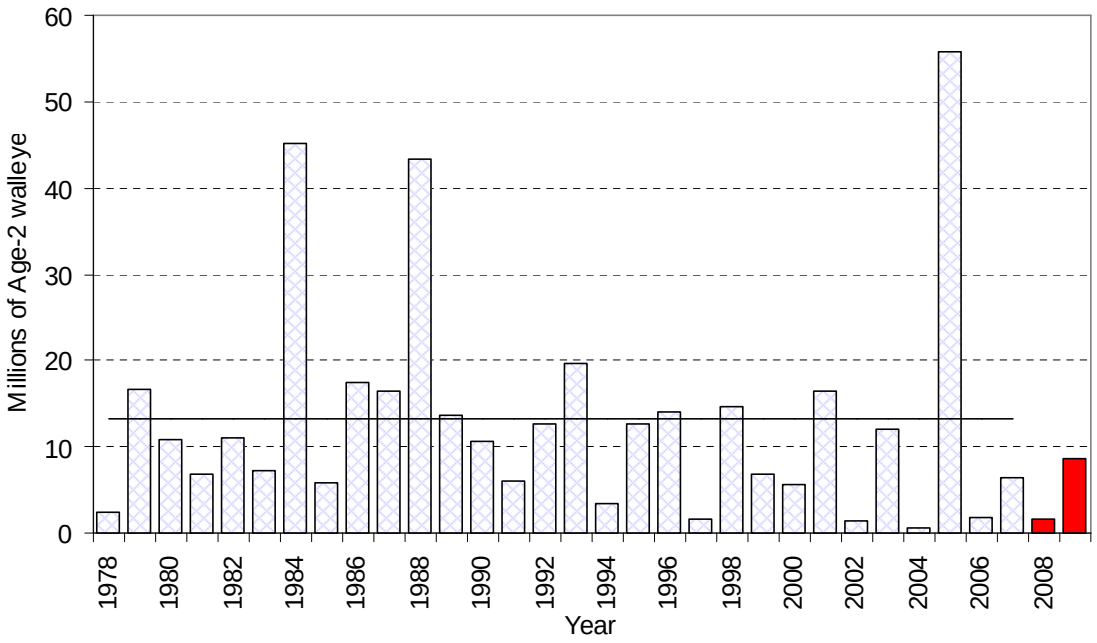

Figure 9. Catch-at-age estimates of age-2 Lake Erie walleye for 1978 to 2007. Estimates for 2008-2009 are from the regression of YOY index and numbers of age-2 from catch-at-age analysis (see Table 9). Solid line represents the historic average (1978-2007).

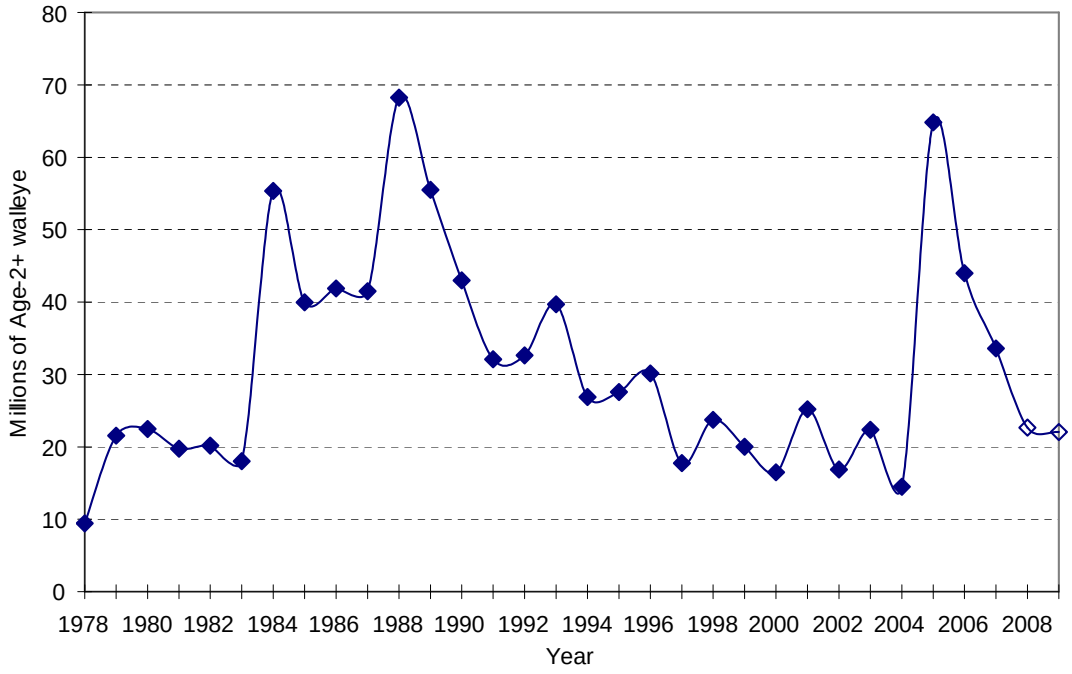

Figure 10. Abundance of Lake Erie walleye from 1978-2007, forecasting two additional years of population abundance (open diamonds).

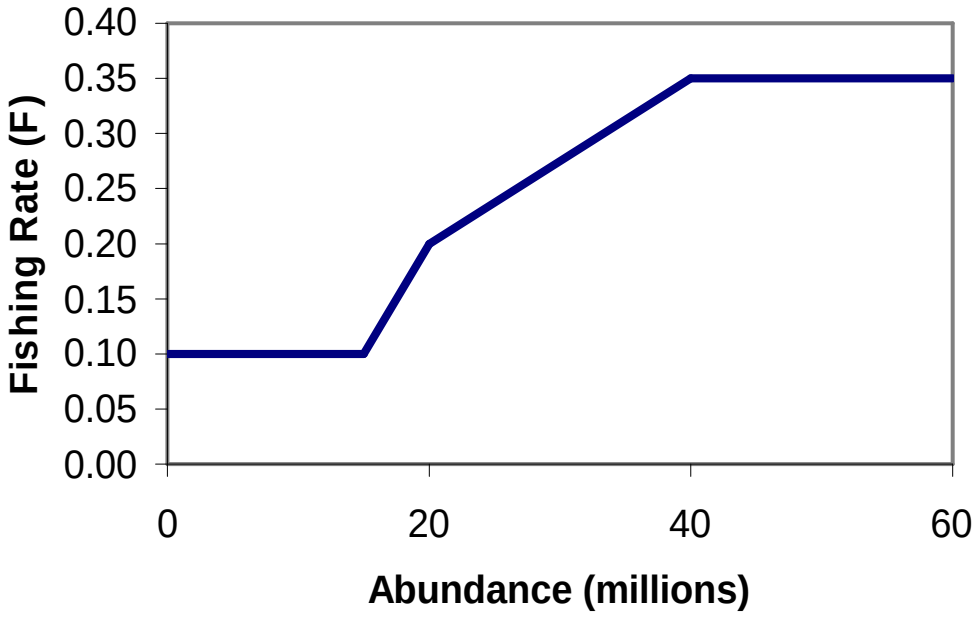

Figure 11. Lake Erie walleye harvest policy for age-2 and older walleye: below 15 million fish, F=0.1; between 15 and 20 million fish, F= 0.02(N)-0.02 (N is abundance in millions of fish); between 20 and 40 million fish, F= 0.0075(N)+0.05; and at 40 million fish and above, F=0.35.