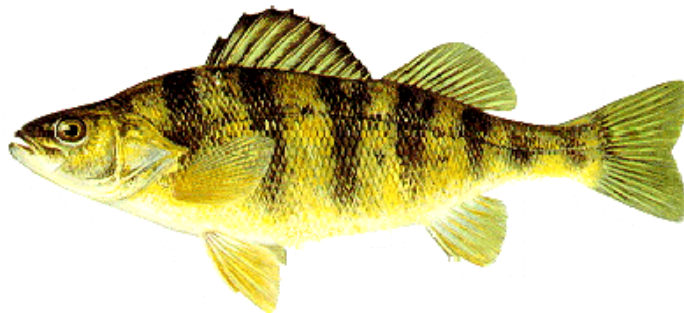


Report of the Lake Erie Yellow Perch Task Group

March 22th, 2012



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Standing Technical Committee
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Note: The data and management summaries contained in this report are provisional. Every effort has been made to ensure their correctness. Contact individual agencies for complete state and provincial data. Data reported in pounds for years prior to 1996 have been converted from metric tonnes. Please contact the Yellow Perch Task Group or individual agencies before using or citing data published herein.

Introduction

From April 2011 through March 2012, the Yellow Perch Task Group (YPTG) addressed the following charges:

1. Maintain and update centralized time series of datasets required for population models and assessment including:
 - a. Fishery harvest, effort, age composition, biological and stock parameters
 - b. Survey indices of young of year, juvenile and adult abundance, size at age and biological parameters
 - c. Fishing harvest and effort by grid.
2. Support a sustainable harvest policy by:
 - a. Examining exploitation strategies
 - b. Recommending an allowable harvest for 2012 for each management unit
3. Assist the STC with the potential development of new exploitation strategies and completion of a Lake Erie Yellow Perch Management Plan.
4. Support QFC modeling efforts for catch-age models and harvest policies.

Charge 1: 2011 Fisheries Review and Population Dynamics

The lakewide total allowable catch (TAC) in 2011 was 12.650 million pounds. This allocation represented a 3.7% decrease from a TAC of 13.137 million pounds in 2010. For yellow perch assessment and allocation, Lake Erie is partitioned into four management units (Units, or MUs; Figure 1.1). The 2011 allocation by management unit was 2.071, 3.537, 6.250, and 0.792 million pounds for Units 1 through 4, respectively. Please note that in 2011, the LEC set the TAC for MU1, MU2 and MU3 higher than the mean RAH values suggested in the March 2011 YPTG report (1.437, 2.526, and 4.996 million pounds respectively, YPTG 2011). Also, in 2011, the LEC set the TAC for MU4 at 0.792 million pounds which was lower than the mean RAH suggested in the YPTG report (0.952 million pounds, YPTG 2011). The lakewide harvest of yellow perch in 2011 was 9.620 million pounds, or 76.0% of the total 2011 TAC. This was a 0.7% decrease from the 2010 harvest of 9.689 million pounds. Harvest by Lake Erie Management Units 1 through 4 was 1.813, 3.065, 4.156, and 0.586 million pounds, respectively (Table 1.1). The portion of TAC harvested was 87.6%, 86.6%, 66.5%, and 74.0%, in MUs 1 through 4, respectively. In 2011, Ontario harvested 6.370 million pounds, followed by Ohio (2.833 million lbs.), Pennsylvania (190 thousand lbs.), Michigan (146 thousand lbs.), and New York (81 thousand lbs.).

Ontario's fraction of allocation harvested was 103.5% in MU1, 103.2% in MU2, 103.0% in MU3, and 102.0% in MU4 (see comments below regarding Ontario's harvest reporting and commercial ice allowance policy). Ohio fishers attained 76.4% of their TAC in the western basin (MU1), 72.7% in the west central basin (MU2), and 31.4% in the east central basin (MU3). Michigan anglers in MU1 attained 77.6% of their TAC. Pennsylvania fisheries harvested 16.0% of their TAC in MU3 and 42.6% of their TAC in MU4. New York fisheries attained 32.9% of their TAC in MU4.

Ontario's portion of the lakewide yellow perch harvest decreased slightly to 66.2% in 2011 from 68.2% in 2010 (Table 1.1). Ohio's proportion of lakewide harvest increased slightly to 29.4% in 2011, from 29.1% in 2010. Harvest in Michigan, Pennsylvania, and New York waters combined represented 4.3% of the lakewide harvest in 2011.

Ontario continued to employ a commercial ice allowance policy implemented in 2002, by which 3.3% is subtracted from commercial landed weight. This step was taken so that ice was not debited towards fishers' quotas. Ontario's landed weights in the YPTG report have not been adjusted to account for ice content. Ontario's reported yellow perch harvest in tables and figures is represented exclusively by the commercial gill net fishery. Reported sport harvests for Michigan, Ohio, Pennsylvania, and New York are based on creel survey estimates. Ohio, Pennsylvania, and New York trap net harvest and effort are based on landed catch reports. Additional fishery documentation is available in annual agency reports.

Harvest, fishing effort, and fishery harvest rates are summarized for the time period 2000 to 2011 by management unit, year, agency, and gear type in Tables 1.2 to 1.5. Trends over a longer time series (1975 to 2011) are depicted graphically for harvest (Figure 1.2), fishing effort (Figure 1.3), and harvest rates (Figure 1.4) by management unit and gear type. The spatial distributions of harvest (all gears) and effort by gear type for 2011 in ten-minute interagency grids are presented in Figures 1.5 through 1.8.

Ontario's yellow perch harvest from large mesh (3 inches or greater) gill nets in 2011 was 9.0%, 20.6%, and 13.4% of the gill net harvest in MUs 1, 2 and 3, respectively, but was negligible in MU4 (0.6%). Harvest, effort, and catch per unit effort from (1) small mesh yellow perch effort (<3 inch stretched mesh) and (2) larger mesh sizes, are distinguished in Tables 1.2 to 1.5. Harvest from targeted small mesh gill nets in 2011 decreased 1.0% in MU1 and 12.2% in MU2, from 2010 harvest. Harvest in MU3 and MU4 in 2011 remained similar to 2010 harvest. Ontario trap net harvest is minimal (103 pounds in 2011) and is included in the total harvest of yellow perch in MU1 (Tables 1.1 and 1.2). Ontario commercial smelt trawlers incidentally catch

yellow perch in management units 2, 3 and 4. Trawl catches are included in the total harvest of yellow perch in Table 1.1 and documented by MU at the bottom of Tables 1.2 to 1.5.

Targeted gill net effort in 2011 increased from 2010 by 11.4% in MU2, 6.0% in MU3, and 27.4% in MU4, but decreased 18.4% in MU1. Gill net effort remained lower in 2011 compared to the 1990s and earlier decades (Figure 1.3). Targeted gill net harvest rates in 2011 decreased 16.5% in MU2, 10.4% in MU3 and 21.8% in MU4 from 2010, but increased 19.2% in MU1 (Figure 1.4).

In 2011, sport harvest in U.S. waters increased 1.1% in MU1, 7.6% in MU3, and 96.4% in MU4 from 2010 harvest, but decreased 37.1% in MU2 (Figure 1.2). Angling effort in U.S. waters increased in 2011 from 2010 in MU3 (3.3%) and MU4 (59.5%), but decreased in MU1 (6.7%) and MU2 (21.3%; Figure 1.3). Yellow perch sport harvest from Ontario waters is assessed periodically, but creel surveys were not performed in 2011.

Sport fishing harvest rates are commonly expressed as fish harvested per angler hour for those anglers seeking yellow perch. These harvest rates are presented in Tables 1.2 to 1.5. Compared to 2010 rates, harvest per angler hour in Ohio waters slightly increased in MU1 (2.9%) and MU3 (2.5%), but decreased in MU2 (18.8%). Angler harvest rates increased from 2010 in Michigan waters (47.8% in MU1), in Pennsylvania waters (32.5% in MU3, 31.8% in MU4), and in New York waters (53.4% in MU4).

Angler harvest in kilograms per angler hour is presented graphically in Figure 1.4 for each management unit, by pooling jurisdictions' harvest weights and effort. In 2011, the sport harvest rate (in kg/hr) increased in MU1 (8.3%), MU3 (9.5%), and MU4 (32.8%), and decreased in MU2 (20.0%).

Harvest from Ohio, Pennsylvania, and New York commercial trap nets in 2011 increased 14.5% in MU2, 74.2% in MU3 and 27.8% in MU4, but decreased 20.2% in MU1 from 2010. Compared to 2010, trap net effort (lifts) in 2011 increased in MU1 (23.5%), MU3 (4.1%), and MU4 (33.5%), and decreased in MU2 (14.8%). In 2011, trap net harvest rates decreased from 2010 in MU1 (35.4%), MU4 (4.4%) and increased in MU2 (34.4%) and MU3 (67.6%).

Age Composition and Growth

Lakewide, the yellow perch harvest in 2011 consisted mostly of age-4 fish (2007 year class, 37.0%), with a fair contribution of age-5 fish (2006 year class, 22.1%), the pooled older cohorts (ages 6+, 20.1%), and age-3 fish (2008 year class, 19.3%) (Table 1.6). In MU1, age-4 (2007 year class, 42.7%) and age-3 (2008 year class, 36.5%) fish contributed the most to the

fishery. These year classes also contributed to the MU2 fishery (47.1% and 21.2% respectively) and the MU4 fishery (38.7% and 28.3% respectively). In MU3, the fishery consisted of 34% pooled older cohorts (mainly comprised of the 2003 year class), followed by age-5 fish (2006 year class, 33.3%) and age-4 (2007 year class, 25.4%).

Yellow perch growth differs among life stages and between basins as illustrated by trends in total length-at-age (Figure 1.9). For simplicity, Figure 1.9 is comprised of young-of-the-year data from summer and fall interagency trawls, while data for age-1 and successive ages to age-4 are from Ontario Partnership gill net surveys (MUs 1 and 4) and Ohio fall trawls (MUs 2 and 3). As these data are taken from fall surveys, caution must be exercised when evaluating these figures. Seasonal exploitation patterns and density-dependent effects may alter the overall picture of growth trends. In addition, separate surveys in the same MU may show dissimilar trends in size-at-age due to north-south growth differences or fishery influences. However, size-at-age long-term time series results describe relatively stable length-at-age for ages 0 to 4 across the management units. Nevertheless, size-at-age in Ontario Partnership gill net surveys in MU1 decreased for ages 2 and 3, since 2008 and age-4 in 2009. On the other hand, in MU3, size-at-age for age 3 and 4 fish in Ohio fall trawls has increased since 2009. Yellow perch condition in Figure 1.10 is comprised of data from Ontario Partnership gill net surveys (MUs 1 and 4) and Ohio fall trawls (MUs 2 and 3). Trends in condition may be influenced by seasonal differences in sampling. Additional data from Long Point Bay trawl surveys are used to determine condition of age-0 yellow perch in MU4.

The task group continues to update yellow perch growth data in: (1) weight-at-age values recorded annually in the harvest and (2) length- and weight-at-age values taken from interagency trawl and gill net surveys. These values are applied in the calculation of population biomass and the forecasting of harvest in the approaching year. Therefore, changes in weight-at-age factor into the changes in overall population biomass and determination of recommended allowable harvest (RAH). In 2007, the YPTG moved from using a two-year average of weight-at-age to using a three-year average, and this was continued in 2011. This was done to minimize the impacts of weak year classes on determining the mean weight-at-age of yellow perch in the population and in the harvest.

ADMB Catch-at-Age Analysis

Population size for each management unit was estimated by catch-at-age analysis using the Auto Differentiation Model Builder computer program (ADMB), with a standard version that

incorporates commercial gill net catchability coefficients based on the seasonal distribution of harvest and relative catch rates. Estimates of population size from 1990 to 2011 and projections for 2012 are presented in Table 1.7. Abundance, biomass, survival, and exploitation rates are presented by management unit graphically for 1975 to 2011 in Figures 1.11 to 1.14. Mean weights-at-age from assessment surveys were applied to abundance estimates to generate population biomass estimates (Table 1.8 and Figure 1.12). Population abundance and biomass estimates are critical to monitoring the status of stocks and determining allowable harvest.

Abundance estimates should be interpreted with several caveats. Inclusion of abundance estimates from 1975 to 2011 implies that the time series are continuous. Lack of data continuity for the entire time series weakens the validity of this assumption. Survey data from multiple agencies are represented only in the latter part of the time series (since the late 1980s); methods of fishery data collection have also varied. Some model parameters are constrained to constants, such as natural mortality, catchability, and selectivity blocks. This technique lessens our ability to directly compare abundance levels over three decades. In addition, commercial gill net selectivity, is estimated independently in the latter part of the time series using gill net selectivity curves derived from index gillnet data by the method of Helser (1998); involving back calculation of length-at-age and weightings based on the monthly distribution of harvest-at-age. With catch-at-age analysis the most recent year's population estimates inherently have the widest error bounds; this is to be expected for cohorts that remain at-large under less than full selectivity in the population.

In the catch-at-age model, population estimates are derived by minimizing an objective function weighted by data sources including fishery effort, fishery catch, and survey catch rates. In 2011-2012, the YPTG group determined data weightings (referred to as λ s in ADMB) using an expert opinion approach for evaluating potential sources of bias in data sets that could negatively influence model performance. Expert opinions were expressed in a spreadsheet template by evaluating possible sources of bias pertaining to all data sources used in the catch-at-age model. YPTG members supplied background materials for each data source to facilitate completion of the λ spreadsheet templates. The perceived magnitude of bias in each data set was ranked according to factors associated with spatial, temporal, sampling, modeling assumptions, and fishing methodology. These qualitative selections linked to numeric values were then weighted by the relative importance assigned to each factor. The YPTG worked as a group to complete the λ spreadsheet templates to determine data weightings for each data set in the model. Data weighting λ s are presented in Appendix A Table 1.

Recruitment Estimator for Incoming Age-2 Yellow Perch

Age-2 yellow perch recruitment in 2012 was predicted by robust regression of juvenile yellow perch trawl and gill net indices against catch-at-age analysis estimates of two-year-old abundance in each management unit. All values were transformed by natural logarithm, and the regression equations included y-intercepts. Only survey data from within each individual management unit was used to project age-2 abundance from that management unit. Age-2 yellow perch recruitment in 2012 was calculated using the mean of age-2 values predicted from the young-of-year and yearling indices that performed well in the regressions ($r^2 > 0.50$) with age-2 abundance estimates (Appendix A Table 2). Data from trawl and gill net index series for the time period examined are presented in Appendix A Table 3, while a key that summarizes abbreviations used for the trawl and gill net series is presented as a legend in Appendix A Table 4.

Estimates of age-2 yellow perch recruitment for 2012 (the 2010 year class) were below average in MU1 and MU2, and above average in MU3 and MU4 (Table 1.7, Appendix A Table 2). Due to differences in selectivity between management units, the 2010 year class will have a moderate contribution to the fishery in MU1 and MU2, and a small contribution to the fishery in MU3 and MU4 in 2012.

2012 Population Size Projection

Stock size estimates for 2012 yellow perch age-3-and-older were projected from statistical catch-at-age analysis (SCAA) estimates of 2011 population size and age-specific survival rates in 2011 (Table 1.8). Projected age-2 yellow perch recruitment from the 2010 year class (method described above) was added to the 2012 population estimate for older fish in each unit, producing the total standing stock in 2012 (Table 1.8). Standard errors and ranges for estimates are provided for each age in 2011, and following estimated survival from SCAA, for 2012. Descriptions of *min*, *mean*, and *max* population estimates refer to the age-specific estimates minus or plus one standard deviation (Table 1.8).

Management unit stock size estimates for 2011 from SCAA (Table 1.7) were higher than those projected in the spring of 2011 in MUs 2 and 3, and were similar to predicted values in MU's 1 and 4 (YPTG 2011). Differences in stock size estimates were due to additional data in the model and an updated method for determining data weightings (see ADMB Catch Age Analysis). Current estimates of age-2 fish in 2011 are from the SCAA's first assessment of this cohort and as

such have the widest error bounds.

Stock size estimates projected for 2012 were slightly lower than 2011 in MUs 1, and 2, and slightly higher in MUs 3 and 4 (Tables 1.7, 1.8, Appendix A Table 2, and Figure 1.11). Abundance projections for 2012 were 21.8, 50.4, 72.4, and 21.9 million age-2-and-older yellow perch in management units 1 through 4, respectively. Abundance estimates of age-2-and-older yellow perch in 2012 are projected to decrease by 6.0% and 10.5% in MUs 1 and 2 compared to the 2011 abundance estimates, and increase by 2.6% and 9.4% in management units 3 and 4. Age-3-and-older yellow perch abundance in 2012 is projected to be 11.8, 31.2, 44.3, and 12.4 million fish in Units 1 through 4, respectively. Model estimates of abundance for age-3-and-older yellow perch in 2012 are projected to decrease from the 2011 estimates in MU1 (26.2%), MU2 (39.2%), MU3 (36.4%) and MU4 (35.4%).

As a function of population estimates and mean weight-at-age from surveys, total biomass estimates of age-2-and-older yellow perch for 2012 are projected to decline in each MU compared to 2011 (Table 1.8 and Figure 1.12): decreasing 3.2%, 8.4%, 2.4%, and 1.1% in MUs 1-4, respectively. The biomass estimates for 2011 are above the historic long-term (1975 to 2010) mean in MU2 (101.8% of the mean value), MU3 (193.1%) and MU4 (316.1%). The biomass estimate for 2011 is below the historic long-term (1975 to 2010) mean in MU1 (57.9% of the mean value). In 2012, age-4 yellow perch (2008 year class) are expected to represent the largest fraction of biomass in MUs 2, 3 and 4. In MU1, age-2 yellow perch (2010 year class) are expected to represent the largest fraction of total biomass.

Estimates of yellow perch survival for age-3-and-older in 2010 were 48.7%, 54.3%, 60.4%, and 62.8% in MUs 1 to 4, respectively (Figure 1.13). In 2011, estimated survival rates of age-3-and-older were 45.1%, 54.5%, 62.7%, and 61.7% in Units 1 through 4 (Table 1.8 and Figure 1.13). Estimates of yellow perch survival in 2011 for age-2-and-older were 50.7% in MU1, 55.4% in MU2, 62.8% in MU3, and 61.9% in MU4 (Table 1.8 and Figure 1.13). Survival rates in 2011 compared to 2010 decreased in MUs 1 and 4, for age-2-and-older and age-3-and-older yellow perch. In MU2, survival rates of age-2-and-older fish decreased from 2010 to 2011, while survival rates of age-3-and-older fish increased slightly. In MU3, 2011 survival rates of age-2-and-older fish remained the same as 2010, while survival rates of age-3-and-older fish increased slightly.

Estimated exploitation rates in 2010 were 22.8%, 15.7%, 8.2%, and 5.2% in management units 1 to 4, respectively, for age-3-and-older yellow perch. Exploitation rates for yellow perch age-3-and-older in 2011 were estimated at 27.3%, 15.5%, 5.3%, and 6.6%, for

MUs 1 to 4, respectively (Figure 1.14). Estimates of yellow perch exploitation for age-2-and-older in 2011 were 20.2% in MU1, 14.3% in MU2, 5.3% in MU3, and 6.3% in MU4 (Table 1.8 and Figure 1.14).

Charge 2: Harvest Strategy and RAH

Harvest Strategy Methodology

Fishing rates applied in 2012 are presented in Table 2.1, along with associated RAH values for each management unit. These fishing rates are similar to those used in 2009 and 2010. These interim harvest strategies were developed for a draft Yellow Perch Management Plan (YPMP), tested using an updated yellow perch simulation (see YPTG 2010 report).

Harvest Strategies and RAH Determination

Fishing rates for 2012 were based on interim harvest strategies from work on the YPMP and yellow perch simulation results (see Charge 3: Lake Erie Yellow Perch Management Plan). The yellow perch simulation determined that fishing rates that were one-half of F_{msy} could support viable sport and commercial fisheries without inviting excessive biological risk. These fishing rates were used to determine *min*, *mean*, and *max* RAH's for 2012 for each management unit (Tables 2.1 and 2.2).

In 2005, an exercise was completed to update the allocation area shares using geographical information system (GIS) mapping. In late 2008, the YPTG proposed that the line dividing MUs 3 and 4 be moved five minutes to the east in order to be consistent with Ontario's Eastern Basin Management Zone. The Lake Erie Committee (LEC) and Standing Technical Committee (STC) approved the change and new areas and allocation shares by jurisdiction were calculated (Figure 2.1). The change was implemented in 2009. These same allocation shares will be used in 2012. The allocation shares by management unit and jurisdiction are:

Allocation of TAC within Management Unit and Jurisdiction, 2012:

<u>MU1:</u>	MI	9.1%	OH	50.3%	ONT	40.6%
<u>MU2:</u>	OH	54.4%	ONT	45.6%		
<u>MU3:</u>	OH	32.4%	PA	15.3%	ONT	52.3%
<u>MU4:</u>	NY	31.0%	PA	11.0%	ONT	58.0%

Charge 3: Lake Erie Yellow Perch Management Plan

With guidance from the STC, the YPTG was charged with supporting the development of a Lake Erie Yellow Perch Management Plan (YPMP). In February 2009, a draft YPMP was submitted to Michigan State University's Quantitative Fisheries Center (QFC) for a technical review of the background material, exploitation strategies and associated yellow perch simulation. The QFC returned preliminary comments in March 2009; however, they indicated that additional time would be required to carry out a more thorough review of the harvest strategies and thresholds defined in the management plan.

During 2009 the YPTG implemented some of the suggestions put forth by the QFC, including changes to the yellow perch simulation and YPMP exploitation policies. Although the yellow perch simulation was used in 2010, full yellow perch exploitation strategies have not been completed for each management unit. The fishing rates currently applied for RAH in MUs 1, 2 and 3 are $\frac{1}{2}F_{msy}$. They are 0.67, 0.67, and 0.70 for management units 1–3, respectively. In MU4, a more conservative fishing rate of 0.30 was chosen.

The LEC, STC, QFC, and stakeholder groups from all jurisdictions on Lake Erie have formed the Lake Erie Percid Management Advisory Group (LEPMAG), to address stakeholder objectives, modeling concerns and exploitation policies for Lake Erie percid. During 2011, LEPMAG focused on walleye objectives and assessment models. In 2012, LEPMAG will begin discussions on stakeholder objectives and catch-at-age modeling concerns for yellow perch. These discussions are expected to lead to updated exploitation strategies for yellow perch in a Lake Erie yellow perch management plan.

Charge 4: Support QFC Modeling Efforts for Catch-Age Models

The YPTG was tasked with reviewing the methodology of assigning weighting factors to data sources in the catch-at-age models. In 2011-12, the YPTG adopted a new approach to determining data weightings in the yellow perch catch-at-age models. This approach is described in Charge 1 of this report.

The LEPMAG, facilitated by the QFC, will review the yellow perch assessment models during the course of their discussion on yellow perch management over the next two years. The YPTG will continue to support this endeavor.

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- Yellow Perch Task Group (YPTG). 2011. Report of the Yellow Perch Task Group, March 2011. Presented to the Standing Technical Committee, Lake Erie Committee of the Great Lakes Fishery Commission. Ann Arbor, Michigan, USA.

Table 1.1. Lake Erie yellow perch harvest in pounds by management unit (Unit) and agency, 2000-2011.

	Year	Ontario*		Ohio		Michigan		Pennsylvania		New York		Total Harvest
		Harvest	%	Harvest	%	Harvest	%	Harvest	%	Harvest	%	
Unit 1	2000	980,323	47	1,038,650	50	67,010	3	--	--	--	--	2,085,983
	2001	813,066	45	915,641	51	70,910	4	--	--	--	--	1,799,617
	2002	1,454,105	50	1,316,553	45	147,065	5	--	--	--	--	2,917,723
	2003	1,179,667	44	1,406,385	53	84,878	3	--	--	--	--	2,670,930
	2004	1,698,761	59	1,090,669	38	94,732	3	--	--	--	--	2,884,162
	2005	1,513,890	60	965,231	38	49,485	2	--	--	--	--	2,528,606
	2006	1,325,464	54	1,055,378	43	62,854	3	--	--	--	--	2,443,696
	2007	727,678	41	982,677	55	62,815	4	--	--	--	--	1,773,170
	2008	580,050	56	409,705	39	47,934	5	--	--	--	--	1,037,689
	2009	853,137	61	463,564	33	87,319	6	--	--	--	--	1,404,020
	2010	879,358	47	889,512	48	83,725	5	--	--	--	--	1,852,595
	2011	870,802	48	796,447	44	145,960	8	--	--	--	--	1,813,209
Unit 2	2000	1,484,125	56	1,169,234	44	--	--	--	--	--	--	2,653,359
	2001	1,794,275	51	1,747,069	49	--	--	--	--	--	--	3,541,344
	2002	2,190,621	52	1,986,730	48	--	--	--	--	--	--	4,177,351
	2003	2,107,639	50	2,113,285	50	--	--	--	--	--	--	4,220,924
	2004	2,051,473	48	2,246,264	52	--	--	--	--	--	--	4,297,737
	2005	2,666,231	59	1,843,190	41	--	--	--	--	--	--	4,509,421
	2006	3,102,269	69	1,393,732	31	--	--	--	--	--	--	4,496,001
	2007	1,847,139	45	2,244,656	55	--	--	--	--	--	--	4,091,795
	2008	1,990,237	50	2,005,000	50	--	--	--	--	--	--	3,995,237
	2009	2,495,611	58	1,801,978	42	--	--	--	--	--	--	4,297,589
	2010	1,888,876	56	1,457,823	44	--	--	--	--	--	--	3,346,699
	2011	1,665,258	54	1,399,503	46	--	--	--	--	--	--	3,064,761
Unit 3	2000	771,646	62	443,250	36	--	--	32,613	3	--	--	1,247,509
	2001	999,450	64	464,811	30	--	--	91,211	6	--	--	1,555,472
	2002	1,192,691	60	640,104	32	--	--	140,821	7	--	--	1,973,616
	2003	1,667,133	72	481,558	21	--	--	177,516	8	--	--	2,326,207
	2004	1,453,419	62	659,447	28	--	--	244,063	10	--	--	2,356,929
	2005	1,771,800	75	457,593	19	--	--	142,028	6	--	--	2,371,421
	2006	3,451,499	90	271,144	7	--	--	106,260	3	--	--	3,828,903
	2007	2,997,101	84	391,285	11	--	--	193,065	5	--	--	3,581,451
	2008	2,200,168	74	629,366	21	--	--	155,014	5	--	--	2,984,548
	2009	2,266,727	74	597,214	20	--	--	190,742	6	--	--	3,054,683
	2010	3,370,099	85	476,808	12	--	--	117,640	3	--	--	3,964,547
	2011	3,366,412	81	636,686	15	--	--	153,233	4	--	--	4,156,331
Unit 4	2000	35,686	73	--	--	--	--	10,950	22	2,458	5	49,094
	2001	35,893	60	--	--	--	--	8,337	14	15,319	26	59,549
	2002	87,541	54	--	--	--	--	46,903	29	26,903	17	161,347
	2003	84,772	60	--	--	--	--	39,821	28	16,511	12	141,104
	2004	98,733	49	--	--	--	--	46,344	23	54,862	27	199,939
	2005	195,347	67	--	--	--	--	42,226	15	53,468	18	291,041
	2006	230,226	69	--	--	--	--	57,005	17	48,107	14	335,338
	2007	185,954	78	--	--	--	--	25,859	11	25,935	11	237,748
	2008	240,270	77	--	--	--	--	31,325	10	40,809	13	312,404
	2009	272,579	72	--	--	--	--	37,991	10	70,030	18	380,600
	2010	467,612	89	--	--	--	--	19,989	4	37,730	7	525,331
	2011	468,001	80	--	--	--	--	37,040	6	80,848	14	585,889
Lakewide Totals	2000	3,271,780	54	2,651,134	44	67,010	1	43,563	<1	2,458	<1	6,035,945
	2001	3,642,684	52	3,127,521	45	70,910	1	99,548	1	15,319	<1	6,955,982
	2002	4,924,958	53	3,943,387	43	147,065	2	187,724	2	26,903	<1	9,230,037
	2003	5,039,211	54	4,001,228	43	84,878	1	217,337	2	16,511	<1	9,359,165
	2004	5,302,386	54	3,996,380	41	94,732	1	290,407	3	54,862	<1	9,738,767
	2005	6,147,268	63	3,266,014	34	49,485	<1	184,254	2	53,468	<1	9,700,489
	2006	8,109,458	73	2,720,254	24	62,854	<1	163,265	1	48,107	<1	11,103,938
	2007	5,757,872	59	3,618,618	37	62,815	<1	218,924	2	25,935	<1	9,684,164
	2008	5,010,725	60	3,044,071	37	47,934	<1	186,339	2	40,809	<1	8,329,878
	2009	5,888,054	64	2,862,756	31	87,319	1	228,733	3	70,030	1	9,136,892
	2010	6,605,945	68	2,824,143	29	83,725	1	137,629	1	37,730	<1	9,689,172
	2011	6,370,473	66	2,832,636	29	145,960	2	190,273	2	80,848	1	9,620,190

*processor weight (quota debit weight) to 2001; fisher/observer weight from 2002 to 2011 (negating ice allowance).

Table 1.2. Harvest, effort and harvest per unit effort summaries for Lake Erie yellow perch fisheries in Management Unit 1 (Western Basin) by agency and gear type, 2000-2011.

		Unit 1				
		Michigan	Ohio		Ontario Gill Nets*	
	Year	Sport	Trap Nets	Sport	Small Mesh	Large Mesh**
Harvest (pounds)	2000	67,010	240,541	798,109	980,323	--
	2001	70,910	179,234	736,407	711,745	101,321
	2002	147,065	337,829	978,724	1,359,637	94,468
	2003	84,879	250,456	1,155,929	1,151,358	28,309
	2004	94,732	289,136	801,533	1,637,488	61,273
	2005	49,485	357,182	608,049	1,402,523	111,082
	2006	62,854	235,852	819,526	1,264,370	61,094
	2007	62,815	200,818	781,859	671,536	56,142
	2008	47,934	0	409,705	484,409	49,378
	2009	87,319	0	463,564	728,012	125,024
	2010	83,725	195,674	693,838	815,170	64,188
	2011	145,960	156,138	640,309	792,336	78,363
Harvest (Metric) (tonnes)	2000	30	109	362	445	--
	2001	32	81	334	323	46
	2002	67	153	444	617	43
	2003	38	114	524	522	13
	2004	43	131	364	743	28
	2005	22	162	276	636	50
	2006	29	107	372	573	28
	2007	28	91	355	305	25
	2008	22	0	186	220	22
	2009	40	0	210	330	57
	2010	38	89	315	370	29
	2011	66	71	290	359	36
Effort (a)	2000	122,447	4,026	965,628	6,741	--
	2001	97,761	1,518	720,923	2,167	2,142
	2002	190,573	2,715	900,289	4,546	739
	2003	121,638	2,213	1,182,694	3,725	395
	2004	206,902	4,351	833,690	6,052	901
	2005	98,429	3,903	816,959	5,170	1,182
	2006	118,628	3,517	683,994	5,194	787
	2007	181,698	2,951	823,624	2,230	1,125
	2008	95,925	0	519,050	1,653	899
	2009	130,556	0	578,303	3,058	1,680
	2010	132,852	2,607	798,240	3,152	845
	2011	139,344	3,219	729,369	2,571	682
Harvest Rates (b)	2000	2.2	27.1	3.0	66.0	--
	2001	2.9	53.5	3.4	149.0	21.5
	2002	2.5	56.4	3.4	135.6	58.0
	2003	2.4	51.3	3.5	140.2	32.5
	2004	1.6	30.1	3.0	122.7	30.8
	2005	1.7	41.5	3.1	123.0	42.6
	2006	1.7	30.4	4.2	110.4	35.2
	2007	1.0	30.9	3.4	136.6	22.6
	2008	1.5	--	2.7	132.9	24.9
	2009	2.7	--	3.1	108.0	33.8
	2010	2.3	34.0	3.4	117.3	34.4
	2011	3.4	22.0	3.5	139.8	52.1

(a) sport effort in angler-hours; gill net effort in km; trap net effort in lifts

(b) harvest rates for sport in fish/hr, gill net in kg/km, trap net in kg/lift

(*) Ontario commercial trap netters harvested 46,263 pounds of yellow perch in MU1 in 2008.

(*) Ontario commercial trap netters harvested 70 pounds of yellow perch in MU1 in 2009.

(*) Ontario commercial trap netters harvested 103 pounds of yellow perch in MU1 in 2011.

(**) Large mesh catch rates are not targeted and therefore of limited value

Table 1.3. Harvest, effort and harvest per unit effort summaries for Lake Erie yellow perch fisheries in Management Unit 2 (western Central Basin) by agency and gear type, 2000-2011.

	Year	Unit 2			
		Ohio		Ontario* Gill Nets	
		Trap Nets	Sport	Small Mesh	Large Mesh**
Harvest (pounds)	2000	565,009	604,225	1,484,125	--
	2001	905,088	841,891	1,593,704	200,571
	2002	1,099,971	886,759	1,892,070	298,551
	2003	1,255,205	858,080	2,019,617	88,022
	2004	1,287,747	958,517	1,893,871	157,602
	2005	1,162,746	680,444	2,446,007	219,723
	2006	744,452	649,280	2,981,793	120,476
	2007	1,701,552	543,104	1,561,287	173,699
	2008	1,376,588	628,412	1,669,682	253,984
	2009	1,338,616	463,362	1,994,208	482,402
	2010	935,616	522,207	1,410,051	470,926
	2011	1,070,817	328,686	1,312,168	339,404
Harvest (Metric) (tonnes)	2000	256	274	673	--
	2001	410	382	723	91
	2002	499	402	858	135
	2003	569	389	916	40
	2004	584	435	859	71
	2005	527	309	1,109	100
	2006	338	294	1,352	55
	2007	772	246	708	79
	2008	624	285	757	115
	2009	607	210	904	219
	2010	424	237	639	214
	2011	486	149	595	154
Effort (a)	2000	5,272	601,712	6,266	--
	2001	4,747	594,741	3,445	4,975
	2002	7,675	658,799	4,786	3,209
	2003	10,214	632,813	5,311	1,555
	2004	12,023	659,454	4,929	2,787
	2005	9,103	784,942	9,716	2,173
	2006	7,544	499,412	11,692	1,925
	2007	9,158	498,843	2,966	2,826
	2008	3,983	450,060	3,124	2,629
	2009	6,317	417,660	5,545	4,241
	2010	6,701	502,507	3,783	3,905
	2011	5,707	395,407	4,214	3,789
Harvest Rates (b)	2000	48.6	2.9	107.4	--
	2001	86.5	3.2	209.9	18.3
	2002	65.0	3.1	179.3	42.1
	2003	55.7	3.3	172.5	25.7
	2004	48.6	3.7	174.3	25.6
	2005	57.9	2.8	114.2	45.9
	2006	44.8	3.7	115.7	28.4
	2007	84.3	2.8	238.7	27.9
	2008	156.7	3.5	242.4	43.8
	2009	96.1	3.0	163.1	51.6
	2010	63.3	3.2	169.0	54.7
	2011	85.1	2.6	141.2	40.6

(a) sport effort in angler-hours; gill net effort in km; trap net effort in lifts

(b) harvest rates for sport in fish/hr, gill net in kg/km, trap net in kg/lift

(*) Ontario commercial trawlers harvested 112,153 pounds of yellow perch in MU2 in 2007.

(*) Ontario commercial trawlers harvested 66,203 pounds of yellow perch in MU2 in 2008.

(*) Ontario commercial trawlers harvested 15,439 pounds of yellow perch in MU2 in 2009.

(*) Ontario commercial trawlers harvested 7,899 pounds of yellow perch in MU2 in 2010.

(*) Ontario commercial trawlers harvested 13,686 pounds of yellow perch in MU2 in 2011.

(**) Large mesh catch rates are not targeted and therefore of limited value

Table 1.4. Harvest, effort and harvest per unit effort summaries for Lake Erie yellow perch fisheries in Management Unit 3 (eastern Central Basin) by agency and gear type, 2000-2011.

	Year	Unit 3					
		Ohio		Ontario* Gill Nets		Pennsylvania	
		Trap Nets	Sport	Small Mesh	Large Mesh**	Trap Nets	Sport
Harvest	2000	156,510	286,740	771,646	--	5,930	26,683
(pounds)	2001	4,472	460,339	948,622	50,828	2,602	96,946
	2002	0	640,104	1,094,894	97,797	2,009	138,812
	2003	0	481,559	1,647,047	20,086	5,050	172,467
	2004	0	659,447	1,443,314	10,105	7,753	236,310
	2005	43,253	414,340	1,657,498	113,969	15,228	126,800
	2006	70,310	200,834	3,332,037	119,461	20,467	85,793
	2007	48,286	342,999	2,941,451	42,570	23,471	169,594
	2008	139,023	490,343	2,160,041	32,673	22,927	132,087
	2009	112,030	485,184	2,180,834	77,858	35,296	155,446
	2010	153,097	323,711	3,065,336	302,410	36,026	104,224
	2011	327,871	308,815	2,911,506	451,628	1,542	151,691
Harvest	2000	71	130	350	--	2.7	12
(Metric)	2001	2.0	209	430	23	1.2	44
(tonnes)	2002	0	290	497	44	0.9	63
	2003	0	218	747	9.1	2.3	78
	2004	0	299	655	4.6	3.5	107
	2005	20	188	752	52	6.9	58
	2006	32	91	1,511	54	9.3	39
	2007	22	156	1,334	19	10.6	77
	2008	63	222	980	15	10.4	60
	2009	51	220	989	35	16.0	70
	2010	69	147	1,390	137	16.3	47
	2011	149	140	1,320	205	0.7	69
Effort	2000	1,640	214,825	2,342	--	231	48,561
(a)	2001	32	269,062	2,451	1,047	175	90,214
	2002	0	416,543	2,490	1,055	95	123,287
	2003	0	256,890	4,617	316	87	138,720
	2004	0	368,537	3,750	268	70	175,596
	2005	947	305,885	5,098	743	129	127,462
	2006	881	139,536	11,130	1,030	124	60,612
	2007	713	218,683	6,115	614	88	135,611
	2008	1,288	234,179	3,336	417	78	110,403
	2009	482	289,602	4,050	728	121	139,438
	2010	972	182,485	5,747	1,125	128	85,294
	2011	1,108	182,630	6,093	1,481	37	94,025
Harvest Rates	2000	43.3	3.0	149.4	--	11.6	1.9
(b)	2001	63.4	2.9	175.4	22.0	6.7	2.6
	2002	--	2.7	199.6	41.7	9.6	3.6
	2003	--	3.1	161.8	28.8	26.3	5.3
	2004	--	4.3	174.6	17.1	50.2	3.9
	2005	20.7	3.1	147.4	69.6	53.5	2.9
	2006	36.2	3.3	135.8	52.6	74.9	3.7
	2007	30.7	3.4	218.2	31.4	121.0	3.8
	2008	49.0	4.6	293.6	35.5	133.3	4.5
	2009	105.4	3.5	244.2	48.5	132.3	4.8
	2010	71.4	4.0	241.9	121.9	127.6	4.0
	2011	134.2	4.1	216.7	138.3	18.9	5.3

(a) sport effort in angler-hours; gill net effort in km; trap net effort in lifts

(b) harvest rates for sport in fish/hr, gill net in kg/km, trap net in kg/lift

(*) Ontario commercial trawlers harvested 13,080 pounds of yellow perch in MU3 in 2007.

(*) Ontario commercial trawlers harvested 7,454 pounds of yellow perch in MU3 in 2008.

(*) Ontario commercial trawlers harvested 8,035 pounds of yellow perch in MU3 in 2009.

(*) Ontario commercial trawlers harvested 2,353 pounds of yellow perch in MU3 in 2010.

(*) Ontario commercial trawlers harvested 3,278 pounds of yellow perch in MU3 in 2011.

(**) Large mesh catch rates are not targeted and therefore of limited value

Table 1.5. Harvest, effort and harvest per unit effort summaries for Lake Erie yellow perch fisheries in Management Unit 4 (Eastern Basin) by agency and gear type, 2000-2011.

		Unit 4					
		New York		Ontario* Gill Nets		Pennsylvania	
	Year	Trap Nets	Sport	Small Mesh	Large Mesh**	Trap Nets	Sport
Harvest (pounds)	2000	625	1,833	35,686	--	0	10,950
	2001	27	15,292	34,284	1,608	0	8,337
	2002	1,951	24,952	85,935	1,606	29	46,874
	2003	1,048	15,464	84,648	124	0	39,822
	2004	3,907	50,955	98,716	17	0	90,514
	2005	7,726	45,742	195,258	52	0	42,226
	2006	9,423	38,684	229,063	1,163	0	57,005
	2007	9,511	16,424	179,595	3,076	0	25,859
	2008	11,136	29,673	234,366	2,689	0	31,325
	2009	13,476	56,554	266,425	4,738	0	37,991
	2010	11,772	25,958	465,775	1,517	0	26,263
	2011	15,045	65,803	464,331	2,761	0	37,040
Harvest (Metric (tonnes))	2000	0.3	0.8	16.2	--	0	5.0
	2001	0.01	6.9	15.5	0.73	0	3.8
	2002	0.9	11.3	39.0	0.70	0.01	21.3
	2003	0.5	7.0	38.4	0.06	0	18.1
	2004	1.8	23.1	44.8	0.01	0	41.0
	2005	3.5	20.7	88.6	0.02	0	19.2
	2006	4.3	17.5	103.9	0.53	0	25.9
	2007	4.3	7.4	81.4	1.40	0	11.7
	2008	5.1	13.5	106.3	1.22	0	14.2
	2009	6.1	25.6	120.8	2.15	0	17.2
	2010	5.3	11.8	211.2	0.69	0	11.9
	2011	6.8	29.8	210.6	1.25	0	16.8
Effort (a)	2000	44	2,606	314	--	0	21,146
	2001	39	22,950	128	28.0	0	12,451
	2002	89	44,270	224	28.0	9	61,734
	2003	91	33,162	373	21.0	0	32,525
	2004	44	73,056	355	3.2	0	62,639
	2005	179	58,667	782	7.8	0	70,921
	2006	208	46,174	1,007	31.8	0	47,274
	2007	144	29,999	550	62.1	0	31,545
	2008	137	34,511	569	69.2	0	27,041
	2009	215	58,829	718	50.9	0	58,475
	2010	287	35,526	1,227	21.7	0	26,544
	2011	383	50,479	1,564	28.6	0	48,537
Harvest Rates (b)	2000	6.4	0.20	51.5	--	--	1.7
	2001	0.3	1.65	121.5	26.0	--	1.5
	2002	9.9	1.13	174.0	25.0	1.5	2.4
	2003	5.2	0.76	102.9	2.9	--	1.9
	2004	40.3	1.14	126.1	2.4	--	1.7
	2005	19.6	1.23	113.2	3.0	--	1.8
	2006	20.5	1.36	103.2	16.6	--	2.9
	2007	30.0	0.97	148.1	22.5	--	1.5
	2008	36.9	1.68	186.8	17.6	--	6.4
	2009	28.4	1.77	168.3	42.2	--	3.2
	2010	18.6	1.31	172.1	31.7	--	2.2
	2011	17.8	2.01	134.6	43.8	--	2.9

(a) sport effort in angler-hours; gill net effort in km; trap net effort in lifts

(b) harvest rates for sport in fish/hr, gill net in kg/km, trap net in kg/lift

(*) Ontario commercial trawlers harvested 3,283 pounds of yellow perch in MU4 in 2007.

(*) Ontario commercial trawlers harvested 3,215 pounds of yellow perch in MU4 in 2008.

(*) Ontario commercial trawlers harvested 1,416 pounds of yellow perch in MU4 in 2009.

(*) Ontario commercial trawlers harvested 320 pounds of yellow perch in MU4 in 2010.

(*) Ontario commercial trawlers harvested 909 pounds of yellow perch in MU4 in 2011.

(**) Large mesh catch rates are not targeted and therefore of limited value

Table 1.6. Estimated 2011 Lake Erie yellow perch harvest by age and numbers of fish by gear and management unit (Unit).

Gear	Age	Unit 1		Unit 2		Unit 3		Unit 4		Lakewide	
		Number	%	Number	%	Number	%	Number	%	Number	%
Gill Nets	1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2	24,918	0.8	16,819	0.3	0	0.0	1,650	0.1	43,386	0.2
	3	1,108,500	37.2	1,208,762	23.4	327,378	3.6	337,721	29.6	2,982,360	16.2
	4	1,289,358	43.3	2,391,354	46.4	2,021,496	22.0	469,363	41.1	6,171,572	33.4
	5	402,245	13.5	916,540	17.8	3,367,828	36.6	198,124	17.3	4,884,737	26.5
	6+	151,624	5.1	621,609	12.1	3,473,286	37.8	135,258	11.8	4,381,777	23.7
	Total	2,976,645	<i>45.9</i>	5,155,083	<i>56.0</i>	9,189,987	<i>81.6</i>	1,142,117	<i>81.6</i>	18,463,832	<i>65.1</i>
Trap Nets	1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	2	986	0.2	5,358	0.2	0	0.0	0	0.0	6,344	0.1
	3	67,330	13.6	410,725	13.6	114,033	13.5	2,233	6.0	594,321	13.5
	4	251,446	50.8	1,539,751	50.8	389,668	46.3	10,423	28.0	2,191,288	49.8
	5	86,312	17.4	528,321	17.4	172,125	20.4	8,438	22.7	795,196	18.1
	6+	88,645	17.9	546,719	18.0	165,902	19.7	16,131	43.3	817,397	18.6
	Total	494,719	<i>7.6</i>	3,030,874	<i>32.9</i>	841,728	<i>7.5</i>	37,225	<i>2.7</i>	4,404,546	<i>15.5</i>
Sport	1	11,518	0.4	0	0.0	3,048	0.2	744	0.3	15,310	0.3
	2	311,336	10.3	6,743	0.7	17,613	1.4	3,618	1.6	339,310	6.2
	3	1,191,127	39.6	335,833	32.9	309,581	25.0	56,902	25.7	1,893,443	34.5
	4	1,228,372	40.8	401,353	39.3	448,337	36.2	62,008	28.0	2,140,070	39.0
	5	169,212	5.6	164,608	16.1	209,862	17.0	49,128	22.2	592,810	10.8
	6+	97,882	3.3	113,628	11.1	248,682	20.1	48,740	22.0	508,932	9.3
	Total	3,009,447	<i>46.4</i>	1,022,165	<i>11.1</i>	1,237,123	<i>11.0</i>	221,140	<i>15.8</i>	5,489,875	<i>19.4</i>
All Gear	1	11,518	0.2	0	0.0	3,048	0.0	744	0.1	15,310	0.1
	2	337,240	5.2	28,920	0.3	17,613	0.2	5,268	0.4	389,040	1.4
	3	2,366,957	36.5	1,955,320	21.2	750,992	6.7	396,857	28.3	5,470,125	19.3
	4	2,769,176	42.7	4,332,458	47.1	2,859,501	25.4	541,795	38.7	10,502,930	37.0
	5	657,769	10.1	1,609,469	17.5	3,749,815	33.3	255,690	18.3	6,272,742	22.1
	6+	338,151	5.2	1,281,956	13.9	3,887,870	34.5	200,129	14.3	5,708,106	20.1
	Total	6,480,811	<i>22.9</i>	9,208,122	<i>32.5</i>	11,268,838	<i>39.7</i>	1,400,482	<i>4.9</i>	28,358,253	<i>100.0</i>

Note: Values in italics delineate harvest percentage by gear in each Unit, while the values in the 'All Gear' boxes are for lakewide harvest percentage by Unit.

Table 1.7. Yellow perch stock size (millions of fish) in each Lake Erie management unit. Abundance in the years 1990 to 2011 are estimated by ADMB catch-age analysis. The 2012 population estimates use age-2 yellow perch estimates derived from regressions of ADMB age-2 abundance values against YOY and yearling trawl index values

	Age	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Unit 1	2	3.967	10.310	15.465	3.806	9.305	23.214	29.065	22.518	43.775	10.390	33.995	33.457	7.747	40.635	3.209	52.716	1.559	8.997	9.733	22.513	9.815	7.249	10.051
	3	1.404	2.085	5.431	8.592	1.521	5.606	14.159	17.269	13.934	26.880	6.623	21.612	21.560	4.957	25.534	2.040	32.668	1.000	5.400	5.984	14.168	6.218	4.576
	4	5.248	0.525	0.636	1.906	2.183	0.640	2.488	6.064	7.946	6.909	14.613	3.618	12.729	11.097	2.709	11.803	1.003	12.912	0.536	2.791	3.027	7.165	3.134
	5	2.115	1.533	0.126	0.148	0.312	0.505	0.180	0.680	1.914	2.972	3.159	7.331	1.971	5.241	4.967	1.009	4.282	0.407	5.143	0.289	1.335	1.365	3.047
	6+	1.696	0.708	0.334	0.077	0.028	0.075	0.174	0.093	0.167	0.486	1.305	2.001	4.862	2.423	3.144	2.362	0.994	1.606	0.766	2.898	1.478	1.213	1.014
	2 and Older	14.431	15.162	21.993	14.529	13.348	30.039	46.064	46.623	67.737	47.638	59.696	68.020	48.869	64.353	39.562	69.929	40.506	24.922	21.579	34.475	29.823	23.210	21.823
	3 and Older	10.464	4.852	6.528	10.723	4.044	6.826	17.000	24.105	23.962	37.248	25.700	34.563	41.122	23.718	36.353	17.214	38.947	15.925	11.846	11.961	20.009	15.961	11.772
Unit 2	2	5.750	16.025	22.086	6.310	12.707	13.183	26.995	14.312	61.816	15.356	54.712	48.189	11.202	88.014	4.975	192.472	5.128	22.580	24.894	46.006	35.053	4.966	19.186
	3	1.348	2.424	6.723	10.580	3.004	7.272	7.339	13.119	7.445	32.826	9.489	32.943	28.540	7.050	53.104	3.238	123.773	3.375	14.685	16.405	29.699	22.632	3.243
	4	8.204	0.506	0.830	2.391	4.050	1.059	2.664	2.894	4.258	3.190	18.218	5.213	18.615	15.246	3.947	28.067	1.869	69.963	2.002	8.863	9.569	17.266	13.482
	5	2.719	2.237	0.114	0.220	0.676	0.817	0.208	0.575	0.511	0.900	1.557	8.701	2.531	8.411	6.428	1.885	12.368	1.099	33.078	1.046	4.206	4.852	8.826
	6+	2.319	1.140	0.585	0.188	0.103	0.156	0.193	0.087	0.076	0.089	0.405	0.905	4.664	3.237	4.961	5.190	3.143	7.236	3.893	19.434	9.444	6.626	5.688
	2 and Older	20.339	22.332	30.338	19.690	20.540	22.488	37.398	30.987	74.107	52.360	84.381	95.952	65.553	121.958	73.415	230.851	146.280	104.253	78.552	91.754	87.971	56.343	50.426
	3 and Older	14.589	6.307	8.252	13.380	7.832	9.304	10.403	16.675	12.290	37.005	29.670	47.763	54.350	33.944	68.440	38.379	141.152	81.672	53.658	45.748	52.918	51.377	31.240
Unit 3	2	4.202	8.386	5.106	2.946	6.298	7.111	13.411	10.520	43.064	12.145	46.069	26.794	6.717	37.743	4.489	151.179	6.023	30.670	44.897	35.163	45.871	0.937	28.110
	3	1.765	2.531	3.614	2.293	1.469	3.622	4.399	8.532	6.648	27.929	7.889	29.809	17.173	4.315	24.477	2.944	100.405	3.992	19.275	29.857	23.491	30.365	0.626
	4	3.874	0.808	0.828	1.299	0.980	0.775	2.129	2.589	4.717	4.021	17.914	5.002	18.938	10.733	2.676	15.118	1.821	56.113	2.448	12.173	19.525	14.957	19.773
	5	1.230	1.283	0.295	0.244	0.432	0.314	0.390	1.075	1.314	2.641	2.520	10.858	3.096	11.295	6.266	1.566	8.685	0.997	31.945	1.471	7.581	11.584	9.209
	6+	4.731	1.697	0.689	0.306	0.187	0.220	0.274	0.331	0.659	1.019	2.237	2.849	8.413	6.892	10.622	9.833	6.599	6.818	4.391	21.842	14.469	12.737	14.695
	2 and Older	15.802	14.705	10.533	7.089	9.366	12.042	20.602	23.047	56.401	47.754	76.630	75.312	54.337	70.977	48.530	180.640	123.532	98.590	102.955	100.505	110.937	70.580	72.412
	3 and Older	11.600	6.318	5.427	4.143	3.069	4.931	7.191	12.527	13.338	35.609	30.561	48.518	47.620	33.234	44.041	29.461	117.509	67.920	58.059	65.343	65.066	69.643	44.302
Unit 4	2	0.604	0.396	0.086	0.263	0.159	1.422	0.864	0.394	4.595	1.834	14.788	3.573	2.425	8.221	1.523	11.751	1.009	9.596	10.655	9.391	13.860	0.832	9.479
	3	0.674	0.391	0.253	0.058	0.168	0.103	0.938	0.570	0.260	3.078	1.218	9.876	2.395	1.625	5.496	1.011	7.796	0.673	6.369	7.095	6.292	9.227	0.553
	4	0.958	0.342	0.178	0.163	0.027	0.084	0.061	0.556	0.337	0.172	1.973	0.805	6.597	1.587	1.066	3.569	0.641	4.723	0.439	4.155	4.684	4.045	5.802
	5	0.400	0.368	0.104	0.100	0.051	0.010	0.043	0.032	0.293	0.215	0.108	1.286	0.536	4.291	1.017	0.676	2.208	0.377	3.038	0.283	2.689	2.919	2.498
	6+	0.958	0.519	0.266	0.208	0.095	0.052	0.031	0.037	0.036	0.201	0.256	0.235	1.009	0.981	3.324	2.694	2.042	2.401	1.787	3.065	2.132	2.960	3.519
	2 and Older	3.594	2.017	0.888	0.791	0.499	1.671	1.936	1.589	5.522	5.499	18.342	15.775	12.962	16.705	12.426	19.700	13.696	17.770	22.288	23.990	29.657	19.982	21.850
	3 and Older	2.990	1.621	0.801	0.529	0.340	0.249	1.073	1.195	0.926	3.666	3.554	12.202	10.537	8.484	10.903	7.950	12.687	8.175	11.633	14.598	15.797	19.150	12.372

Table 1.8. Projection of the 2012 Lake Erie yellow perch population. Stock size estimates are derived from survival from ADMB 2011 abundance, and age 2 estimates for 2012 are derived from regressions of ADMB age-2 abundance against YOY and yearling survey indices (see Appendix A). Standard errors are produced from ADMB catch-age and regression analyses.

	2011 Parameters					Rate Functions					2012 Parameters					Stock Biomass			
	Age	Stock Size (numbers)				Mortality Rates				Survival Rate (S)	Age	Stock Size (numbers)			3-yr Mean Weight in Pop'n. (kg)	millions kg		millions lbs.	
		Mean	Std. Dev.	Min.	Max.	(F)	(Z)	(A)	(u)			Mean	Min.	Max.		2011	2012	2012	
Unit 1	2	7.249	4.251	2.998	11.499	0.060	0.460	0.369	0.048	0.631	2	10.051	4.084	24.512	0.066	0.464	0.663	1.463	
	3	6.218	2.633	3.585	8.851	0.285	0.685	0.496	0.206	0.504	3	4.576	1.893	7.259	0.111	0.616	0.508	1.120	
	4	7.165	2.718	4.448	9.883	0.455	0.855	0.575	0.306	0.425	4	3.134	1.807	4.461	0.162	0.989	0.508	1.120	
	5	1.365	0.529	0.836	1.894	0.474	0.874	0.583	0.316	0.417	5	3.047	1.892	4.203	0.198	0.202	0.603	1.330	
	6+	1.213	0.466	0.747	1.679	0.604	1.004	0.634	0.381	0.366	6+	1.014	0.622	1.405	0.252	0.352	0.256	0.563	
	Total	23.210		12.614	33.805	0.279	0.679	0.493	0.202	0.507	Total	21.823	10.298	41.842	0.116	2.622	2.538	5.596	
	(3+)	15.961		9.616	22.306	0.397	0.797	0.549	0.273	0.451	(3+)	11.772	6.214	17.329	0.159	2.158	1.875	4.133	
Unit 2	2	4.966	2.700	2.266	7.666	0.026	0.426	0.347	0.021	0.653	2	19.186	8.723	42.629	0.071	0.323	1.362	3.004	
	3	22.632	8.983	13.649	31.615	0.118	0.518	0.404	0.092	0.596	3	3.243	1.480	5.007	0.121	2.467	0.392	0.865	
	4	17.266	5.886	11.380	23.153	0.271	0.671	0.489	0.197	0.511	4	13.482	8.131	18.833	0.164	2.521	2.211	4.875	
	5	4.852	1.586	3.267	6.438	0.268	0.668	0.487	0.195	0.513	5	8.826	5.817	11.836	0.202	0.806	1.783	3.931	
	6+	6.626	2.258	4.368	8.884	0.328	0.728	0.517	0.233	0.483	6+	5.688	3.784	7.591	0.264	1.796	1.502	3.311	
	Total	56.343		34.930	77.756	0.190	0.590	0.446	0.143	0.554	Total	50.426	27.936	85.895	0.144	7.912	7.250	15.987	
	(3+)	51.377		32.664	70.090	0.207	0.607	0.455	0.155	0.545	(3+)	31.240	19.213	43.267	0.188	7.589	5.888	12.983	
Unit 3	2	0.937	0.585	0.352	1.522	0.004	0.404	0.332	0.003	0.668	2	28.110	11.466	67.539	0.053	0.037	1.490	3.285	
	3	30.365	14.072	16.293	44.437	0.029	0.429	0.349	0.024	0.651	3	0.626	0.235	1.016	0.102	3.006	0.064	0.141	
	4	14.957	5.963	8.994	20.919	0.085	0.485	0.384	0.067	0.616	4	19.773	10.610	28.936	0.154	2.079	3.045	6.714	
	5	11.584	4.302	7.283	15.886	0.096	0.496	0.391	0.076	0.609	5	9.209	5.538	12.880	0.200	1.946	1.842	4.061	
	6+	12.737	4.272	8.464	17.009	0.111	0.511	0.400	0.087	0.600	6+	14.695	9.513	19.878	0.269	3.579	3.953	8.716	
	Total	70.580		41.387	99.774	0.066	0.466	0.372	0.053	0.628	Total	72.412	37.361	130.249	0.144	10.647	10.393	22.917	
	(3+)	69.643		41.034	98.251	0.067	0.467	0.373	0.053	0.627	(3+)	44.302	25.895	62.710	0.201	10.610	8.904	19.632	
Unit 4	2	0.832	0.584	0.248	1.416	0.008	0.408	0.335	0.007	0.665	2	9.479	3.904	21.426	0.096	0.096	0.910	2.006	
	3	9.227	5.210	4.018	14.437	0.064	0.464	0.371	0.051	0.629	3	0.553	0.165	0.941	0.165	1.523	0.091	0.201	
	4	4.045	2.097	1.947	6.142	0.082	0.482	0.382	0.065	0.618	4	5.802	2.526	9.077	0.248	0.938	1.439	3.173	
	5	2.919	1.468	1.451	4.387	0.111	0.511	0.400	0.087	0.600	5	2.498	1.203	3.793	0.288	0.797	0.719	1.586	
	6+	2.960	1.455	1.505	4.415	0.115	0.515	0.402	0.090	0.598	6+	3.519	1.769	5.269	0.328	1.009	1.154	2.545	
	Total	19.982		9.168	30.795	0.079	0.479	0.381	0.063	0.619	Total	21.850	9.567	40.507	0.197	4.363	4.314	9.512	
	(3+)	19.150		8.920	29.380	0.083	0.483	0.383	0.066	0.617	(3+)	12.372	5.663	19.081	0.275	4.267	3.404	7.505	

Table 2.1. Estimated harvest of Lake Erie yellow perch for 2012 using the proposed fishing policy and selectivity-at-age from combined fishing gears.

	Age	2012 Stock Size (numbers)			Exploitation Rate				2012 Catch (millions of fish)			3-yr Mean Weight in Harvest (kg)	2012 Harvest Range					
		Mean	Min.	Max.	F	s(age)	F(age)	(u)	Mean	Min.	Max.		Catch (millions of kg)			Catch (millions of lbs)		
													Mean	Min.	Max.	Mean	Min.	Max.
Unit 1	2	10.051	4.084	24.512	0.670	0.140	0.094	0.074	0.744	0.302	1.815	0.098	0.073	0.030	0.178	0.161	0.065	0.392
	3	4.576	1.893	7.259	0.670	0.610	0.409	0.280	1.282	0.530	2.035	0.122	0.156	0.065	0.248	0.345	0.143	0.547
	4	3.134	1.807	4.461	0.670	0.782	0.524	0.342	1.072	0.618	1.526	0.144	0.154	0.089	0.220	0.340	0.196	0.484
	5	3.047	1.892	4.203	0.670	0.802	0.537	0.349	1.063	0.660	1.466	0.158	0.168	0.104	0.232	0.370	0.230	0.511
	6+	1.014	0.622	1.405	0.670	0.866	0.580	0.370	0.375	0.230	0.520	0.179	0.067	0.041	0.093	0.148	0.091	0.205
	Total	21.823	10.298	41.842				0.208	4.536	2.341	7.360	0.136	0.619	0.329	0.970	1.364	0.725	2.140
	(3+)	11.772	6.214	17.329				0.322	3.792	2.038	5.546	0.144	0.546	0.299	0.793	1.204	0.660	1.748
Unit 2	2	19.186	8.723	42.629	0.670	0.109	0.073	0.058	1.116	0.508	2.480	0.122	0.136	0.062	0.303	0.300	0.137	0.667
	3	3.243	1.480	5.007	0.670	0.395	0.265	0.193	0.627	0.286	0.968	0.141	0.088	0.040	0.136	0.195	0.089	0.301
	4	13.482	8.131	18.833	0.670	0.742	0.497	0.328	4.425	2.669	6.181	0.152	0.673	0.406	0.940	1.483	0.894	2.072
	5	8.826	5.817	11.836	0.670	0.791	0.530	0.345	3.045	2.007	4.084	0.162	0.493	0.325	0.662	1.088	0.717	1.459
	6+	5.688	3.784	7.591	0.670	0.838	0.561	0.361	2.052	1.365	2.738	0.190	0.390	0.259	0.520	0.859	0.572	1.147
	Total	50.426	27.936	85.895				0.223	11.265	6.834	16.451	0.158	1.780	1.092	2.560	3.926	2.409	5.646
	(3+)	31.240	19.213	43.267				0.325	10.149	6.327	13.971	0.162	1.644	1.030	2.258	3.625	2.272	4.978
Unit 3	2	28.110	11.466	67.539	0.700	0.037	0.026	0.021	0.593	0.242	1.424	0.106	0.063	0.026	0.151	0.139	0.057	0.333
	3	0.626	0.235	1.016	0.700	0.241	0.169	0.129	0.081	0.030	0.131	0.136	0.011	0.004	0.018	0.024	0.009	0.039
	4	19.773	10.610	28.936	0.700	0.693	0.485	0.322	6.365	3.415	9.314	0.155	0.987	0.529	1.444	2.175	1.167	3.183
	5	9.209	5.538	12.880	0.700	0.755	0.529	0.344	3.170	1.907	4.434	0.168	0.533	0.320	0.745	1.174	0.706	1.643
	6+	14.695	9.513	19.878	0.700	0.786	0.550	0.355	5.219	3.378	7.059	0.191	0.997	0.645	1.348	2.198	1.423	2.973
	Total	72.412	37.361	130.249				0.213	15.427	8.972	22.363	0.168	2.590	1.525	3.706	5.710	3.362	8.171
	(3+)	44.302	25.895	62.710				0.335	14.835	8.730	20.939	0.170	2.527	1.499	3.555	5.572	3.305	7.838
Unit 4	2	9.479	3.904	21.426	0.300	0.032	0.010	0.008	0.075	0.031	0.169	0.119	0.009	0.004	0.020	0.020	0.008	0.044
	3	0.553	0.165	0.941	0.300	0.327	0.098	0.077	0.043	0.013	0.073	0.161	0.007	0.002	0.012	0.015	0.005	0.026
	4	5.802	2.526	9.077	0.300	0.535	0.161	0.123	0.713	0.310	1.115	0.185	0.132	0.057	0.206	0.291	0.127	0.455
	5	2.498	1.203	3.793	0.300	0.774	0.232	0.172	0.430	0.207	0.653	0.208	0.089	0.043	0.136	0.197	0.095	0.299
	6+	3.519	1.769	5.269	0.300	0.782	0.235	0.174	0.611	0.307	0.915	0.233	0.142	0.072	0.213	0.314	0.158	0.470
	Total	21.850	9.567	40.507				0.086	1.871	0.868	2.925	0.203	0.379	0.178	0.587	0.837	0.392	1.295
	(3+)	12.372	5.663	19.081				0.145	1.797	0.837	2.756	0.206	0.371	0.174	0.567	0.817	0.384	1.250

Table 2.2. Lake Erie yellow perch fishing rates and the Recommended Allowable Harvest (RAH; in millions of lbs) for 2012 by Management Unit (Unit).

Unit	Fishing Rate	Recommended Allowable Harvest (millions lbs.)		
		MIN	MEAN	MAX
1	0.670	0.725	1.364	2.140
2	0.670	2.409	3.926	5.646
3	0.700	3.362	5.710	8.171
4	0.300	0.392	0.837	1.295
Total		6.888	11.837	17.251

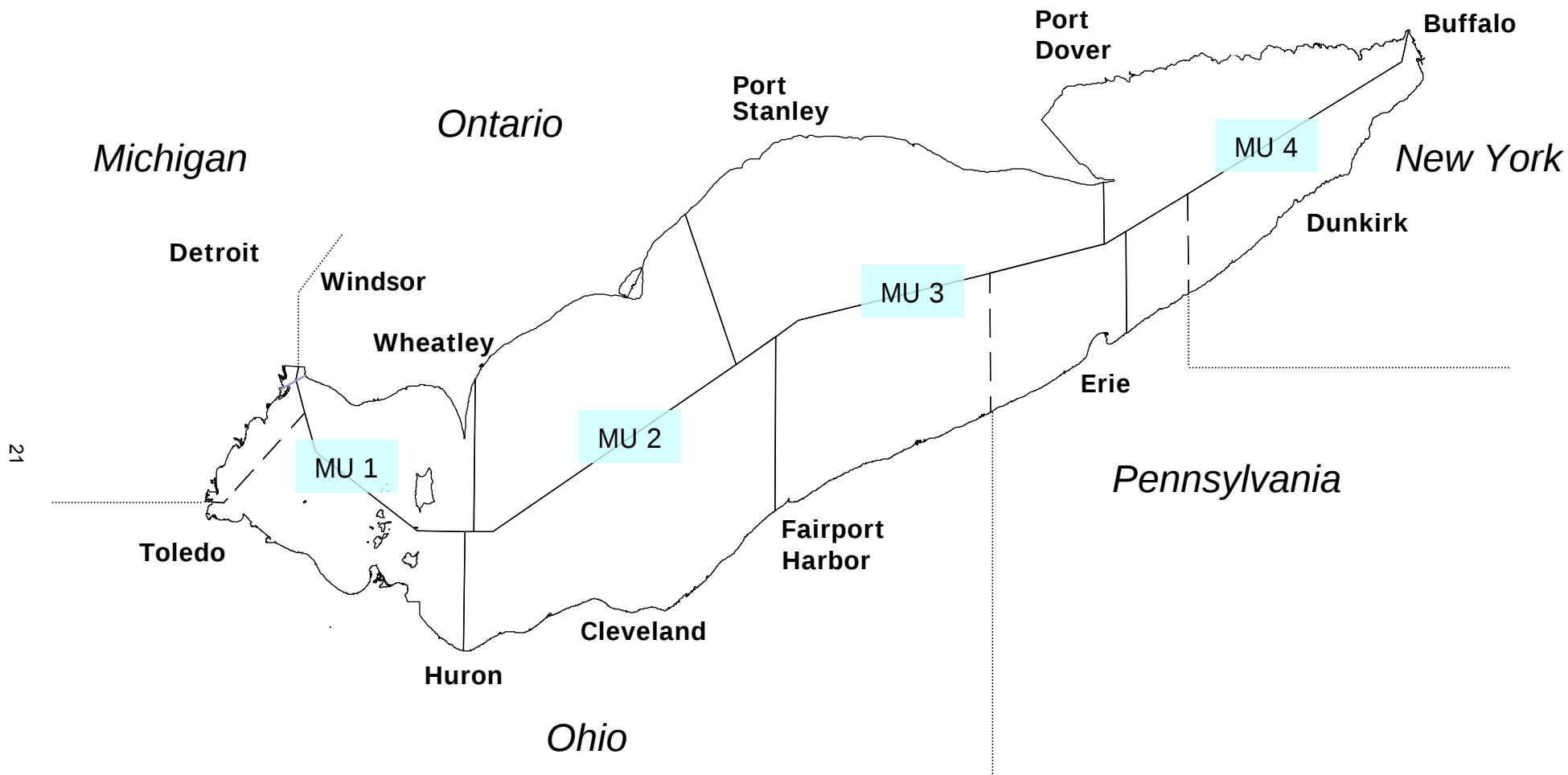


Figure 1.1. Yellow Perch Management Units (MUs) of Lake Erie. For illustrative purposes only, this map should not be used for quota determination or border delineation.

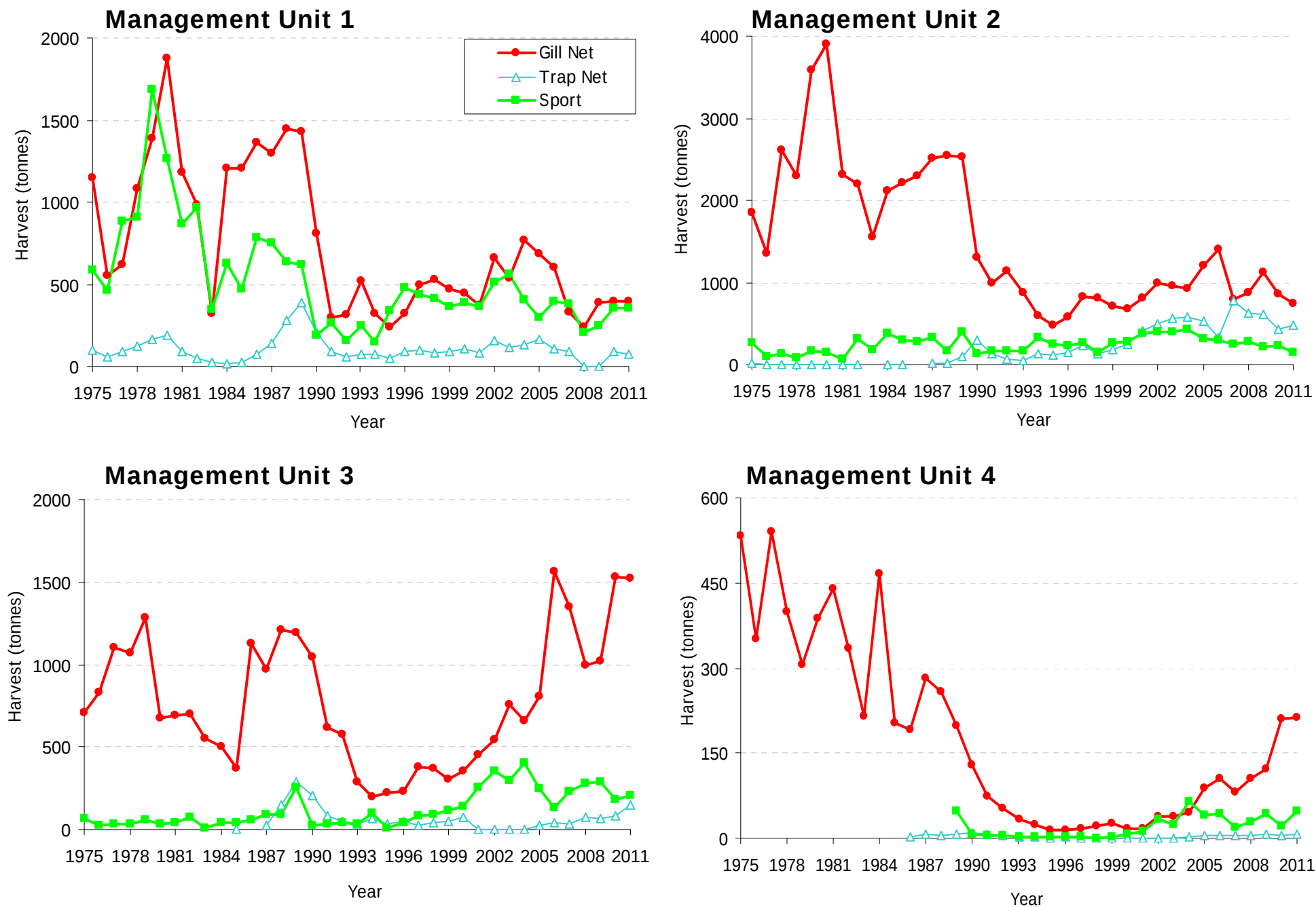


Figure 1.2. Lake Erie yellow perch harvest (metric tonnes) by management unit and gear type.

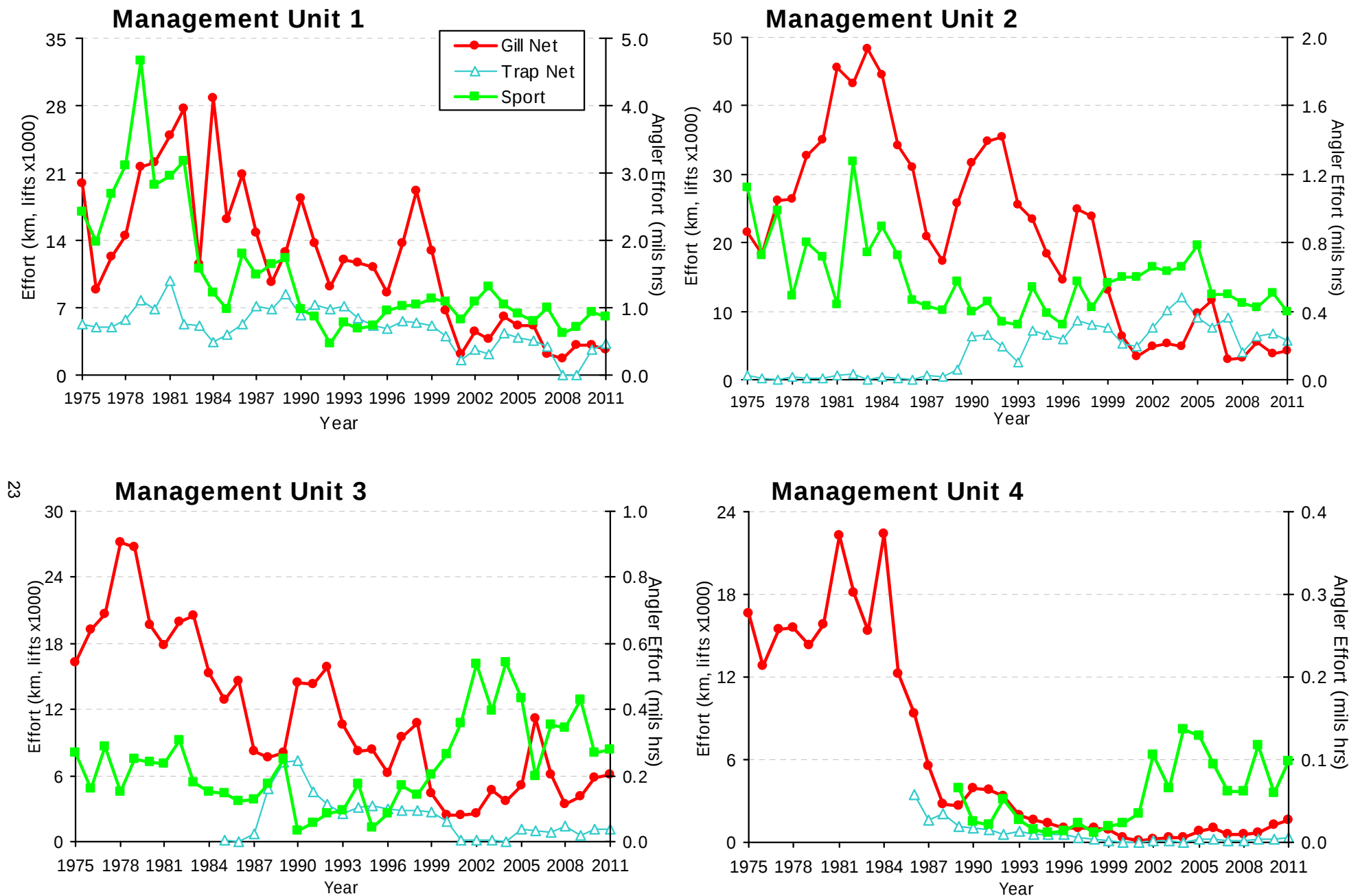


Figure 1.3. Lake Erie yellow perch effort by management unit and gear type. Note: gill net effort presented is targeted effort with small mesh (< 3") only.

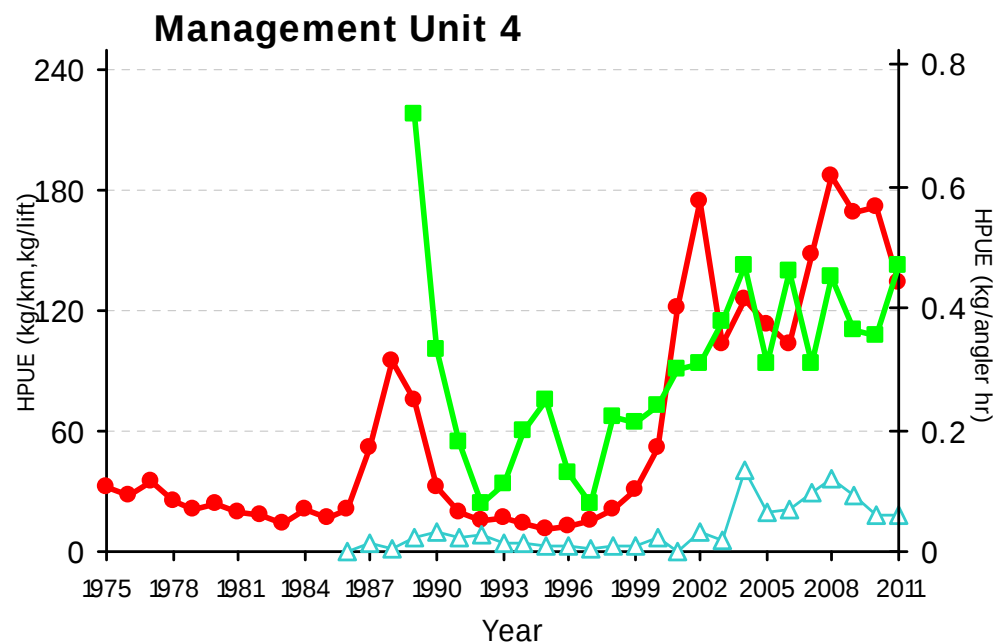
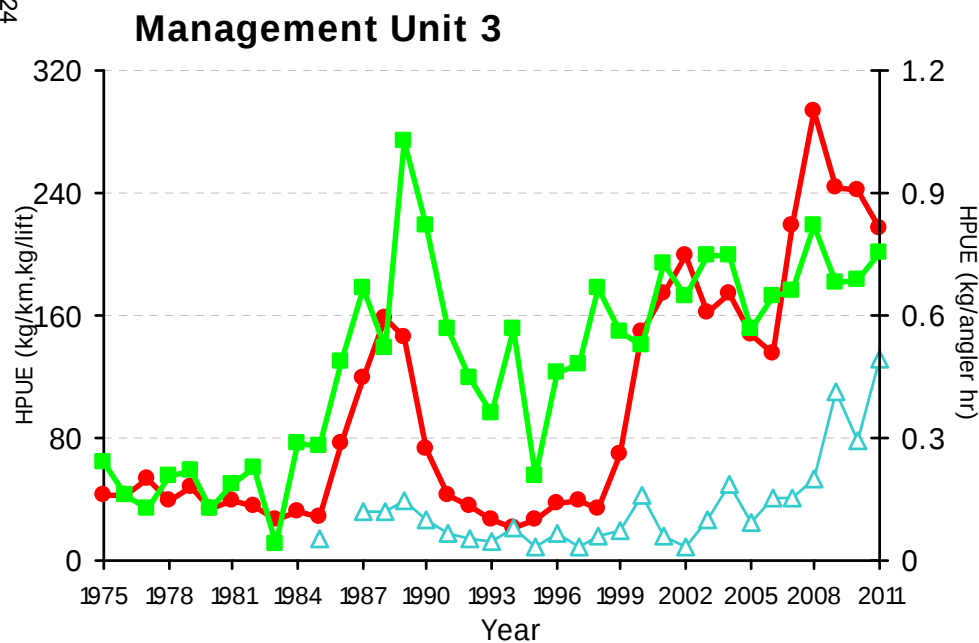
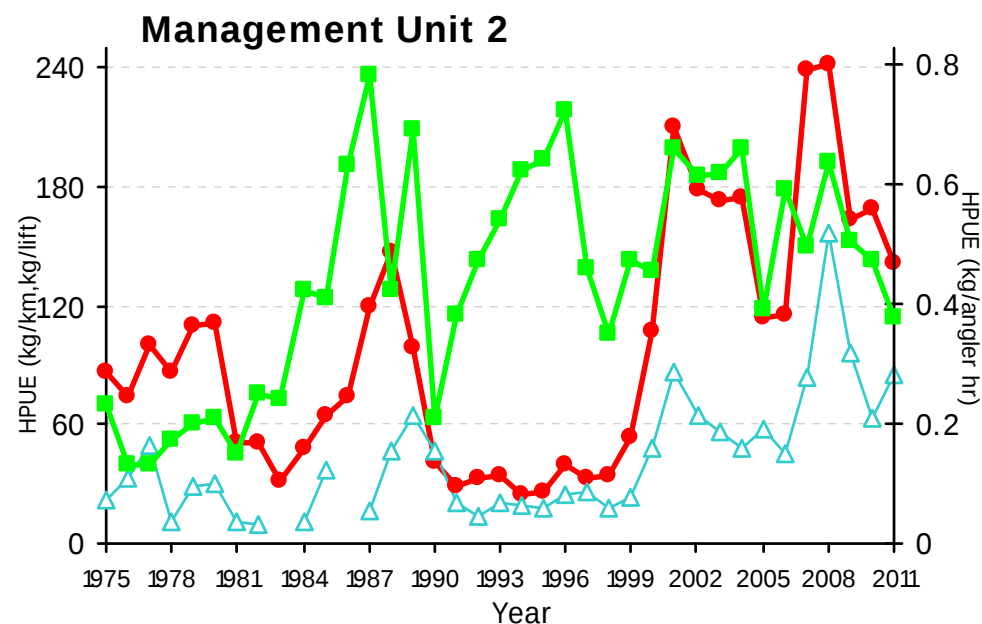
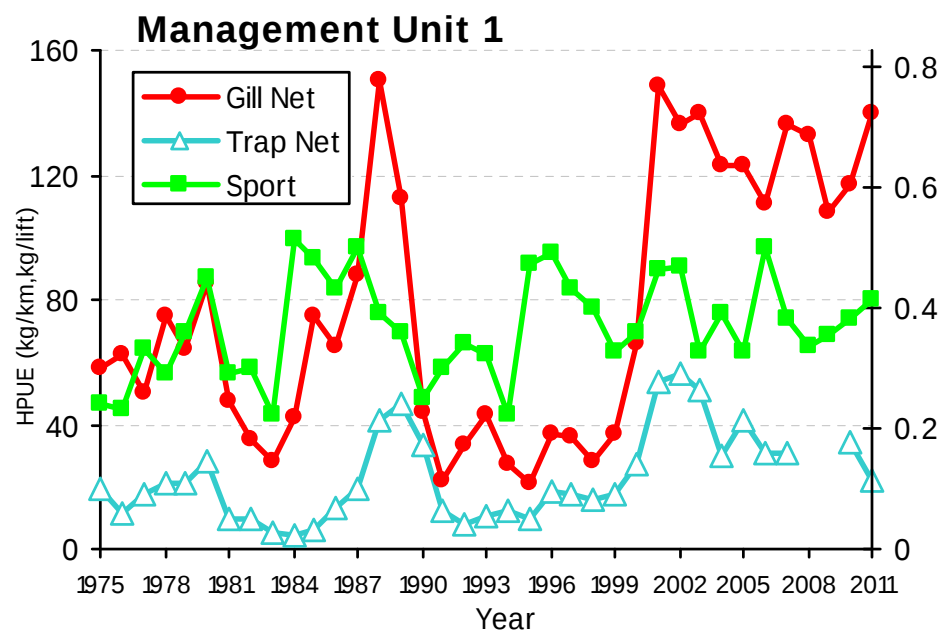


Figure 1.4. Lake Erie yellow perch harvest per unit effort (HPUE) by management unit and gear type.
Note: 2001 to 2011 gill net CPUE is for small mesh (< 3") only.

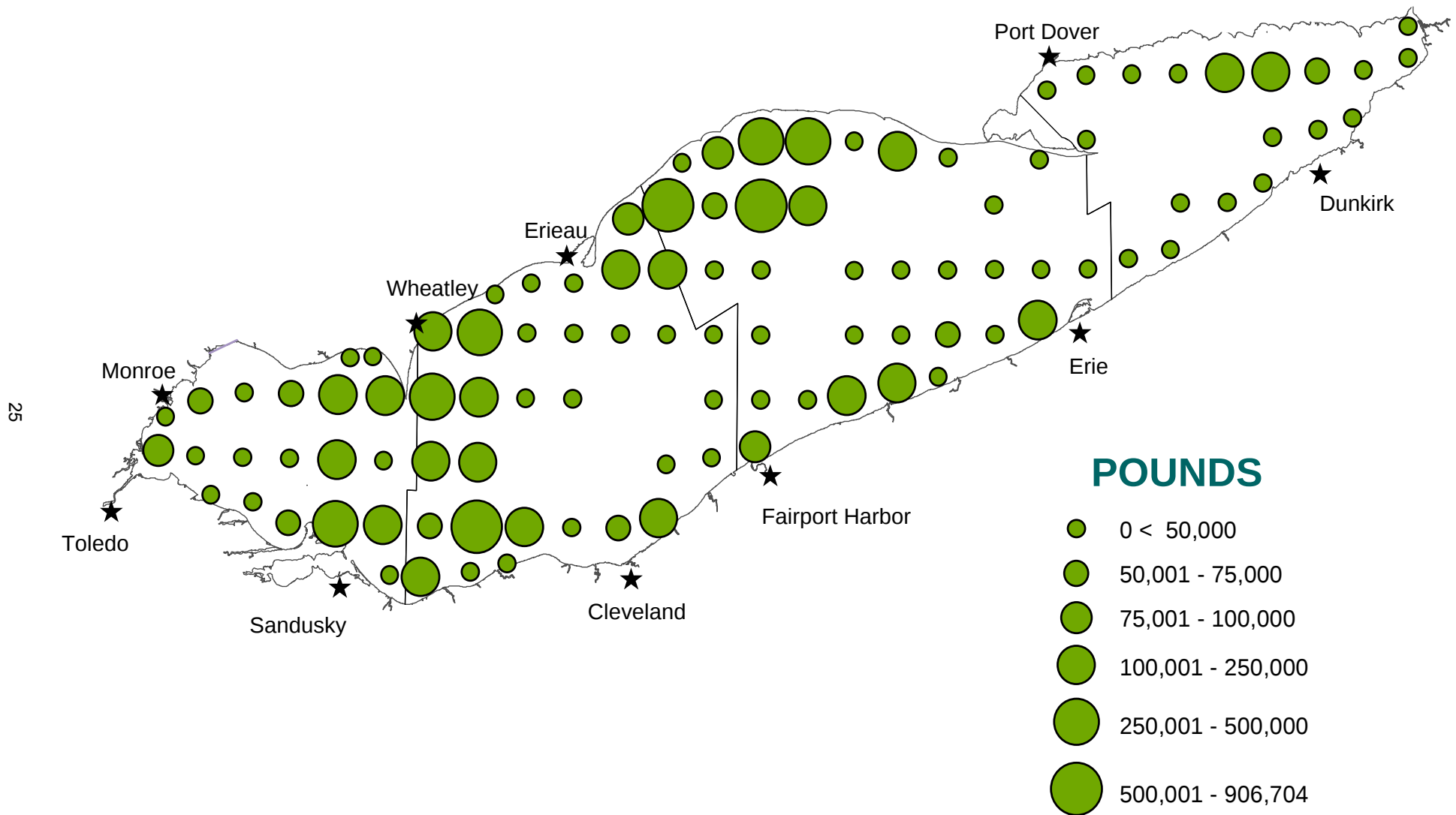


Figure 1.5. Spatial distribution of yellow perch total harvest (lbs.) in 2011 by 10-minute grid.

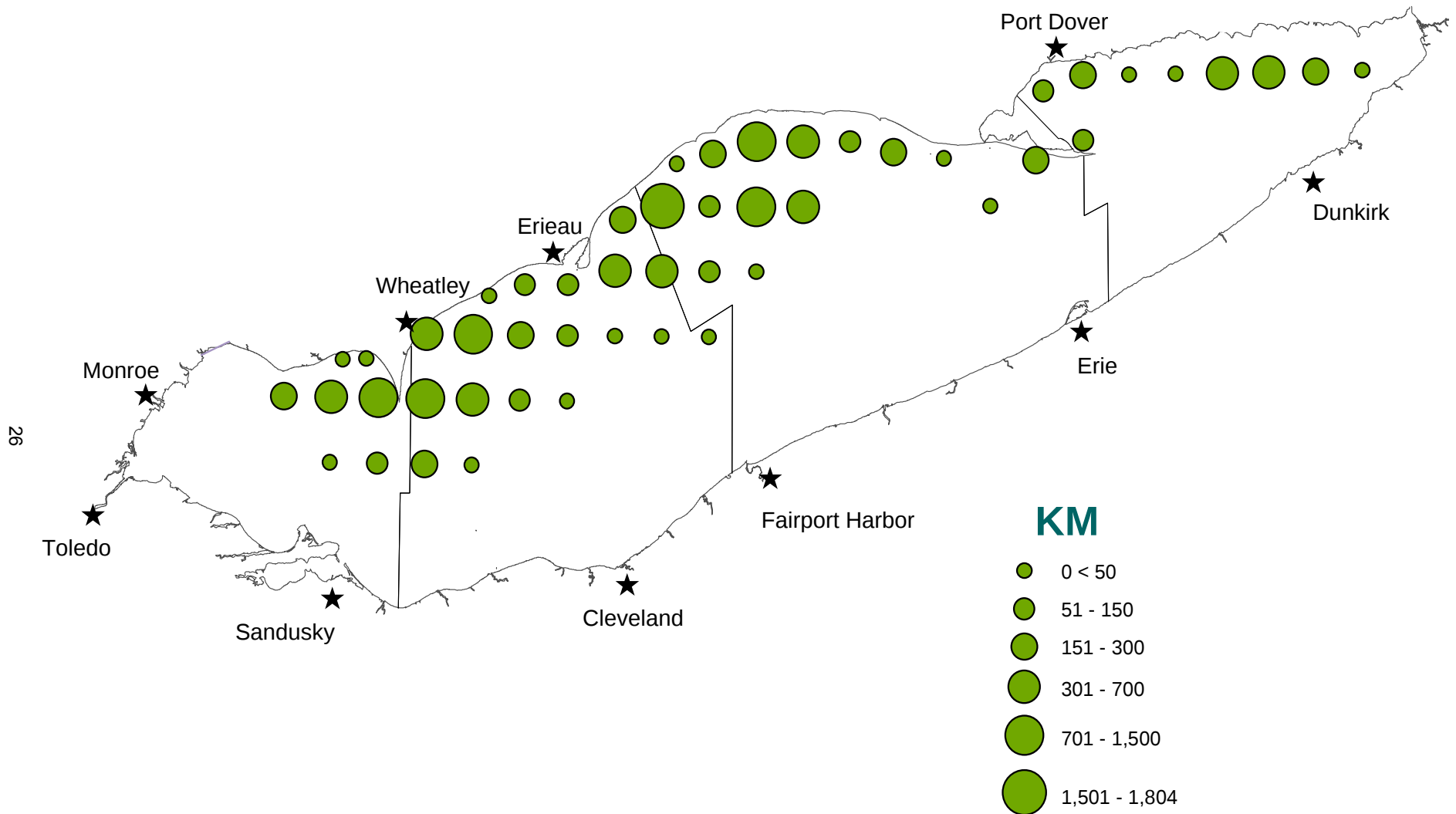


Figure 1.6. Spatial distribution of yellow perch gill net effort (km) in 2011 by 10-minute grid.

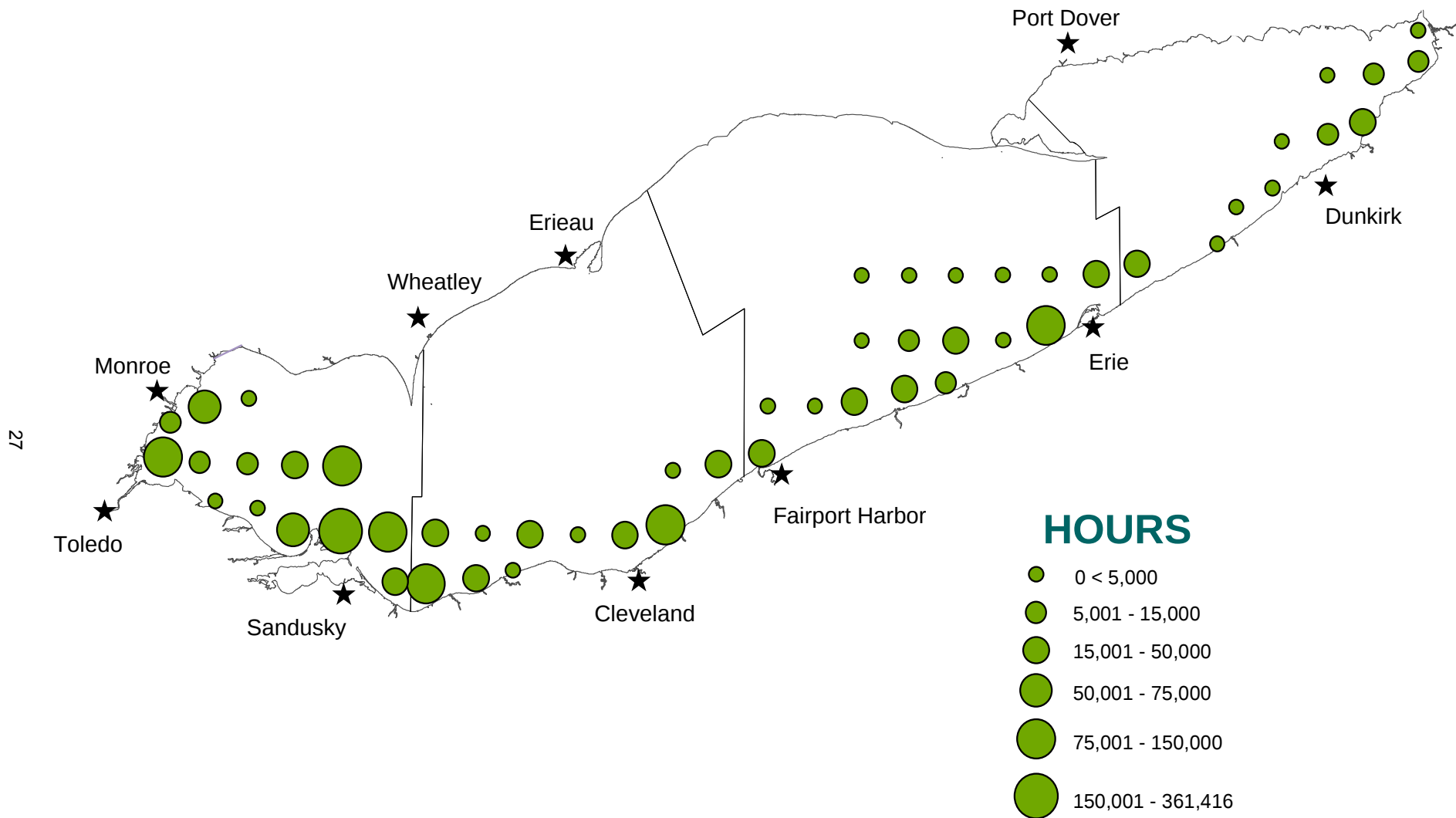


Figure 1.7. Spatial distribution of yellow perch sport angling effort (angler hours) in 2011 by 10-minute grid.

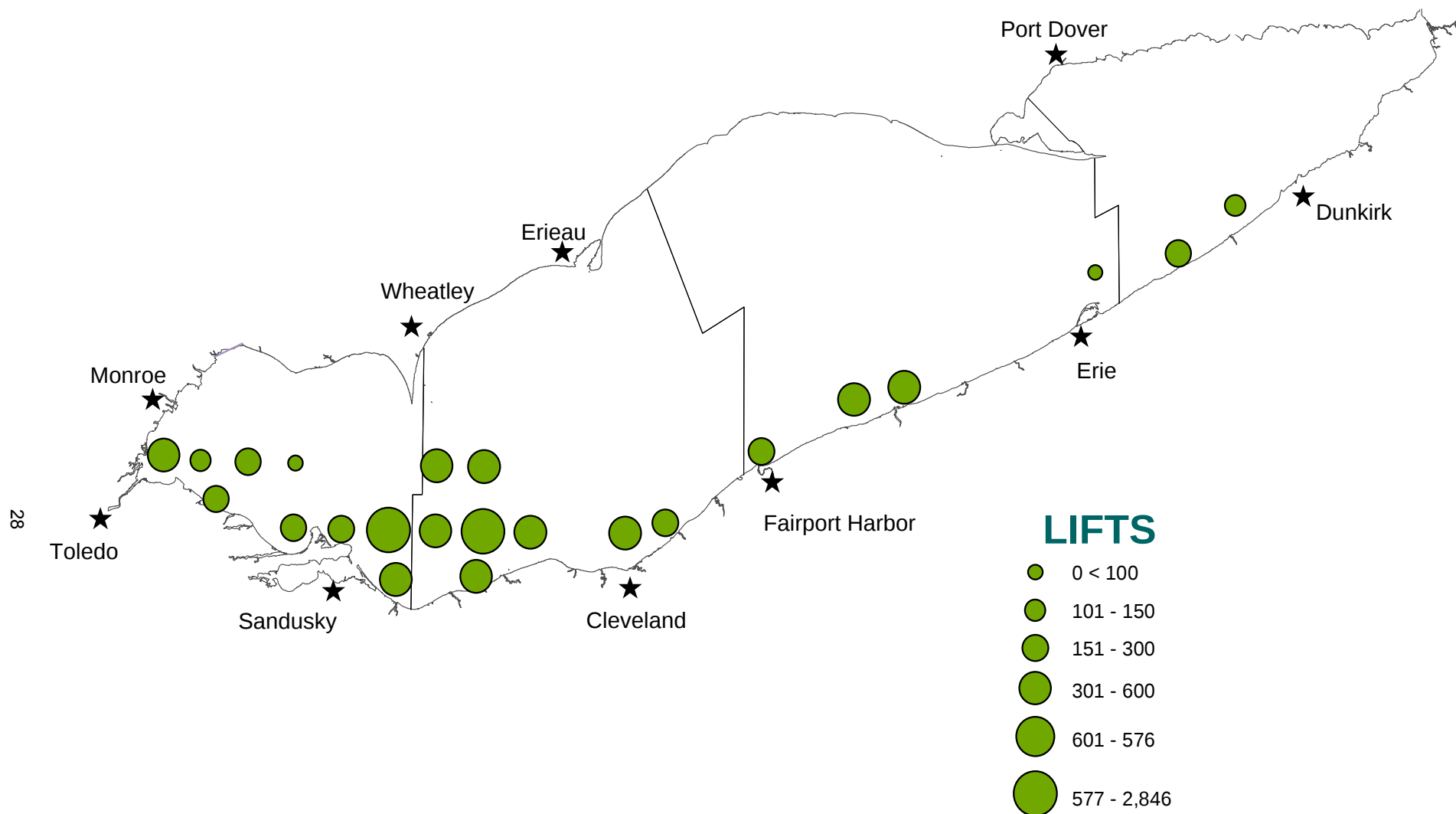


Figure 1.8. Spatial distribution of yellow perch trap net effort (lifts) in 2011 by 10-minute grid.

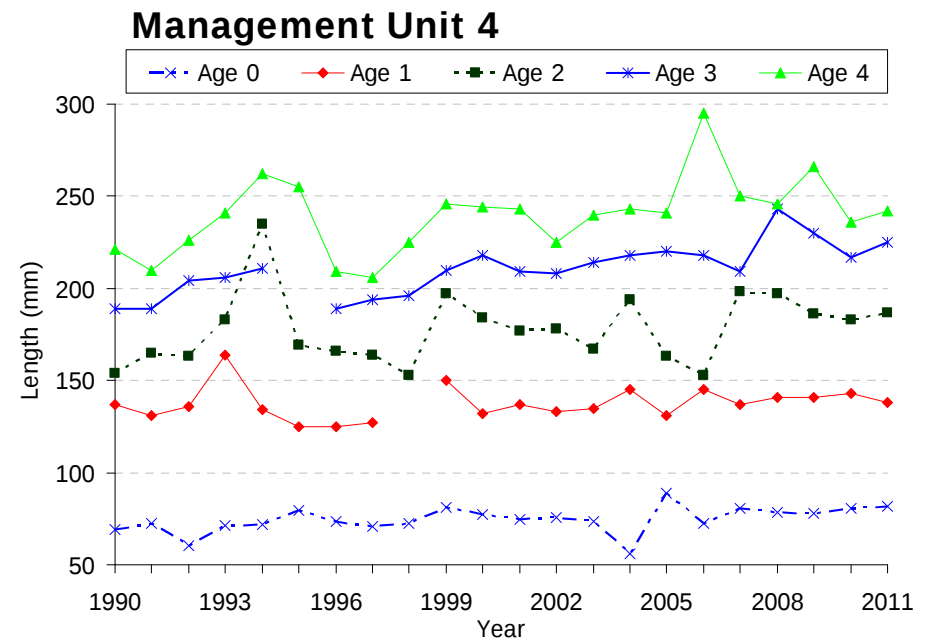
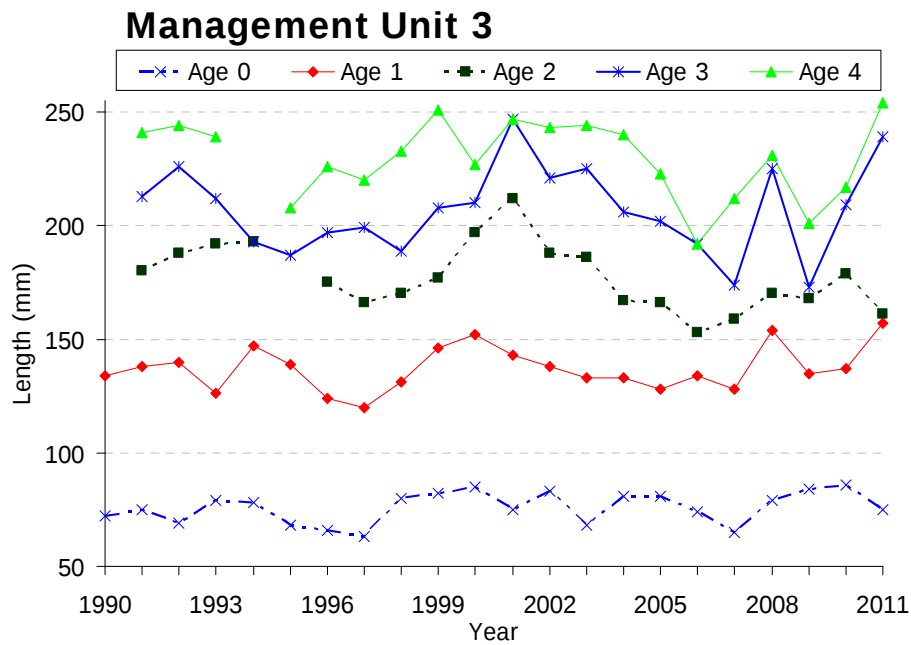
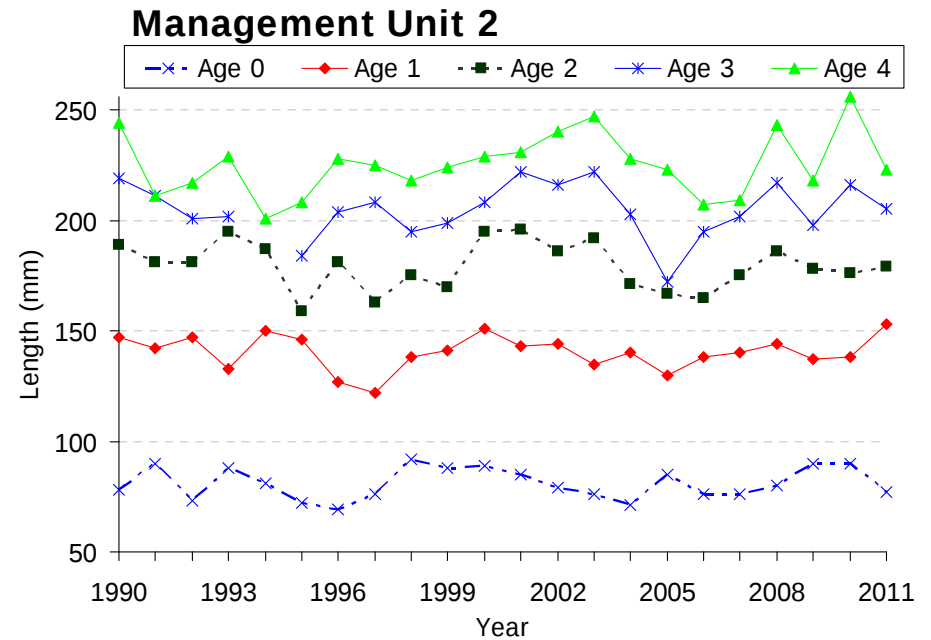
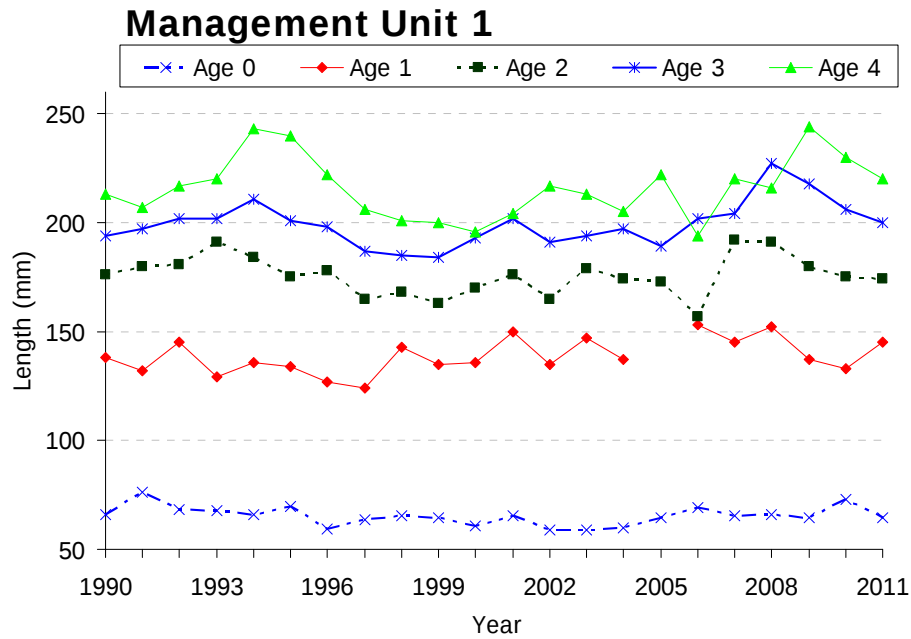


Figure 1.9. Yellow perch total length-at-age from 1990-2011 fall interagency experimental samples for ages 0-4 by management unit (MU).

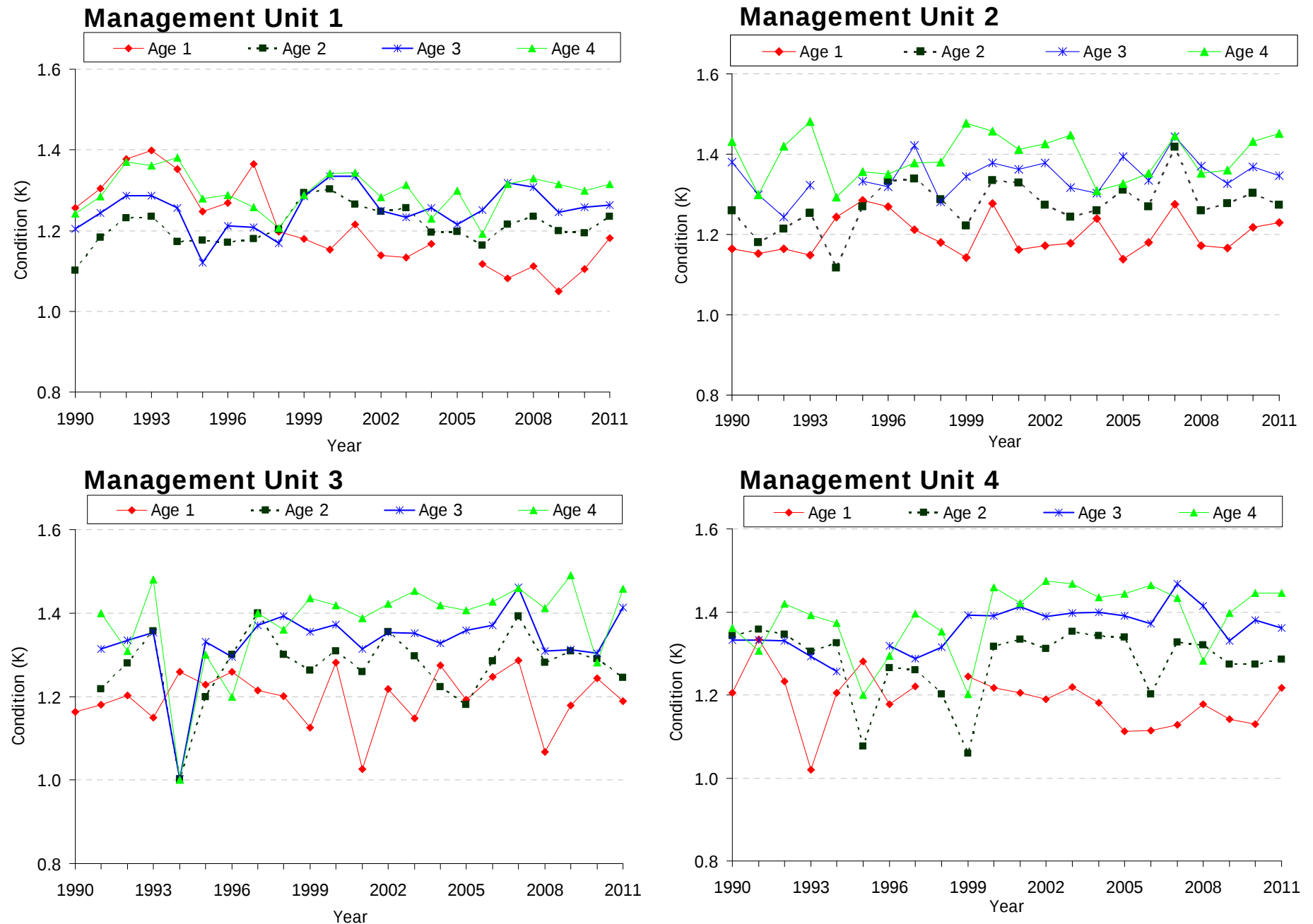


Figure 1.10. Yellow perch condition (K) at age from 1990-2011 fall interagency experimental samples for ages 1-4 by management unit (MU).

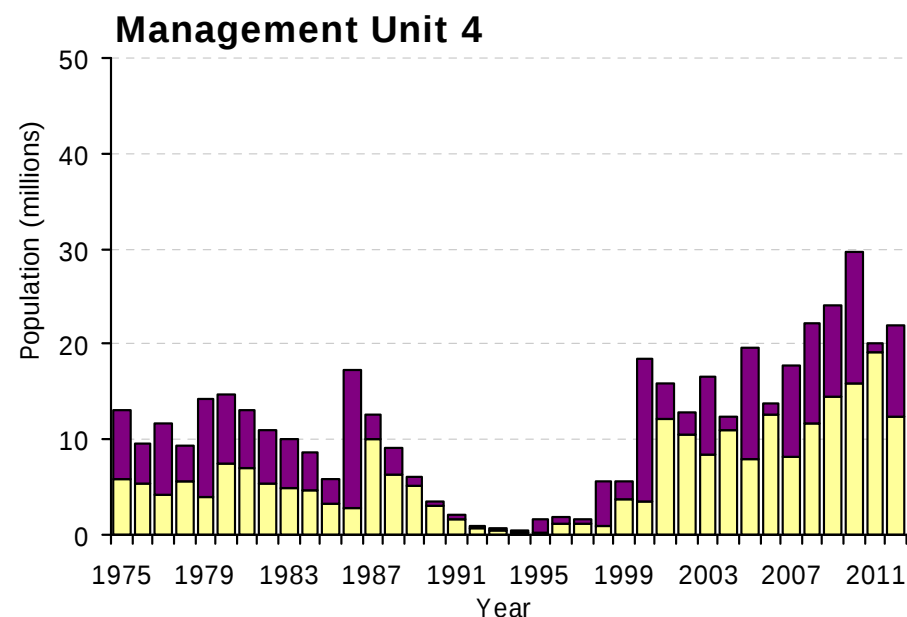
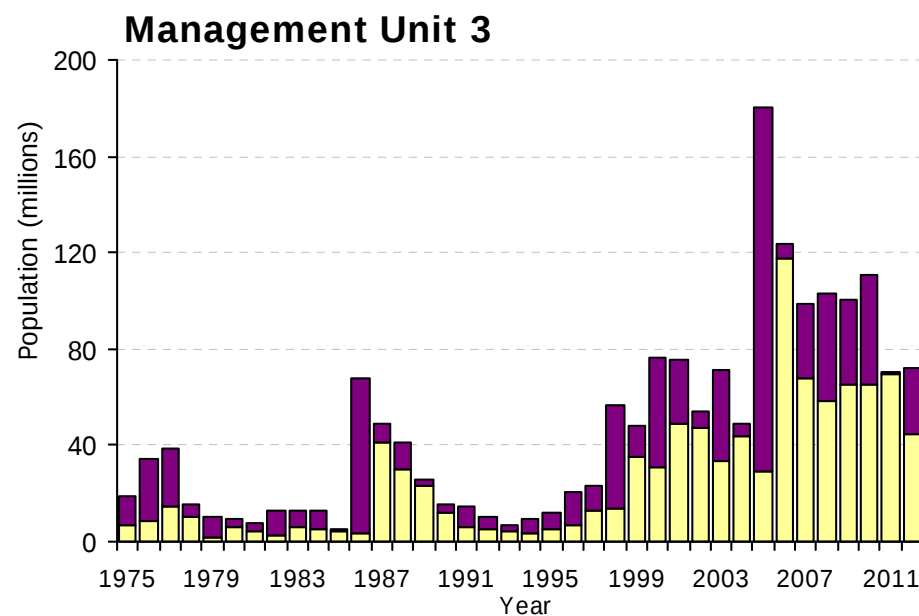
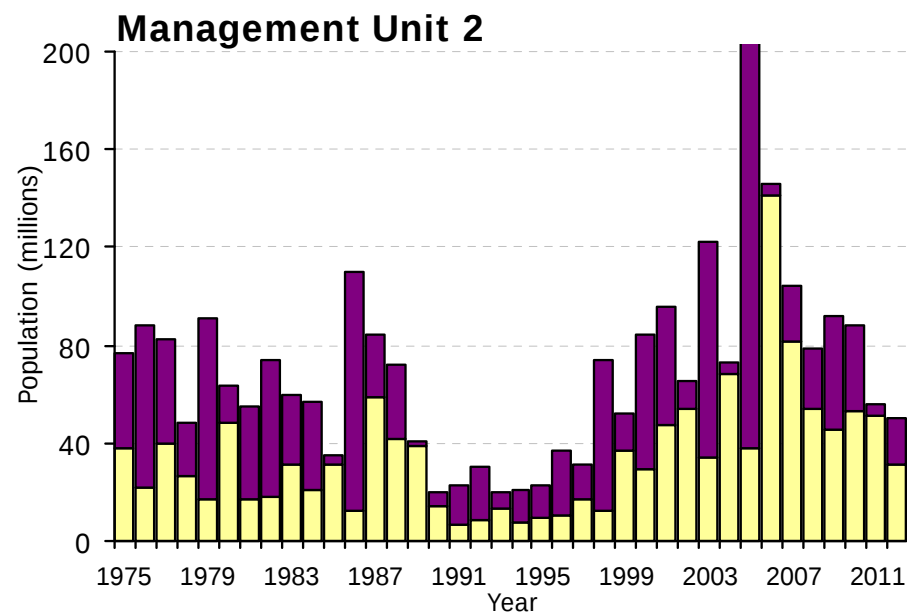
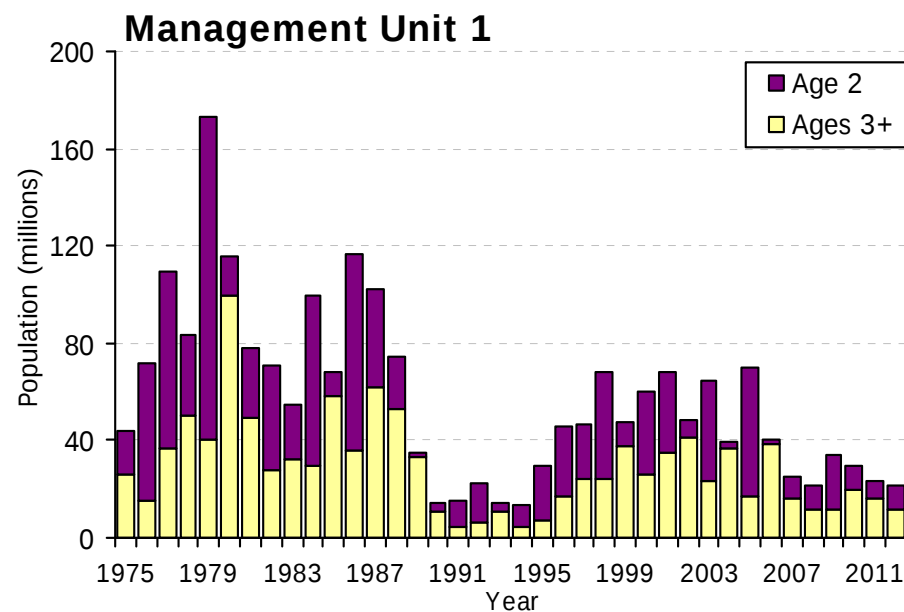


Figure 1.11. Lake Erie yellow perch population estimates by management unit for age 2 (dark bars) and ages 3+ (light bars). Estimates for 2012 are from ADMB and regressions for age 2 from survey gears.

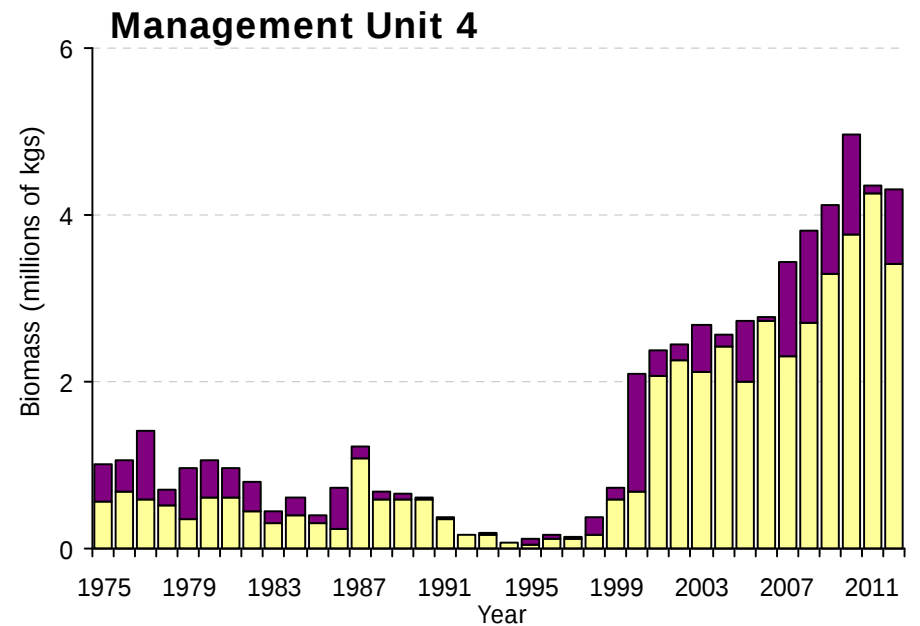
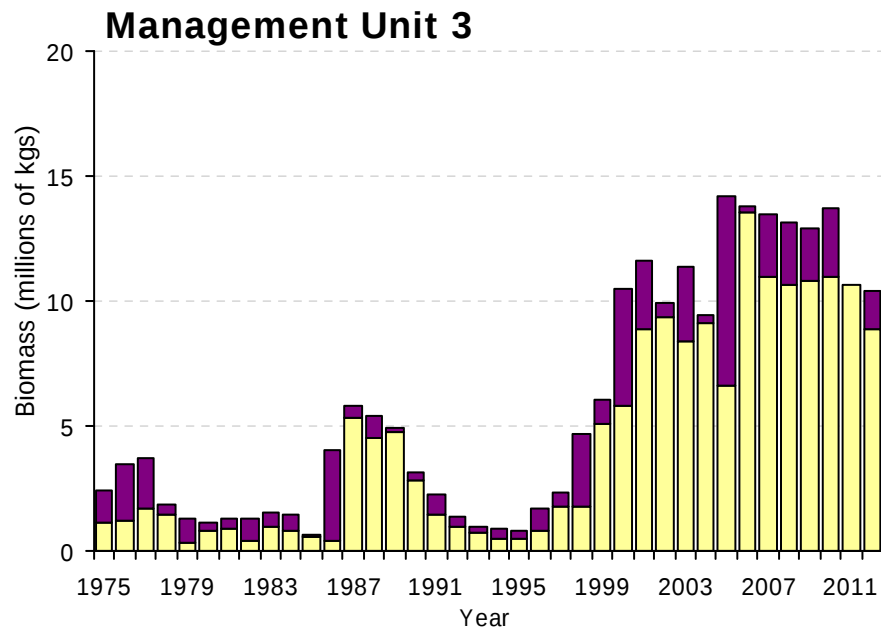
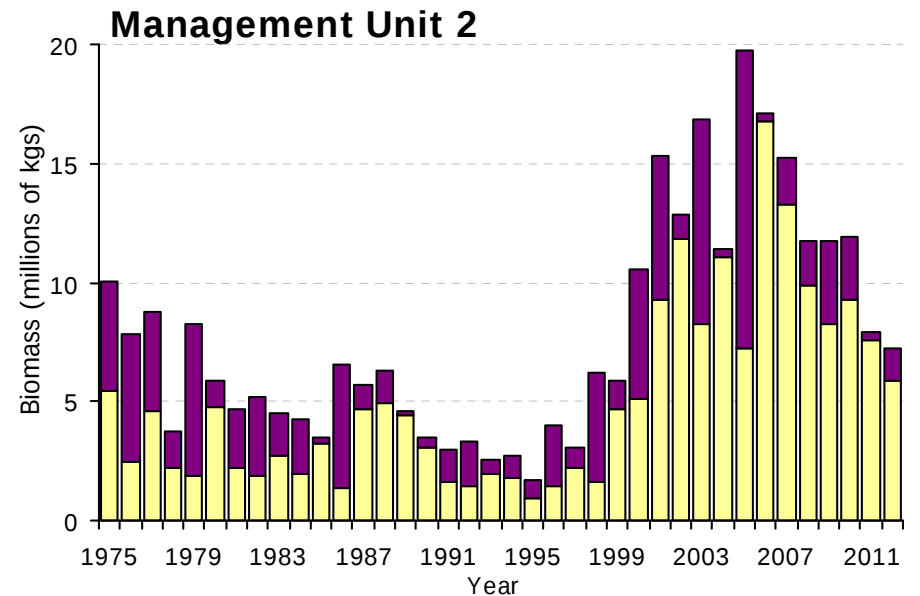
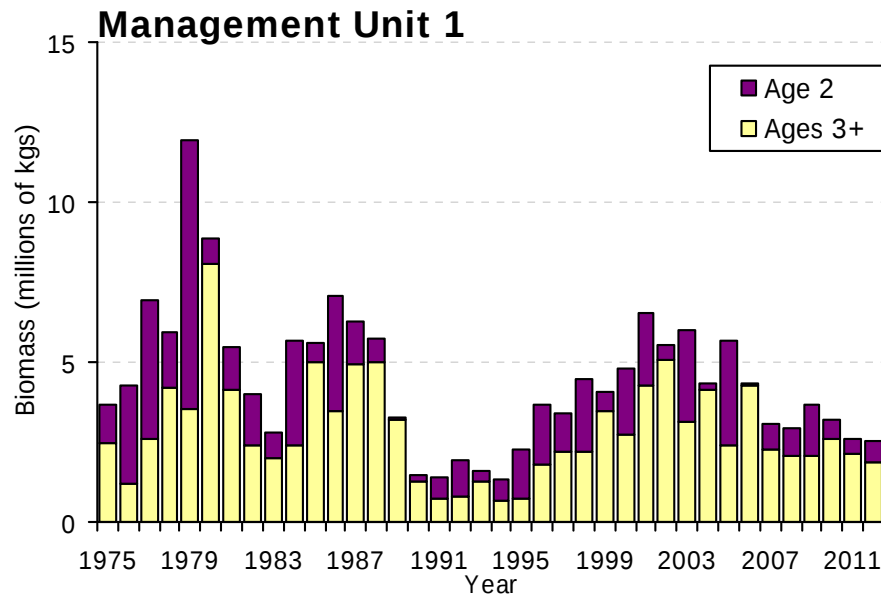


Figure 1.12. Lake Erie yellow perch biomass estimates by management unit for age 2 (dark bars) and ages 3+ (light bars). Estimates for 2012 are from ADMB and regressions for age 2 from survey gears.

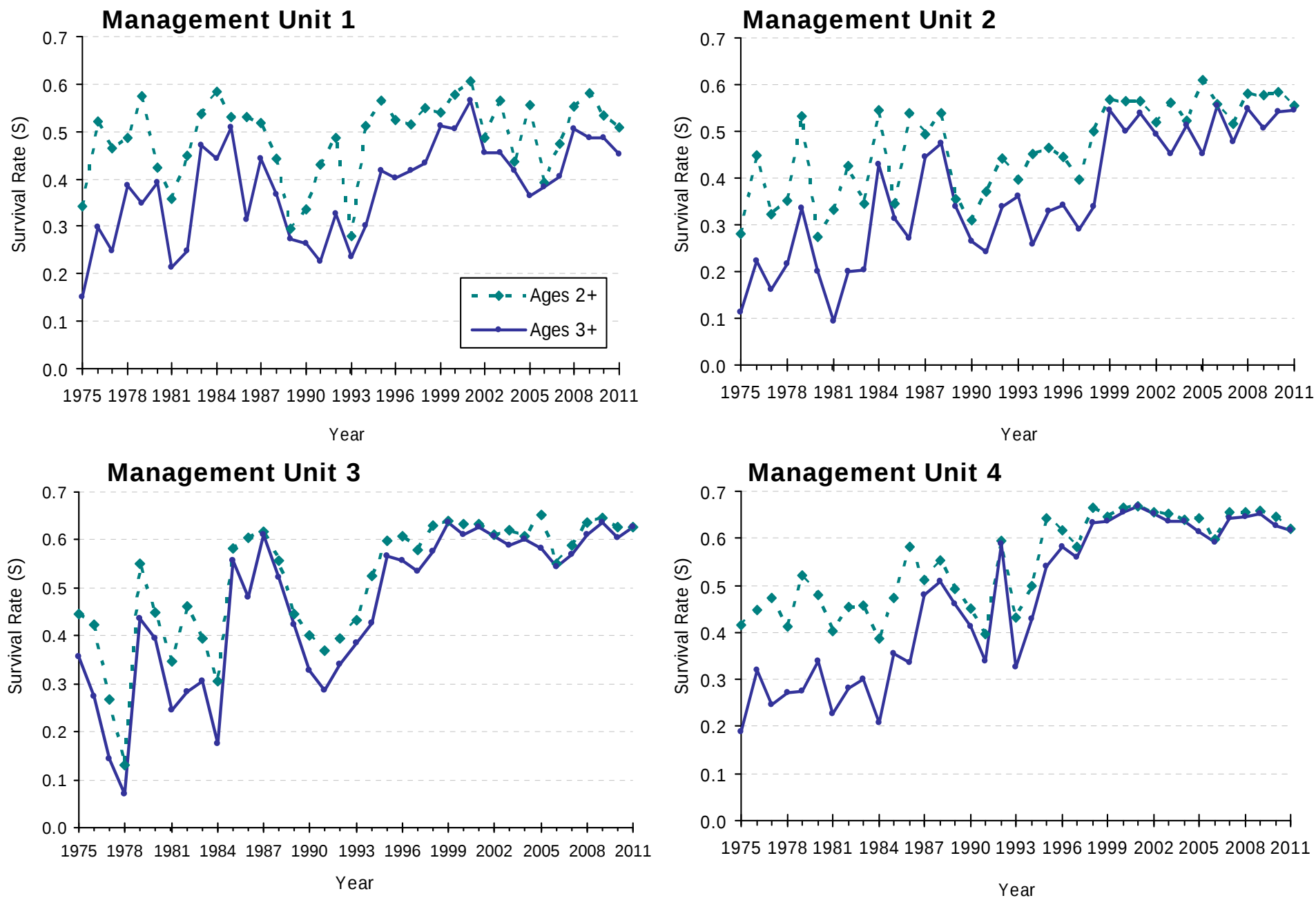


Figure 1.13. Lake Erie yellow perch survival rates by management unit for ages 2+ (dashed line) and ages 3+ (solid line). Estimates are derived from ADMB.

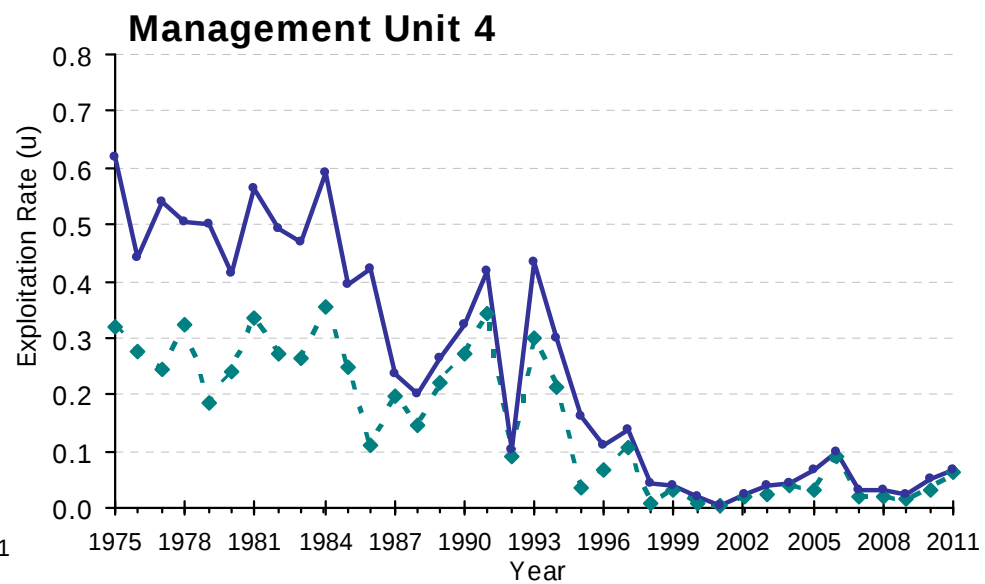
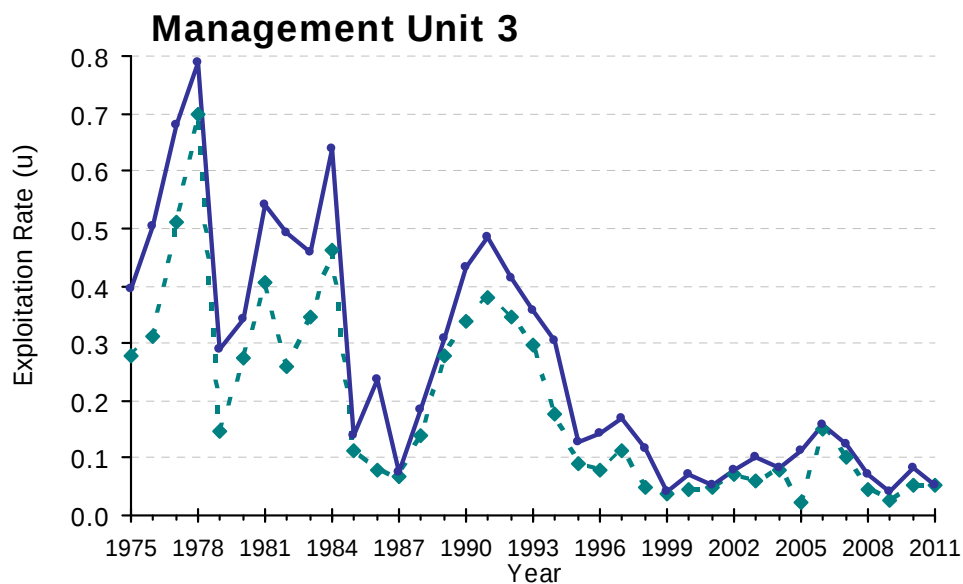
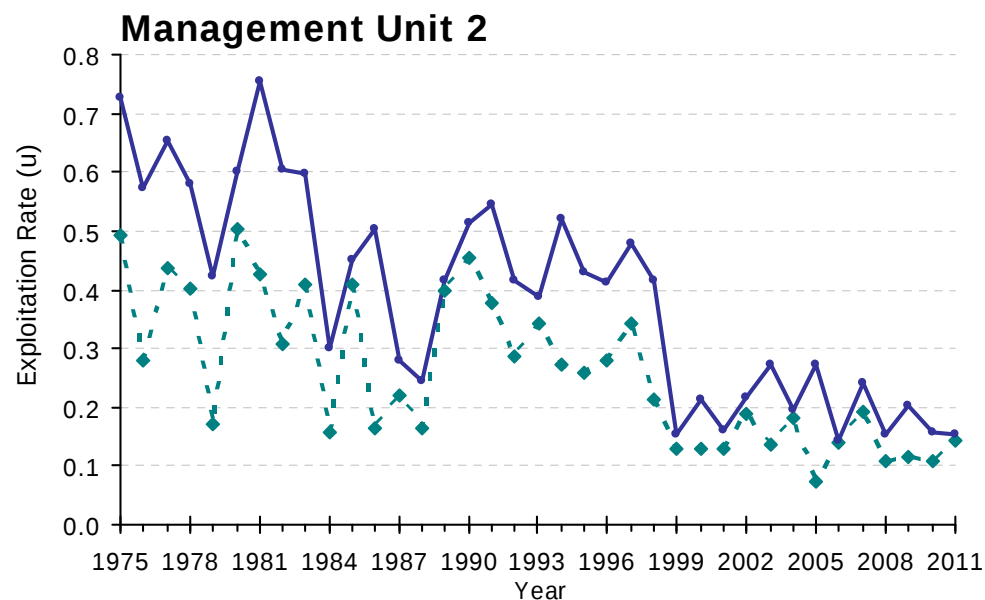
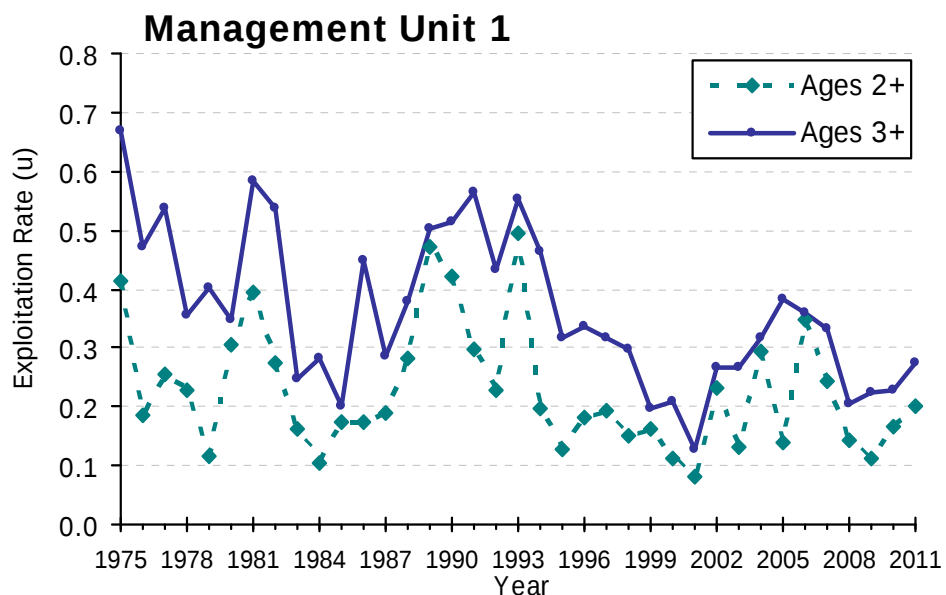
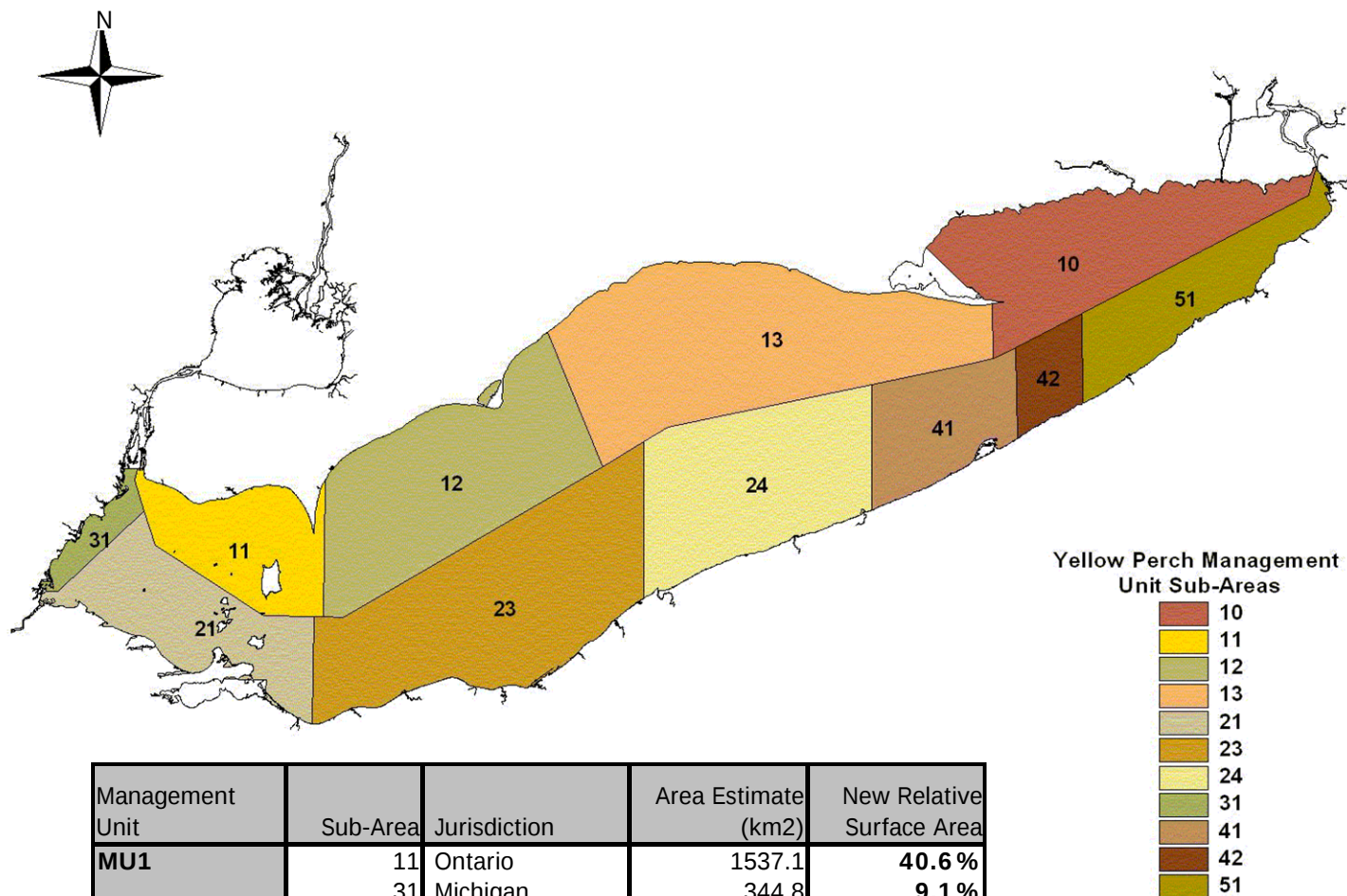


Figure 1.14. Lake Erie yellow perch exploitation rates by management unit for ages 2+ (dashed line) and ages 3+ (solid line). Estimates are derived from ADMB.



Management Unit	Sub-Area	Jurisdiction	Area Estimate (km ²)	New Relative Surface Area
MU1	11	Ontario	1537.1	40.6 %
	31	Michigan	344.8	9.1 %
	21	Ohio	1905.6	50.3 %
	MU1 Total		3787.5	
MU2	12	Ontario	3497.4	45.6 %
	23	Ohio	4175.3	54.4 %
	MU2 Total		7672.7	
MU3	13	Ontario	4749.9	52.3 %
	24	Ohio	2943.7	32.4 %
	41	Pennsylvania	1385.8	15.3 %
	MU3 Total		9079.4	
MU4	10	Ontario	2818.7	58.0 %
	42	Pennsylvania	535.6	11.0 %
	51	New York	1507.2	31.0 %
	MU4 Total		4861.4	

Figure 2.1 Calculations for subunit areas in the Yellow Perch Task Group Management Units.

Appendix A Table 1. Expert Opinion (EO) Lambda (λ) values and relative number of terms associated with catch-at-age analysis data sources by management unit (Unit).

Unit	Data Source	λ	Relative Number of Terms
1	Commercial Gill Net Effort	0.8	1
	Sport Effort	0.7	1
	Commercial Trap Net Effort	0.5	1
	Commercial Gill Net Harvest	1.0	5
	Sport Harvest	0.9	5
	Commercial Trap Net Harvest	0.7	5
	Trawl Survey Catch Rates	1.0	3
	Partnership Gill Net Index Catch Rates	1.0	5
2	Commercial Gill Net Effort	0.8	1
	Sport Effort	0.8	1
	Commercial Trap Net Effort	0.6	1
	Commercial Gill Net Harvest	1.0	5
	Sport Harvest	0.9	5
	Commercial Trap Net Harvest	0.7	5
	Trawl Survey Catch Rates	0.9	4
	Partnership Gill Net Index Catch Rates	1.0	5
3	Commercial Gill Net Effort	0.8	1
	Sport Effort	0.8	1
	Commercial Trap Net Effort	0.6	1
	Commercial Gill Net Harvest	1.0	5
	Sport Harvest	0.8	5
	Commercial Trap Net Harvest	0.6	5
	Trawl Survey Catch Rates	1.0	4
	Partnership Gill Net Index Catch Rates	1.0	5
4	Commercial Gill Net Effort	0.8	1
	Sport Effort	0.7	1
	Commercial Trap Net Effort	0.6	1
	Commercial Gill Net Harvest	1.0	5
	Sport Harvest	0.7	5
	Commercial Trap Net Harvest	0.6	5
	NY Gill Net Survey Catch Rates	1.0	5
	Partnership Gill Net Index Catch Rates	0.9	5

Appendix A Table 2. Robust regression results from survey indices used for projecting estimates of age-2 yellow perch recruiting in 2012 by Management Unit.**Management Unit 1**

Index	Value	R-Square	Intercept	Lower Int SE	Upper Int SE	Slope	Lower Slope SE	Upper Slope SE	Lower Age-2 Est	Age-2 estimate	Upper Age-2 Est
OHF10	26.9	0.784	-0.3606	-0.7756	0.0544	0.6381	0.5544	0.7218	1.915	4.832	10.670
OOS11	25.9	0.777	-0.0568	-0.3929	0.2793	0.7281	0.6276	0.8286	4.329	9.383	19.230
OPSF11	158.7	0.761	0.9507	0.3728	1.5286	0.4009	0.2970	0.5048	5.551	18.778	58.716
OOS10	96.9	0.720	-0.6714	-1.0347	-0.3081	0.6096	0.5133	0.7059	2.737	7.356	17.685
OHF11	10.0	0.515	1.3716	1.0680	1.6752	0.4244	0.3595	0.4893	5.890	9.905	16.262
mean									4.084	10.051	24.512

Management Unit 2

Index	Value	R-Square	Intercept	Lower Int SE	Upper Int SE	Slope	Lower Slope SE	Upper Slope SE	Lower Age-2 Est	Age-2 estimate	Upper Age-2 Est
OPSF21	101.8	0.806	1.0410	0.6981	1.3839	0.5188	0.4223	0.6153	13.218	30.327	68.024
OHF20B	8.7	0.718	1.0316	0.5721	1.4911	0.6333	0.4978	0.7688	4.491	10.829	24.480
OHJ21B	73.0	0.622	0.9417	0.4009	1.4825	0.5048	0.3857	0.6239	6.854	21.520	63.574
OHS20	.	0.609	1.8932	1.6026	2.1838	0.3511	0.2799	0.4223	.	.	.
OHF21B	5.5	0.563	1.0039	0.6360	1.3718	0.6570	0.5581	0.7559	4.369	8.334	15.227
OHS21	34.5	0.516	1.6712	1.3965	1.9459	0.4437	0.3799	0.5075	14.683	24.920	41.839
mean									8.723	19.186	42.629

Management Unit 3

Index	Value	R-Square	Intercept	Lower Int SE	Upper Int SE	Slope	Lower Slope SE	Upper Slope SE	Lower Age-2 Est	Age-2 estimate	Upper Age-2 Est
OHS30	.	0.824	1.2574	1.0279	1.4869	0.4049	0.3537	0.4561	.	.	.
OPSF31	218.6	0.811	0.8579	0.5313	1.1845	0.5438	0.4605	0.6271	19.373	43.255	95.130
OHJ31B	41.7	0.732	1.1485	0.7018	1.5952	0.5481	0.4129	0.6833	8.506	23.685	63.100
OHF31	55.5	0.675	1.2312	0.8514	1.6110	0.6140	0.4866	0.7414	15.684	39.781	98.682
OHF30	15.1	0.649	1.1781	0.8152	1.5410	0.5781	0.4614	0.6948	7.145	15.192	31.192
OHS31B	41.3	0.552	1.6214	1.1581	2.0847	0.3621	0.2331	0.4911	6.622	18.636	49.591
mean									11.466	28.110	67.539

Management Unit 4

Index	Value	R-Square	Intercept	Lower Int SE	Upper Int SE	Slope	Lower Slope SE	Upper Slope SE	Lower Age-2 Est	Age-2 estimate	Upper Age-2 Est
NYF41	138.2	0.786	-0.0126	-0.2819	0.2567	0.6253	0.5218	0.7288	8.911	20.624	46.181
NYF40	192.7	0.743	0.0986	-0.2043	0.4015	0.3554	0.2829	0.4279	2.617	6.172	13.224
OPSF41	95.4	0.622	0.3250	0.0165	0.6335	0.3988	0.2929	0.5047	2.875	7.558	17.901
LPC40	51.8	0.507	0.4410	0.0953	0.7867	0.2713	0.1761	0.3665	1.212	3.559	8.397
mean									3.904	9.479	21.426

Appendix A Table 3. Interagency trawl surveys indices. All series are reported in arithmetic mean catch per hectare.

Year	OHS10	OHF10	OHS11	OHF11	OOS10	OOS11	OHS20	OHF20	OHS21	OHF21	OHS30	OHF30	OHF20B	OHF21B	OHF30B	OHF31B	OHS20B	OHS21B	OHS30B	OHS31B	OHJ21B	OHJ31B	OHJ21	OHJ31
1984	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1985	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1986	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1987	16.3	.	74.9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1988	188.6	.	11.2	.	212.6	13.3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1989	106.1	.	11.8	.	265.4	12.5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1990	144.4	310.1	20.7	82.0	259.2	35.2	1.7	43.6	67.4	24.0	0.9	21.1	52.2	23.0	20.5	14.3	1.7	67.4	0.6	7.2	.	.	.	.
1991	146.9	58.1	27.6	0.4	113.3	42.1	5.4	10.8	43.5	51.6	4.5	1.3	9.3	50.0	1.2	18.5	5.4	43.5	6.4	103.4	216.5	19.7	216.5	19.7
1992	60.7	90.9	9.5	0.7	94.2	16.5	7.2	40.2	8.0	15.6	19.6	27.5	35.8	14.3	31.8	3.4	7.2	8.0	24.3	2.7	18.5	0.8	18.5	0.8
1993	1164.2	256.4	14.4	3.7	862.5	39.5	41.7	10.3	29.1	39.6	39.7	16.0	10.6	49.0	27.3	12.1	41.7	29.1	39.7	16.0	9.7	5.8	9.7	5.8
1994	508.5	287.1	57.7	73.1	469.7	62.9	73.3	77.1	5.0	11.1	77.2	14.7	71.9	12.0	16.1	3.4	73.3	5.0	77.2	16.7	23.3	10.2	23.3	10.2
1995	348.9	82.4	128.8	0.1	478.8	113.5	3.2	2.9	102.2	67.7	25.3	10.0	2.5	82.3	12.4	27.3	2.2	151.1	30.5	18.7	.	.	.	.
1996	3290.8	579.3	79.9	82.3	2544.9	122.8	998.1	128.7	11.6	13.0	1912.1	122.0	119.1	11.2	128.4	3.9	843.3	15.7	1785.8	2.7	11.1	0.8	7.9	0.9
1997	52.2	33.7	121.8	104.9	55.2	93.8	29.0	9.3	677.7	148.0	.	2.9	12.3	110.2	2.6	34.0	29.0	677.7	.	.	539.0	66.9	506.2	63.8
1998	174.5	250.9	4.8	16.0	170.6	8.2	235.1	74.4	3.5	6.4	275.5	38.9	69.8	6.3	38.1	3.7	223.8	2.9	298.9	3.5	21.1	11.9	22.5	16.2
1999	270.1	155.3	68.5	47.1	330.0	75.0	31.4	63.1	19.4	41.7	44.8	22.0	73.6	40.7	21.0	40.0	26.8	19.4	44.8	63.5	470.0	85.3	399.2	85.3
2000	186.4	41.5	85.3	38.0	102.5	113.6	0.6	18.0	86.6	57.1	0.0	1.0	21.9	61.6	1.3	19.3	0.6	86.6	.	84.8	58.1	9.3	50.6	10.3
2001	322.1	246.3	12.8	10.3	398.4	11.3	313.2	118.0	7.7	5.2	1283.7	13.2	114.6	5.7	13.6	0.4	341.9	6.4	1283.7	10.2	351.7	3.5	299.0	4.3
2002	33.1	30.4	77.1	86.5	26.4	59.5	0.3	3.8	191.0	45.9	1.7	3.1	6.0	51.7	2.5	38.3	0.3	191.0	1.7	749.6	223.9	40.2	247.1	39.0
2003	1509.9	1111.6	3.0	7.1	1620.8	12.3	1174.9	126.7	3.8	2.5	1170.2	56.5	149.0	3.2	47.5	1.2	1077.5	4.2	844.6	1.5	11.3	2.5	10.4	2.6
2004	40.9	9.3	210.7	127.7	45.2	240.7	35.1	8.2	313.0	206.1	3.6	2.0	8.7	216.5	1.9	45.2	39.7	323.7	3.6	61.9	459.4	42.7	422.0	42.7
2005	124.2	62.3	5.2	2.0	114.8	5.2	108.8	43.9	23.1	19.2	278.2	126.8	37.8	18.3	156.2	132.3	118.8	25.0	278.2	82.3	42.6	19.3	44.9	19.3
2006	180.2	121.9	6.4	12.5	222.9	12.4	4.9	11.3	2.2	4.3	60.7	19.7	10.0	4.2	18.9	12.5	4.9	2.2	60.7	10.8	30.2	113.6	29.7	113.6
2007	592.9	631.5	14.5	23.6	444.6	18.8	237.0	150.6	22.6	20.2	237.0	166.5	167.0	19.8	177.8	37.0	244.5	25.1	237.0	40.9	171.3	281.8	192.7	281.8
2008	267.0	74.7	23.5	15.3	387.2	142.1	219.5	32.1	63.1	55.0	558.3	52.8	37.3	56.6	52.8	26.4	287.2	66.6	558.3	150.2	297.1	97.2	303.5	97.2
2009	186.0	69.36	85.3	57.0	136.6	88.4	16.0	1.6	58.3	20.2	0.1	0.5	1.3	20.7	0.5	139.4	12.2	63.1	0.1	104.3	129.9	48.2	125.9	48.2
2010	58.2	26.9	22.2	17.8	96.9	26.4	.	41.1	.	11.9	.	96.3	41.1	11.9	96.3	12.4	.	.	.	.	31.2	12.1	28.8	12.1
2011	29.9	12.0	15.5	10.0	178.0	25.9	7.1	10.5	34.5	6.4	14.1	15.1	8.7	5.5	14.1	50.5	9.9	31.3	14.1	41.3	73.0	41.7	70.8	40.8

Year	OHS31	OHF31	OLPN40	OLPN41	ILP40	ILP41	NYF40	NYF41	LPS41	LPC40	LPC41	OLPO40	OLPO41	OPSF11	OPSF21	OPSF31	OPSF41
1984	.	.	283.9	9.7	761.7	44.5	.	.	.	119.1	5.9	7.3	0.0	.	.	.	.
1985	.	.	2.4	32.6	20.8	125.5	.	.	.	3.8	30.5	1.6	17.1	.	.	.	.
1986	.	.	102.0	0.2	1859.5	61.7	.	.	7.6	212.7	6.9	0.0	0.3	.	.	.	.
1987	.	.	3.4	284.1	3.8	39.7	.	.	5.5	0.8	36.7	0.0	2.1	.	.	.	.
1988	.	.	667.7	0.8	305.0	2.9	.	.	1.1	105.8	0.4	0.4	0.0	.	.	.	.
1989	.	.	296.9	53.2	457.7	84.6	.	.	6.3	82.1	16.4	0.4	1.9	.	.	6.8	76.6
1990	9.2	13.4	43.3	12.0	202.6	21.0	.	.	0.0	26.7	5.6	0.0	2.6	41.3	68.9	29.7	0.6
1991	66.6	19.6	15.5	1.0	144.0	24.5	.	.	1.7	17.8	3.2	0.7	0.6	63.3	56.6	3.8	1.6
1992	4.4	3.1	54.3	9.0	594.0	32.8	10.4	2.3	5.6	70.3	4.6	0.0	0.1	47.5	8.0	5.7	6.3
1993	16.0	12.0	21.6	4.5	239.8	17.9	110.1	3.0	7.9	30.6	2.6	2.9	0.2	146.9	112.0	93.2	0.1
1994	16.7	4.0	159.8	15.3	84.0	29.8	47.7	8.4	2.7	34.7	6.2	10.6	1.7	317.8	22.5	39.7	7.4
1995	22.4	32.7	6.0	33.7	5.3	54.3	5.7	14.2	15.2	4.3	10.9	4.0	1.7	362.5	81.3	55.2	9.6
1996	3.2	3.7	199.1	2.6	53.6	6.1	106.3	0.3	0.4	33.6	1.1	7.9	0.1	198.4	70.8	.	.
1997	.	47.5	18.9	59.8	21.5	5.4	0.2	5.5	4.4	4.4	7.1	0.0	0.1	139.3	350.5	177.9	.
1998	3.7	4.0	114.9	1.2	1005.9	14.9	1.5	0.2	8.4	127.8	1.7	8.1	0.0	17.5	6.7	6.2	0.0
1999	63.5	40.6	2.5	69.5	34.0	155.7	36.1	33.5	23.0	16.1	110.0	15.5	109.3	440.6	107.6	67.9	119.9
2000	84.8	19.9	10.2	2.1	1.2	4.8	23.1	6.6	0.7	3.6	11.3	3.0	13.4	106.1	162.4	55.5	36.9
2001	10.2	0.4	76.7	2.0	463.8	2.7	97.9	11.5	4.8	69.4	2.0	13.8	1.9	12.9	9.6	1.9	9.5
2002	749.6	49.5	0.6	13.9	8.3	42.6	9.3	15.5	6.8	1.0	6.6	0.0	0.7	198.7	245.2	186.6	19.7
2003	2.3	1.1	93.3	0.8	224.0	1.5	472.5	1.9	1.3	222.8	2.3	240.6	2.6	2.7	2.6	7.2	3.2
2004	61.7	44.4	0.5	4.3	0.1	21.4	1.5	28.7	6.5	0.1	12.4	0.1	12.2	976.5	1188.5	332.5	7.7
2005	82.3	131.6	10.3	0.1	8.8	0.2	57.8	5.4	0.4	124.4	0.1	156.2	0.0	0.0	2.2	2.5	0.2
2006	10.8	13.6	2.8	1.4	0.3	4.8	283.2	39.9	19.5	30.1	12.1	38.0	14.6	15.7	28.5	94.8	129.7
2007	40.9	34.5	6.3	0.9	73.9	3.0	401.3	41.2	9.1	63.5	7.9	70.0	9.6	184.4	203.9	202.5	43.4
2008	150.2	26.4	4.9	6.6	0.3	4.1	1088.3	44.3	5.7	279.4	20.8	356.0	25.1	333.1	310.6	150.6	87.0
2009	104.3	137.2	1.5	4.2	0.0	0.0	11.6	62.5	0.7	0.4	10.7	0.3	13.1	265.2	121.4	190.0	30.6
2010	.	12.4	13.2	0.6	5.7	0.6	192.7	4.0	1.7	51.8	0.2	63.5	0.0	49.5	18.1	36.2	15.7
2011	41.3	55.5	3.9	1.9	3.9	12.8	87.2	138.2	5.0	176.7	2.6	224.6	1.3	158.7	101.8	218.6	95.4

Appendix A Table 4.

Legend. Lakewide trawl index codes and series names used in Appendix A Tables 2 and 3. All series are reported in arithmetic mean catch per hectare, except LPS41 and OPSF11-41, gill net indices which are reported in mean catch per lift. Abbreviations in Appendix T3 ending with a 'B' represent survey indices blocked by depth strata.

Abbreviation	Series
OHS10	Ohio Management Unit 1 summer age 0
OHS11	Ohio Management Unit 1 summer age 1
OHF10	Ohio Management Unit 1 fall age 0
OHF11	Ohio Management Unit 1 fall age 1
OOS10	Ontario/Ohio Management Unit 1 summer age 0
OOS11	Ontario/Ohio Management Unit 1 summer age 1
OHS20	Ohio Management Unit 2 summer age 0
OHF20	Ohio Management Unit 2 fall age 0
OHS21	Ohio Management Unit 2 summer age 1
OHF21	Ohio Management Unit 2 fall age 1
OHS30	Ohio Management Unit 3 summer age 0
OHF30	Ohio Management Unit 3 fall age 0
OHS31	Ohio Management Unit 3 summer age 1
OHF31	Ohio Management Unit 3 fall age 1
OHJ21	Ohio Management Unit 2 June age 1
OHJ31	Ohio Management Unit 3 June age 1
OLPN40	Outer Long Point Bay Nearshore Management Unit 4 age 0
OLPN41	Outer Long Point Bay Nearshore Management Unit 4 age 1
OLPO40	Outer Long Point Bay Offshore Management Unit 4 age 0
OLPO41	Outer Long Point Bay Offshore Management Unit 4 age 1
ILPF40	Inner Long Point Bay Management Unit 4 age 0
ILPF41	Inner Long Point Bay Management Unit 4 age 1
LPC40	Long Point Composite Management Unit 4 age 0
LPC41	Long Point Composite Unit 4 age 1
LPS41	Long Point Bay Management Unit 4 summer Gill Net age 1
NYF40	New York Management Unit 4 fall age 0
NYF41	New York Management Unit 4 fall age 1
OPSF11	Ontario Partnership Gill Net Management Unit 1 fall age 1
OPSF21	Ontario Partnership Gill Net Management Unit 2 fall age 1
OPSF31	Ontario Partnership Gill Net Management Unit 3 fall age 1
OPSF41	Ontario Partnership Gill Net Management Unit 4 fall age 1