Lake Erie Multi-species Commercial

Announcement Comment Draft Report

Conformity Assessment Body (CAB)	SAI Global
Assessment team	Vito Ciccia Romito, Lead and P2 John Casselman, P1 Bob Allain, P3
Fishery client	Ontario Commercial Fisheries’ Association (OCFA)
Assessment Type	First Reassessment
Report Code	MSC046
Report Date	19 December 2019

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2 Glossary

ADMB	Auto Differentiation Model Builder
AFS	Aboriginal Fisheries Strategy
B_{limit}	Spawning Stock Biomass Limit reference Point
B_{msy}	Spawning Stock Biomass at Maximum Sustainable Yield
B_{target}	Spawning Stock Biomass Target Reference Point
B0	Unfished biomass
CLC	Council of Lake Committees
COA	Canada-Ontario Agreement
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPMS	Coordinated Percid Management Strategy
CPUE	Catch per Unit Effort
CWTG	Cold Water Task Group
DA	Decision Analysis
DCR	Daily Catch Record
DFO	Department of Fisheries & Oceans
EF	Environment Factors
EO	Environmental Objectives
ETP	Endangered, threatened and protected
FAM	Fishery Assessment Methodology
FAO	Food & Agricultural Organisation
FCO	Fish Community Goals and Objectives
FMP	Fisheries Management Plan
F_{msy}	Fishing Mortality at Maximum Sustainable Yield
FTG	Forage Task Group
FTR	Fish Mortality Target Reference Point
FWS	Fisheries & Wildlife Service
GLAHF	Great Lakes Aquatic Habitat Framework
GLFC	Great Lakes Fishery Commission
GLIFWC	Great Lakes Indian Fish & Wildlife Commission
GLNPO	Great Lakes National Program Office
GLRI	Great Lakes Restoration Initiative
GLWQA	Great Lakes Water Quality Agreement
HCR	Harvest Control Rule
HS	Harvest Strategy
HTG	Habitat Task Group
IFC	Intertek Fisheries Certification
IJC	International Joint Commission
ITQ	individual Transferable Quota
JSP	Joint Strategic Plan
K	Carrying capacity
LADST	Lake bed Alteration Decision Support Tool
LaMP	Lakewide Action and Management Plans
lbs	Pound weight

LEC	Lake Erie Committee
LEMU	Lake Erie Management Unit
LEPC	Lake Erie Program Committee
LEPMAG	Lake Erie Percid Management Advisory Group
LRP	Limit Reference Point
LTL	Lower Trophic level
LTLA	Lower Trophic Level Assessment program
F	Fishing mortality
M	Natural Mortality
MDNR	Michigan Department of Natural Resources
MSC	Marine Stewardship Council
MSE	Management Strategy Evaluation
MSY	Maximum Sustainable Yield
mt	Metric tonne
MU	Management Unit
NIS	Non-indigenous species
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NYSDEC	New York State Department of Environmental Conservation
OCFA	Ontario Commercial Fisheries Association
ODNR	Ohio Department of Natural Resources
OMNRF	Ontario Ministry of Natural Resources and Forestry
PCM	Post-capture mortality
PFBC	Pennsylvania Fish and Boat Commission
PRI	Point of Recruitment Impairment
q	Catchability
QFC	Michigan State University’s Quantitative Fisheries Center
QZ	Quota Zone
RAH	Recommended Allowable Harvest
RBF	Risk Based Framework
RP	Reference Point
SARA	Species at Risk Act
SARO	Species at Risk Ontario
SCAA	Statistical Catch at Age
SFF	Sustainable Fisheries Framework
SPOF	Strategic Plan for Ontario Fisheries
SSB	Spawning Stock Biomass
SSB_0	Unfished Spawning Stock Biomass
STC	Standing Technical Committee
TAC	Total Allowable Catch
TL	Trophic level
TRP	Target Reference Point
UoA	Unit(s) of Assessment
UoC	Unit(s) of Certification
USGS	US Geological Survey

VMS	Vessel Monitoring System
WMP	Walleye Management Plan
WTG	Walleye Task Group
YOY	Young of Year
YPMP	Yellow Perch Management Plan
YPTG	Yellow Perch Task Group

3 Executive summary

To be drafted at Announcement Comment Draft Report stage
To be completed at Public Certification Report stage

The executive summary shall include:

- Date and location of site visit.
- The main strengths and weaknesses of the client's operation.
- The draft determination / determination reached with supporting justification.

Reference(s): FCP v2.1 Section(s) 7.12, 7.18, 7.21

The fisheries under assessment are regular wild capture fisheries assessed against the MSC Default Assessment Tree. These fisheries are not considered to be enhanced or introduced fisheries.

ACDR stage – Main Strengths and Weaknesses

Main strengths and weaknesses – P1

- Both walleye and yellow perch in Lake Erie are managed using well developed stock assessment methods, with limit and target reference points defined within a harvest control rule framework, that provides, as its main output, TAC information to manage and limit the harvest of these two species. Both species are well above their limit and target reference points for several years.
- There are no significant P1 weaknesses for either yelolow perch or walleye.

Main strengths and weaknesses – P2

- Primary species for the yellow perch and walleye fishery are walleye and yellow perch, respectively. These stock are healthy and managed sustainably, according to fishery specific fishery management plans (FMPs) and harvest control rules.
- Main secondary species in the fishery (i.e. channel catfish, freshwater drum and white bass) are considered to be above PRI levels and there is no evidence that the yellow perch and walleye fisheries may be affecting these stock in any significant way.
- Habitat effects of these fisheries on Lake Erie's habitats are considered to be negligible. This is based on a very limited footprint of the gillnet and trapnet gears employed in these commercial fisheries.
- ETP species interactions are considered likely to be very limited.
- Ecosystem effects of the fishery are also considered to be quite limited.
- There are no significant weaknesses relating the ecosystem impacts of these fisheries, aside from the fact that some additional research information (e.g. potential foodweb effects resulting from the removal of walleye and yellow perch on other species in Lake Erie) would be helpful to achieve higher scores.

Main strengths and weaknesses – P3

- The fishery has a comprehensive and modern legal framework consisting of statutes and regulations, and supported by policies and practices that are capable of delivering sustainability outcomes.
- The management system is well supported by practices that promote interactive consultation and engagement with affected parties, consistency of decision-making, transparency in resolving disputes, effective surveillance and enforcement operations, and performance measurement.
- There are no significant weaknesses to the management system for the fishery.

4 Report details

4.1 Authorship and peer review details

To be drafted at Announcement Comment Draft Report stage
Peer reviewer information to be completed at Public Comment Draft Report stage

The report shall contain:

- Names of team members.
- Specification of which person is the team leader.
- Names of the peer reviewers.
- Statement that peer reviewers can be viewed on the assessment downloads page on the MSC website.

If the Risk-Based Framework (RBF) has been used in assessing the fishery the report shall state which team member(s) has had training in the use of the RBF.

Reference(s): FCP v2.1 Section(s) 7.6, 7.14, Annex PC

This Lake Erie Multi-species Commercial fishery Announcement Comment Draft Report has been drafted by Vito Romito (Lead Assessor and P2), Dr John Casselman (P1) and Bob Allain (P3). Information on the assessment team has been provided below.

Vito Romito, Leas Assessor primary responsible for Principle 2 and Traceability
Vito has almost 10 years of expertise in fisheries certification and is an ISO14001 Certified Lead Auditor and MSC FCR v.2.0 and FCP v.2.1 approved Fisheries Team Leader for SAI Global with extensive experience in ecosystems effects of fisheries. Vito received a BSc (Honours) in Ecology and a MSc in Tropical Coastal Management from Newcastle University (U.K.), in between which he worked for a year in Tanzania, carrying out comparative biodiversity assessments of pristine and dynamited coral reef ecosystems around the Mafia Island Marine Park. For five years he worked at Global Trust Certification/ later SAI Global as Lead Assessor for all the fishery assessments in Alaska, Iceland and Louisiana. Vito has also carried out several IFFO forage fisheries assessments in Chile, Peru, Europe and other various pre-assessments in Atlantic and Pacific Canada. To date, Vito has headed and conducted dozens of assessments involving 40+ different species including salmonid, groundfish, pelagic, flatfish, crustacean and cephalopod species in Europe, North and South America, and SE Asia. For three years, as a senior fisheries consultant and then manager with RS Standards Ltd., he was involved in the development and testing of a Data Deficient Fisheries framework and v.2.0 fisheries standard for the ASMI Alaska RFM Scheme, and IFFO RS Improver/FIP projects related to South East Asia multispecies bottom trawl fisheries. Vito re-joined the SAI Global Fisheries Team in 2018 and has since been involved in fisheries assessments in the Baltic Sea, Canada, Iceland, Alaska and Louisiana.

Dr. John Casselman, primary responsible for Principle 1
Dr John Casselman has experience in marine biology going back more than 40 years including as Senior Aquatic Scientist at J.F. MacLaren, Engineers and Environmental Scientists, and as Research Scientist and as Senior Research Scientist at the Ontario Ministry of Natural Resources (OMNR) from 1973 until 2005. He has most recently been involved in analysis of long-term datasets where he demonstrated the significant overriding effects of climate on community dynamics and population abundance, year-class strength, and the role of predator-prey interaction, especially in early life stages. In 2005, Dr Casselman was awarded the Fruetel Memorial Award of the Ontario Ministry of Natural Resources for significant contributions to Ontario's fisheries research, assessment, and management programs. In 2008, he received the Award of Excellence of the 10,000-member American Fisheries Society, the most prestigious award of the 138-year-old society, given annually in recognition of original and outstanding contributions to fisheries science and aquatic biology for lifetime achievements as a researcher, mentor, and leader.

Robert (Bob) Allain, primary responsible for Principle 3
Bob Allain served in Canada's Department of Fisheries and Oceans for 32 years dealing with management, enforcement and policy. While in Government Service, he consulted internationally for the Canadian International Development Agency, the (former) International Centre for Ocean Development, the World Bank, and the Food and Agricultural Organization of the United Nations. He has participated in, and spoken at, international conferences in the United States, Ireland and Australia and has given over 600 media interviews to national and international news agencies while in government service. On behalf of various national (CIDA, ICOD) and international (UNFAO, World Bank) organizations with specific mandates for the advancement of fisheries management and conservation in developing coastal states: Evaluated the effectiveness of national monitoring, control and surveillance (MCS) programs of several West African (CECAF) coastal states; studied opportunities for inter-regional cooperation, and prepared comprehensive conceptual reports for improving the organization and delivery of MCS programs. Evaluated the strengths and weaknesses of national fisheries legislation in respect of foreign and domestic fisheries licensing and revenue systems, enforcement responses and effectiveness, penalties and the conservation of marine species.

The RBF has been used in the Assessment. Vito Romito, the Lead Assessor is RBF trained.

4.2 Version details

Table 1. Fisheries program documents versions.

Document	Version number
MSC Fisheries Certification Process	Version 2.1
MSC Fisheries Standard	Version 2.01
MSC General Certification Requirements	Version 2.4
MSC Reporting Template	Version 1.1

5 Unit(s) of Assessment and Certification and results overview

5.1 Unit(s) of Assessment and Unit(s) of Certification

5.1.1 Unit(s) of Assessment

The Lake Erie Multi Species commercial fishery continues to be within the scope of the MSC Fishery Standard.

Table 2. Units of Assessment for the for the Lake Erie Multi-Species Commercial Fishery.

Unit of Assessment 1 (of 8)	
Species:	Yellow Perch (*Perca flavescens*)
Stock:	Lake Erie Yellow Perch, QZ1
Geographical Area:	Lake Erie: QZ1
Harvest method:	Small mesh gill net
Management System	Department of Fisheries and Oceans (DFO), Canada / Lake Erie Committee (LEC) / Ministry of Natural Resources and Forestry (MNRF), Ontario
Client Group:	Ontario Commercial Fisheries' Association (OCFA)
Other Eligible fishers:	None
Unit of Assessment 2 (of 8)	
Species:	Yellow Perch (*Perca flavescens*)
Stock:	Lake Erie Yellow Perch, QZ2
Geographical Area:	Lake Erie: QZ2
Harvest method:	Small mesh gill net
Management System	Department of Fisheries and Oceans (DFO), Canada/ Lake Erie Committee (LEC) / Ministry of Natural Resources and Forestry (MNRF), Ontario
Client Group:	OCFA
Other Eligible fishers:	None
Unit of Assessment 3 (of 8)	
Species:	Yellow Perch (*Perca flavescens*)
Stock:	Lake Erie Yellow Perch, QZ3(W)
Geographical Area:	Lake Erie: QZ3 (W)
Harvest method:	Small mesh gill net
Management System	Department of Fisheries and Oceans (DFO), Canada/ Lake Erie Committee (LEC) / Ministry of Natural Resources and Forestry (MNRF), Ontario
Client Group:	OCFA
Other Eligible fishers:	None
Unit of Assessment 4 (of 8)	
Species:	Yellow Perch (*Perca flavescens*)
Stock:	Lake Erie Yellow Perch, QZ3 (E)
Geographical Area:	Lake Erie: QZ3 (E)
Harvest method:	Small mesh gill net
Management System	Department of Fisheries and Oceans (DFO), Canada/ Lake Erie Committee (LEC) / Ministry of Natural Resources and Forestry (MNRF), Ontario
Client Group:	OCFA
Other Eligible fishers:	None
Unit of Assessment 5 (of 8)	
Species:	Yellow Perch (*Perca flavescens*)
Stock:	Lake Erie Yellow Perch, MU1
Geographical Area:	Lake Erie: MU1
Harvest method:	Small mesh trap net
Management System	US Fisheries & Wildlife Service (FWS) / Lake Erie Committee (LEC) / Ohio Department of Natural Resources (ODNR)
Client Group:	OCFA
Other Eligible fishers:	None
Unit of Assessment 6 (of 8)	

Table 2. Units of Assessment for the for the Lake Erie Multi-Species Commercial Fishery.

Species:	Yellow Perch (*Perca flavescens*)
Stock:	Lake Erie Yellow Perch, MU2
Geographical Area:	Lake Erie: MU2
Harvest method:	Small mesh trap net
Management System	US Fisheries & Wildlife Service (FWS) / Lake Erie Committee (LEC) / Ohio Department of Natural Resources (ODNR)
Client Group:	OCFA
Other Eligible fishers:	None
Unit of Assessment 7 (of 8)	
Species:	Yellow Perch (*Perca flavescens*)
Stock:	Lake Erie Yellow Perch, MU3
Geographical Area:	Lake Erie: MU3
Harvest method:	Small mesh trap net
Management System	US Fisheries & Wildlife Service (FWS) / Lake Erie Committee (LEC) / Ohio Department of Natural Resources (ODNR)
Client Group:	OCFA
Other Eligible fishers:	None
Unit of Assessment 8 (of 8)	
Species:	Walleye (*Sander vitreus*)
Stock:	Lake Erie Walleye
Geographical Area:	Lake Erie
Harvest method:	Large mesh gill net
Management System	Department of Fisheries and Oceans (DFO), Canada / Lake Erie Committee (LEC) / Ministry of Natural Resources and Forestry (MNRF), Ontario
Client Group:	OCFA
Other Eligible fishers:	None

5.1.2 Unit(s) of Certification

To be drafted at Client and Peer Review Draft Report stage
To be completed at Public Certification Report stage

The report shall include a justification for any changes to the proposed Unit(s) of Certification (UoC).

Reference(s): FCP v2.1 Section 7.5

UoCs will be included during Client and Peer Review Draft Report stage

5.2 Assessment results overview

5.2.1 Determination, formal conclusion and agreement

To be drafted at Final Draft Report
To be completed at Public Certification Report

The report shall include a formal statement as to the certification determination recommendation reached by the assessment team on whether the fishery should be certified.

The report shall include a formal statement as to the certification action taken by the CAB's official decision-makers in response to the Determination recommendation.

Reference(s): FCP v2.1 Section 7.21

5.2.2 Principle level scores

To be drafted at Client and Peer Review Draft Report

The report shall include scores for each of the three MSC principles in the table below.

Reference(s): FCP v2.1 Section 7.17

Table 3. Principle level scores.

Principle	UoA 1	UoA 2	UoA 3	UoA 4
Principle 1 – Target species				
Principle 2 – Ecosystem impacts				
Principle 3 – Management system				

5.2.3 Summary of conditions

To be drafted at Client and Peer Review Draft Report

The report shall include a table summarising conditions raised in this assessment. Details of the conditions shall be provided in the appendices. If no conditions are required, the report shall include a statement confirming this.

Reference(s): FCP v2.1 Section 7.18

Table 4. Summary of conditions.

Condition number	Condition	Performance Indicator (PI)	Related to previous condition?
			Yes / No / NA
			Yes / No / NA
			Yes / No / NA

5.2.4 Recommendations

To be drafted at Client and Peer Review Draft Report stage.

If the CAB or assessment team wishes to include any recommendations to the client or notes for future assessments, these may be included in this section.

6 Traceability and eligibility

6.1 Eligibility date

The report shall include the eligibility date and the justification for selecting this date, including consideration of whether the traceability and segregation systems in the fishery are appropriately implemented.

Reference(s): FCP v2.1 Section 7.8

6.2 Traceability within the fishery

To be drafted at Announcement Comment Draft Report stage
To be completed at Public Certification Report stage

The report shall include a description of the tracking, tracing and segregation systems within the fishery and how these systems will allow any products sold as MSC certified to be traced back to the Unit of Certification.

The report shall include an evaluation of the robustness of the management systems related to traceability.

The report shall include any traceability references, including hyperlinks to publicly-available documents.

The report shall include a description of the factors that may lead to risks of non-certified seafood being mixed with certified seafood prior to entering Chain of Custody using the table below. For each risk factor, there shall be a description of whether the risk factor is relevant for the fishery and, if so, a description of the relevant mitigation measures or traceability systems in place.

Reference(s): FCP v2.1 Section 7.9

Most of the traceability information below is derived from the original 2015 certification report with updates provided by OCFA in October 2019.

Traceability in the Yellow Perch fishery.

Yellow perch vessels are licensed to fish in a specific quota zone (see UoAs) and must complete a log book and DCR while their activities are monitored by VMS. In the past, there have been examples of fishing outside the licensed zone but this appears to be no longer an issue and is considered to be a low risk.
The main risks for substitution are:

1. Yellow perch caught in the “other” trap nets (i.e. large mesh) are not certified. With respect to YP in Ohio waters, there is some potential for certified fish to co-mingle with non-certified but there are measures in place to prevent co-mingling including that it is illegal for fishers to have yellow perch from multiple MU’s on their boat at the same time, so from an MU standpoint a vessel can only have yellow perch from a single MU on board at any given time. **It is not clear if this or an equivalent or more robust requirement is mirrored in Ontario waters. This element will be further assessed in later stage of the assessment.**
2. Over quota Yellow perch caught in one gear and declared as landings from another. There is a low risk due to the potential high sanctions if caught.
3. Non-MSC Yellow perch from other lakes being sold as MSC Lake Erie fish. ON processors do purchase non-certified Walleye and YP from other lakes, e.g. Lake Huron, Lake Winnipeg, etc. Fish processing companies must have effective mechanisms to separate MSC fish from non-MSC fish. This has to be verified through Chain of Custody audits.

There is no on-lake processing or trans-shipping activities reported. In Ontario landings of the large vessels are mainly limited to Port Colborne, Port Dover, Port Burwell, Port Stanley, Erieau Harbour, Wheatley Harbour and Kingsville Harbour. In Ohio landings of trap vessels are mainly limited to Sundusky, Fairport, Port Clinton. The combination of management measures allied with plant accounting is considered a robust management approach to traceability and ensuring the integrity of MSC certified product.

Traceability in the Walleye fishery.

Walleye vessels are licensed to fish in a specific quota zone and must complete a log book and DCR while their activities are monitored by VMS. In the past, there have been examples of fishing outside the correct zones but this no longer appears to be an issue. It is now considered to be a low risk. The main risks for substitution are:

1. Walleye caught in the non-certified east basin Lake Erie fishery. DCRs should clearly note if the landed fish is MSC certified or MSC not-certified and fish must be kept separate. **Where certified and non-certified fish is taken on the same trip there is already a requirement to have in place a system to physically separate the catch of them on-board the vessel. This element will be further assessed/verified in later stages of the assessment.** In these cases, processors have MSC CoCs and food safety systems that are intended to prevent co-mingling of certified and non-certified fish.
2. Walleye caught in the Yellow perch gillnet fishery or in the gear used in other fisheries would not be certified. This moderate risk shall be mitigated through appropriate landing and chain of custody processes that ensure that certified and non-certified landings are physically and administratively separated.
3. Walleye caught illegally on the U.S. part of Lake Erie. There is a low risk due to the potential high sanctions if caught. Furthermore, in Ohio there is no commercial harvesting of Walleye, i.e., the species is entirely non-commercial. Therefore the risk is considered quite small.
4. Non-MSC Walleye from other lakes being sold as MSC Lake Erie walleye. ON processors do purchase non-certified Walleye and YP from other lakes, e.g. Lake Huron, Lake Winnipeg, etc. Fish processing companies must have effective mechanisms to separate MSC fish from non-MSC fish. As above, this has to be verified through Chain of Custody audits.

There is no on-lake processing or trans-shipping activities reported. In Ontario landings of the large vessels are mainly limited to Port Colborne, Port Dover, Port Burwell, Port Stanley, Erieau Harbour, Wheatley Harbour and Kingsville Harbour. The combination of management measures allied with plant accounting is considered a robust management approach to traceability and ensuring the integrity of MSC certified product.

Table 5. Traceability within the fishery (information from October 2019).

Factor	Description
Will the fishery use gears that are not part of the Unit of Certification (UoC)? If Yes, please describe: - If this may occur on the same trip, on the same vessels, or during the same season; - How any risks are mitigated.	No, all the relevant gears have been assessed are part of the UoC.
Will vessels in the UoC also fish outside the UoC geographic area? If Yes, please describe: - If this may occur on the same trip; - How any risks are mitigated.	Yes, but never on the same trip. Landings are recorded per gear type.

Table 5. Traceability within the fishery (information from October 2019).

Do the fishery client members ever handle certified and non-certified products during any of the activities covered by the fishery certificate? This refers to both at-sea activities and on-land activities. - Transport - Storage - Processing - Landing - Auction If Yes, please describe how any risks are mitigated.	Yes. There is some handling of certified and non-certified product for both YP and walleye, but the situation varies between ON and OH. **Ontario**: In ON, non-certified Walleye can originate from the east basin gill net fishery. There is no Lake Erie source of non-certified YP from ON waters. ON processors do purchase non-certified Walleye and YP from other lakes, e.g. Lake Huron, Lake Winnipeg, etc. In these cases, processors have MSC CoCs and food safety systems that are intended to prevent co-mingling of certified and non-certified fish. **Ohio (TH)**: In OH, there is no traceability issue with Walleye as there is no commercial harvesting, i.e., the species is entirely non-commercial. With respect to YP, there is some potential for certified fish to co-mingle with non-certified but there are measures in place to prevent co-mingling including that it is illegal for fishers to have yellow perch from multiple MU's on their boat at the same time, so from an MU standpoint a vessel can only have yellow perch from a single MU on board at any given time. Regarding certified vs. non-certified yellow perch, here is the language provided to all trap net license holders every year prior to the fishing season as part of their preliminary quota allocation letter: *"Lastly, as a part of the recent Marine Stewardship Council (MSC) certification of yellow perch harvested from Ohio's Lake Erie commercial trap nets, the MSC audit team has instituted a requirement to keep targeted yellow perch (harvested from yellow perch trap nets) separate from yellow perch harvested from non-targeted trap nets (e.g. bass nets). This requirement is in place to ensure chain of custody for the certified portion of Ohio's yellow perch harvest. To maintain chain of custody, licensees should keep yellow perch harvested from non- targeted trap nets separate from those harvested from targeted trap nets while on the vessel and in transport to wholesalers."* As further information related to the above statement, generally speaking license holders that sell to Ontario processors do not harvest yellow perch from nets targeted at other species. The statement above handles that scenario if it ever would arise, but license holders that sell to Ontario are not the license holders that this would be a concern for. There are a few small operators that fish white bass nets nearshore at Cedar Point and also yellow perch nets offshore at Cedar Point, but they do not sell yellow perch to Ontario processors. The license holders that do sell to Ontario exclusively fish yellow perch targeted nets on days that they are harvesting yellow perch.

Table 5. Traceability within the fishery (information from October 2019).	
Does transhipment occur within the fishery? If Yes, please describe: - If transhipment takes place at-sea, in port, or both; - If the transhipment vessel may handle product from outside the UoC; - How any risks are mitigated.	No.
Are there any other risks of mixing or substitution between certified and non-certified fish? If Yes, please describe how any risks are mitigated.	No, but it is helpful to describe a few nearby fisheries. There is a small commercial Trap Net fishery harvesting Yellow Perch in the NY waters of MU4 (https://www.dec.ny.gov/docs/fish_marine_pdf/2018lerpt.pdf), and a small trap net fishery for Walleye and Yellow Perch in the Pennsylvania waters of MU4. The harvest of walleye in MU4 is prosecuted using trapnet gear. This is not considered a risk since it is a separate and different gear from the large mesh gillnet Walleye UoA under assessment here. Trapnet harvesting of YP in MU4 is also considered not problematic because it is separate from what is being assessed (i.e. by MU and gear type). Furthermore, in the case of Yellow Perch (YP) each of the MUs represents a bi-national assessment and management unit. All stock components and removals are considered as per individual MU. Jurisdictional shares of the MU-specific TAC are proportional to each jurisdiction's surface area within the MU. In the case of Walleye, the east basin (MU4/5) is outside of the international TAC area. These fish (whether harvested in the ON gill net fishery, or the NY fishery) are managed by other than the LEC and are not part of the MSC certified large mesh fishery UoC.

6.3 Eligibility to enter further chains of custody

To be drafted at Announcement Comment Draft Report stage
To be completed at Public Certification Report stage

The report shall include a determination of whether the seafood product will be eligible to enter certified chains of custody, and whether the seafood product is eligible to be sold as MSC certified or carry the MSC ecolabel.

The report shall include a list of parties, or category of parties, eligible to use the fishery certificate, and sell product as MSC certified.

The report shall include the point of intended change of ownership of product, a list of eligible landing points, and the point from which subsequent Chain of Custody certification is required.

If the CAB makes a negative determination under FCP v2.1 Section 7.9, the CAB shall state that fish and fish products from the fishery are not eligible to be sold as MSC certified or carry the MSC ecolabel. If the client group includes other entities such as agents, unloaders, or other parties involved with landing or sale of certified fish, this needs to be clearly stated in the report including the point from which Chain of Custody is required.

Reference(s): FCP v2.1 Section 7.9

Companies included by the Client Group

To be confirmed by the client group.

Yellow Perch Eligibility
Product from the certified UoC in Canadian waters will be eligible to enter further certified chains of custody when caught and landed by a licensed fishing vessel with an available quota and using the required gear as specified in this assessment. Only licensed vessels approved by the client group may trade in certified product. Only processors belonging to the client group may market certified product.

Product from the certified UoC in U.S. waters will be eligible to enter further certified chains of custody as long as current working practises ensure that trap caught MSC certified fish is not mixed with trap caught non–certified fish. This process shall reflect the changes required by the management authority. Once the changes have been introduced, they will need to be assessed and confirmed as acceptable by the certifying CAB.

Only yellow perch caught and landed by an Ohio licensed fishing vessel with an available quota and using the required gear will be covered by the certification. Only licensed vessels approved by the client group may trade in certified product. Only processors belonging to the client group may market certified product.

In both Ontario and Ohio landings may be made at those landing points approved and made known to the relevant authority. Where a vessel sells all of its catch to a single processor and the product is transported directly from the vessel to the processing facility, the chain of custody shall begin in the processing facility. Where an intermediary or intermediaries between the landing and the processing plant takes ownership of the product the intermediary /ies shall have chain of custody certification.

Walleye eligibility
Product from the certified UoC will be eligible to enter further certified chains of custody when caught and landed by a licensed fishing vessel with an available quota and using the required gear. However, where certified and noncertified fish is taken on the same trip, before product from such a trip may be sold as certified there shall be in place a system to physically separate the catch of them on-board the vessel. This should not be a problem for Walleye since all the commercial harvest occurs in Ontario, which is covered by this assessment. Only licensed vessels approved by the client group may trade in certified product. Only processors belonging to the client group may market certified product.

In Ontario landings may be made at those landing points approved and made known to the relevant authority. Where a vessel sells all of its catch to a single processor and the product is transported directly from the vessel to the processing facility, the chain of custody shall begin in the processing facility. Where an intermediary or intermediaries between the landing and the processing plant takes ownership of the product the intermediary/ies shall have chain of custody certification.

6.4 Eligibility of Inseparable or Practicably Inseparable (IPI) stock(s) to enter further chains of custody

There are no IPI stocks in the fisheries under assessment.

7 Scoring

7.1 Summary of Performance Indicator level scores

Table 6. Fishery Assessment Scoring Worksheet (Green cells in P2 indicate that those PIs have the same score across all UoAs)

Yellow Perch UoA 1-7 and Walleye UoA 8 (All UoAs)

Principle	Component	Weight	Performance Indicator (PI)		Weight	Score
One	Outcome	0.333	1.1.1	Stock status	0.500	100
			1.1.2	Stock rebuilding	0.500	100
	Management	0.667	1.2.1	Harvest strategy	0.250	90
			1.2.2	Harvest control rules & tools	0.250	95
			1.2.3	Information & monitoring	0.250	80
			1.2.4	Assessment of stock status	0.250	95
Overall weighted Principle-level scores					**Score**	
Principle 1 - Target species					**93.3**	

Yellow Perch UoA 1-7 and Walleye UoA 8 (All UoAs)

Principle	Component	Weight	Performance Indicator (PI)		Weight	Score
Three	Governance and policy	0.500	3.1.1	Legal &/or customary framework	0.333	100
			3.1.2	Consultation, roles & responsibilities	0.333	95
			3.1.3	Long term objectives	0.333	100
	Fishery specific management system	0.500	3.2.1	Fishery specific objectives	0.250	80
			3.2.2	Decision making processes	0.250	100
			3.2.3	Compliance & enforcement	0.250	100
			3.2.4	Monitoring & management performance evaluation	0.250	90
Overall weighted Principle-level scores					**Score**	
Principle 3 - Management					**95.4**	

UoA 1

Principle	Component	Weight	Performance Indicator (PI)		Weight	Score
Two	Primary species	0.200	2.1.1	Outcome*	0.333	100
			2.1.2	Management strategy	0.333	95
			2.1.3	Information/Monitoring	0.333	95
	Secondary species	0.200	2.2.1	Outcome	0.333	90
			2.2.2	Management strategy	0.333	95

			2.2.3	Information/Monitoring	0.333	85
	ETP species	0.200	2.3.1	Outcome	0.333	80
			2.3.2	Management strategy	0.333	85
			2.3.3	Information strategy	0.333	80
	Habitats	0.200	2.4.1	Outcome	0.333	80
			2.4.2	Management strategy	0.333	80
			2.4.3	Information	0.333	80
	Ecosystem	0.200	2.5.1	Outcome	0.333	80
			2.5.2	Management	0.333	80
			2.5.3	Information	0.333	80

Overall weighted Principle-level scores	**Score**
Principle 2 - Ecosystem	**85.7**

UoA 2

Principle	Component	Weight	Performance Indicator (PI)		Weight	Score
Two	Primary species	0.200	2.1.1	Outcome	0.333	100
			2.1.2	Management strategy	0.333	95
			2.1.3	Information/Monitoring	0.333	100
	Secondary species	0.200	2.2.1	Outcome	0.333	90
			2.2.2	Management strategy	0.333	95
			2.2.3	Information/Monitoring	0.333	85
	ETP species	0.200	2.3.1	Outcome	0.333	80
			2.3.2	Management strategy	0.333	85
			2.3.3	Information strategy	0.333	80
	Habitats	0.200	2.4.1	Outcome	0.333	80
			2.4.2	Management strategy	0.333	80
			2.4.3	Information	0.333	80
	Ecosystem	0.200	2.5.1	Outcome	0.333	80
			2.5.2	Management	0.333	80
			2.5.3	Information	0.333	80

Overall weighted Principle-level scores	**Score**
Principle 2 - Ecosystem	**86.0**

UoA 3

Principle	Component	Weight	Performance Indicator (PI)		Weight	Score
Two	Primary species	0.200	2.1.1	Outcome	0.333	100
			2.1.2	Management strategy	0.333	95
			2.1.3	Information/Monitoring	0.333	100
	Secondary species	0.200	2.2.1	Outcome	0.333	90
			2.2.2	Management strategy	0.333	95
			2.2.3	Information/Monitoring	0.333	85
	ETP species	0.200	2.3.1	Outcome	0.333	80
			2.3.2	Management strategy	0.333	85
			2.3.3	Information strategy	0.333	80
	Habitats	0.200	2.4.1	Outcome	0.333	80
			2.4.2	Management strategy	0.333	80
			2.4.3	Information	0.333	80
	Ecosystem	0.200	2.5.1	Outcome	0.333	80
			2.5.2	Management	0.333	80
			2.5.3	Information	0.333	80

Overall weighted Principle-level scores	**Score**
Principle 2 - Ecosystem	**86.0**

UoA 4

Principle	Component	Weight	Performance Indicator (PI)		Weight	Score
Two	Primary species	0.200	2.1.1	Outcome	0.333	100
			2.1.2	Management strategy	0.333	95
			2.1.3	Information/Monitoring	0.333	100
	Secondary species	0.200	2.2.1	Outcome	0.333	90
			2.2.2	Management strategy	0.333	95
			2.2.3	Information/Monitoring	0.333	85
	ETP species	0.200	2.3.1	Outcome	0.333	80
			2.3.2	Management strategy	0.333	85
			2.3.3	Information strategy	0.333	80
	Habitats	0.200	2.4.1	Outcome	0.333	80

			2.4.2	Management strategy	0.333	80
			2.4.3	Information	0.333	80
	Ecosystem	0.200	2.5.1	Outcome	0.333	80
			2.5.2	Management	0.333	80
			2.5.3	Information	0.333	80

Overall weighted Principle-level scores	**Score**
Principle 2 - Ecosystem	**86.0**

UoA 5

Principle	Component	Weight	Performance Indicator (PI)		Weight	Score
Two	Primary species	0.200	2.1.1	Outcome	0.333	100
			2.1.2	Management strategy	0.333	100
			2.1.3	Information/Monitoring	0.333	100
	Secondary species	0.200	2.2.1	Outcome	0.333	80
			2.2.2	Management strategy	0.333	80
			2.2.3	Information/Monitoring	0.333	80
	ETP species	0.200	2.3.1	Outcome	0.333	90
			2.3.2	Management strategy	0.333	85
			2.3.3	Information strategy	0.333	80
	Habitats	0.200	2.4.1	Outcome	0.333	80
			2.4.2	Management strategy	0.333	80
			2.4.3	Information	0.333	80
	Ecosystem	0.200	2.5.1	Outcome	0.333	80
			2.5.2	Management	0.333	80
			2.5.3	Information	0.333	80

Overall weighted Principle-level scores	**Score**
Principle 2 - Ecosystem	**85.0**

UoA 6

Principle	Component	Weight	Performance Indicator (PI)		Weight	Score
Two	Primary species	0.200	2.1.1	Outcome	0.333	100
			2.1.2	Management strategy	0.333	100
			2.1.3	Information/Monitoring	0.333	100

	Secondary species	0.200	2.2.1	Outcome	0.333	90
			2.2.2	Management strategy	0.333	95
			2.2.3	Information/Monitoring	0.333	85
	ETP species	0.200	2.3.1	Outcome	0.333	90
			2.3.2	Management strategy	0.333	85
			2.3.3	Information strategy	0.333	80
	Habitats	0.200	2.4.1	Outcome	0.333	80
			2.4.2	Management strategy	0.333	80
			2.4.3	Information	0.333	80
	Ecosystem	0.200	2.5.1	Outcome	0.333	80
			2.5.2	Management	0.333	80
			2.5.3	Information	0.333	80

Overall weighted Principle-level scores	**Score**
Principle 2 - Ecosystem	**87.0**

UoA 7

Principle	Component	Weight	Performance Indicator (PI)		Weight	Score
Two	Primary species	0.200	2.1.1	Outcome	0.333	100
			2.1.2	Management strategy	0.333	100
			2.1.3	Information/Monitoring	0.333	100
	Secondary species	0.200	2.2.1	Outcome	0.333	90
			2.2.2	Management strategy	0.333	95
			2.2.3	Information/Monitoring	0.333	85
	ETP species	0.200	2.3.1	Outcome	0.333	90
			2.3.2	Management strategy	0.333	85
			2.3.3	Information strategy	0.333	80
	Habitats	0.200	2.4.1	Outcome	0.333	80
			2.4.2	Management strategy	0.333	80
			2.4.3	Information	0.333	80
	Ecosystem	0.200	2.5.1	Outcome	0.333	80
			2.5.2	Management	0.333	80
			2.5.3	Information	0.333	80

Overall weighted Principle-level scores	**Score**
Principle 2 - Ecosystem	**87.0**

UoA 8

Principle	Component	Weight	Performance Indicator (PI)		Weight	Score
Two	Primary species	0.200	2.1.1	Outcome	0.333	100
			2.1.2	Management strategy	0.333	95
			2.1.3	Information/Monitoring	0.333	100
	Secondary species	0.200	2.2.1	Outcome	0.333	90
			2.2.2	Management strategy	0.333	85
			2.2.3	Information/Monitoring	0.333	85
	ETP species	0.200	2.3.1	Outcome	0.333	80
			2.3.2	Management strategy	0.333	85
			2.3.3	Information strategy	0.333	80
	Habitats	0.200	2.4.1	Outcome	0.333	80
			2.4.2	Management strategy	0.333	80
			2.4.3	Information	0.333	80
	Ecosystem	0.200	2.5.1	Outcome	0.333	80
			2.5.2	Management	0.333	80
			2.5.3	Information	0.333	80

Overall weighted Principle-level scores	**Score**
Principle 2 - Ecosystem	**85.3**

7.2 Principle 1

7.2.1 Principle 1 background

As per MSC Fisheries Standard v2.01 requirements, in Principle 1 teams are required to score the whole of the target stock(s) selected for inclusion in the Unit of Assessment (UoA). In the Outcome Performance Indicator (PI), requirements are for the stock to be at a level which maintains high productivity and has a low probability of recruitment overfishing. The next two PIs require the existence of a robust and precautionary harvest strategy and well defined and effective harvest control rules in place. Finally, the last two PIs assess for relevant information collection to support (and monitor) the harvest strategy, and for the adequate assessment of stock status.

The Lake Erie Yellow perch and Walleye Fisheries

Lake Erie contains important and valuable international commercial and sport fisheries. It is said to have one of the world's largest freshwater commercial fisheries. The target species in these fisheries are primarily two percids – yellow perch (*Perca flavescens*) and walleye (*Sander vitreus*). Both of these species received MSC certification in 2015 (Intertek 2015), with two conditions on yellow perch. Particulars concerning the operation of both the commercial and the sport fisheries were detailed there. This section encompasses primarily the period of time since that certification but, where appropriate, includes longer-term information and data for reference and comparative purposes. Notably, the yellow perch stock is assessed according to four management units (MU1–MU4). In Ohio, the yellow perch commercial fishing season is May to November, with small-mesh trap nets. In Ontario, the gill-net fishery is open year-round, with regulations covering gear-soak times when ice is present. Mesh is small in size (minimum allowable stretch mesh size of 57 mm) and nets are bottom-set. The walleye population is considered to be a single stock. In the Ontario commercial fishery, walleye are caught by large-mesh mid-water gill nets (minimum size 89 mm). Walleye may also be caught incidentally in small-mesh gear that targets other species. Recreational fisheries in both Canadian and U.S. waters also target both species. Commercial fishing of walleye is not allowed in U.S. waters.

LTL Species Considerations

Yellow perch and walleye, the target (P1) species assessed in this report are not considered to be key Low-Trophic Level (LTL) species.

7.2.2 Yellow perch

7.2.2.1 Biology description

Yellow perch is a cool-water species that is abundant throughout its native range in North America; the Great Lakes Basin is centrally located in this broad distributional range, where it is prolific in trophic and mesotrophic environments. Yellow perch are economically important, both commercially and recreationally, to all jurisdictions on Lake Erie. They inhabit a vast territory and a wide variety of habitats and is very adaptable, occupying a broad range of warm- and cool-water conditions (Scott and Crossman 1973). It is a spring spawner; eggs are extruded in a unique transparent gelatinous string or tube that adheres to submerged vegetation or lies on the bottom. The preferred summer temperature range of adults is from 18°C to 25°C (Brown et al. 2009), with a mean optimum temperature for somatic growth of 22.9°C (Casselman 2002).

Yellow perch are opportunistic omnivores that are abundant and highly productive in Lake Erie. Adults eat a broad range of benthic invertebrates and forage fishes. It is possible that body condition and growth of yellow perch in the western basin of Lake Erie in the early 2000s was slower than in the central basin because of higher summer temperatures and lower abundance of macroinvertebrates (Markham and Knight 2017). Biological differences exist between the western-based stock and other stocks in Lake Erie, and for quota management, the Lake Erie Committee (LEC) recognizes a discrete western basin stock (Markham and Knight

2017). In the central basin, diets of adult yellow perch during the mid- to late 2000s were dominated by the spiny water flea (*Bythotrephes longimanus*) and emerald shiner (*Notropis atherinoides*).

Lake Erie yellow perch populations are strong in the west and central basins, where shallow, warm, and productive waters are prevalent (YPTG 2007). Spawning stocks of yellow perch are well distributed throughout the central basin of Lake Erie and frequently spawn near tributary inlets. The newly hatched fry move far offshore and may be affected by hypoxia and upwellings (Markham and Knight 2017). However, these impacts on feeding, growth, and survival are not well known. Since yellow perch are an abundant, adaptable benthic omnivore, in the eastern basin of Lake Erie they are able to use a wide variety of water temperatures and habitats (Scott and Crossman 1973). The diet of yellow perch changes with size and season. In the late 2000s, there was strong anecdotal information that yellow perch consumed increasing numbers of round goby (*Neogobius melanostomus*) since its invasion in the eastern basin in 2000. In the eastern basin, yellow perch are considered to be one population for assessment and inter-jurisdictional quota management, even though there may be a number of spatially isolated small spawning stocks (YPTG 2007).

Year-class strength of yellow perch can be extremely variable. In Lake Erie over the past three decades, yellow perch have produced a number of strong year classes, the strongest in 1996 and the next in 2003, which was coincidental with a strong year class of walleye. Since 2014, year classes have been relatively strong and important in sustaining an important commercial and recreational fishery (SAI Global 2019).

Recruitment signals, best detected in long-term datasets, emphasize the importance of environmental conditions in relation to recruitment. The yellow perch fishery of Lake Erie has been co-managed by several jurisdictions around Lake Erie since 1984. Zhang et al. (2018) reviewed this intensive fisheries management and concluded that populations such as yellow perch showed minimal negative harvest effects and were more strongly affected by environmental conditions than by exploitation.

Almost all warm- and cool-water predatory fish, including walleye, prey upon yellow perch. Under some conditions, yellow perch may be a primary prey of walleye, and these two percid populations are often tightly coupled (Brown et al. 2009). The interaction has been studied extensively, and an inverse relationship in abundance and biomass has been observed; e.g., Thao et al. (2016). Consistent with the former MSC certification of this species (Intertek 2015), yellow perch in Lake Erie are not considered a key low-trophic-level (LTL) species since it does not meet the criteria for a key LTL as defined by MSC Fisheries Standard v2.01 (MSC 2018).

7.2.2.2 Fishery description

Lake Erie has one of the world's largest freshwater commercial fisheries. Although yellow perch have been exploited in the Great Lakes since the mid- to late 1800s, it was not until successful negotiations and ratification of the Convention of Great Lakes Fisheries in 1954 that there was international co-operation to manage the fishery. The Great Lakes Fishery Commission, (GLFC) established in 1955 by the Convention, coordinated research and assessment and facilitated co-operative fisheries management. Lake committees were established in 1981, and since that time, the Lake Erie Committee and associated task groups have addressed ecosystem and harvest issues. The Yellow Perch Task Group (YPTG) is responsible for population assessment within MUs defined on Lake Erie and annually recommends allowable harvest (RAH) and establishes total allowable catch (TAC) for yellow perch. Lake Erie was divided into four MUs for the purposes of assessment, data collection, population modelling, and quota determination (Figure 1A).

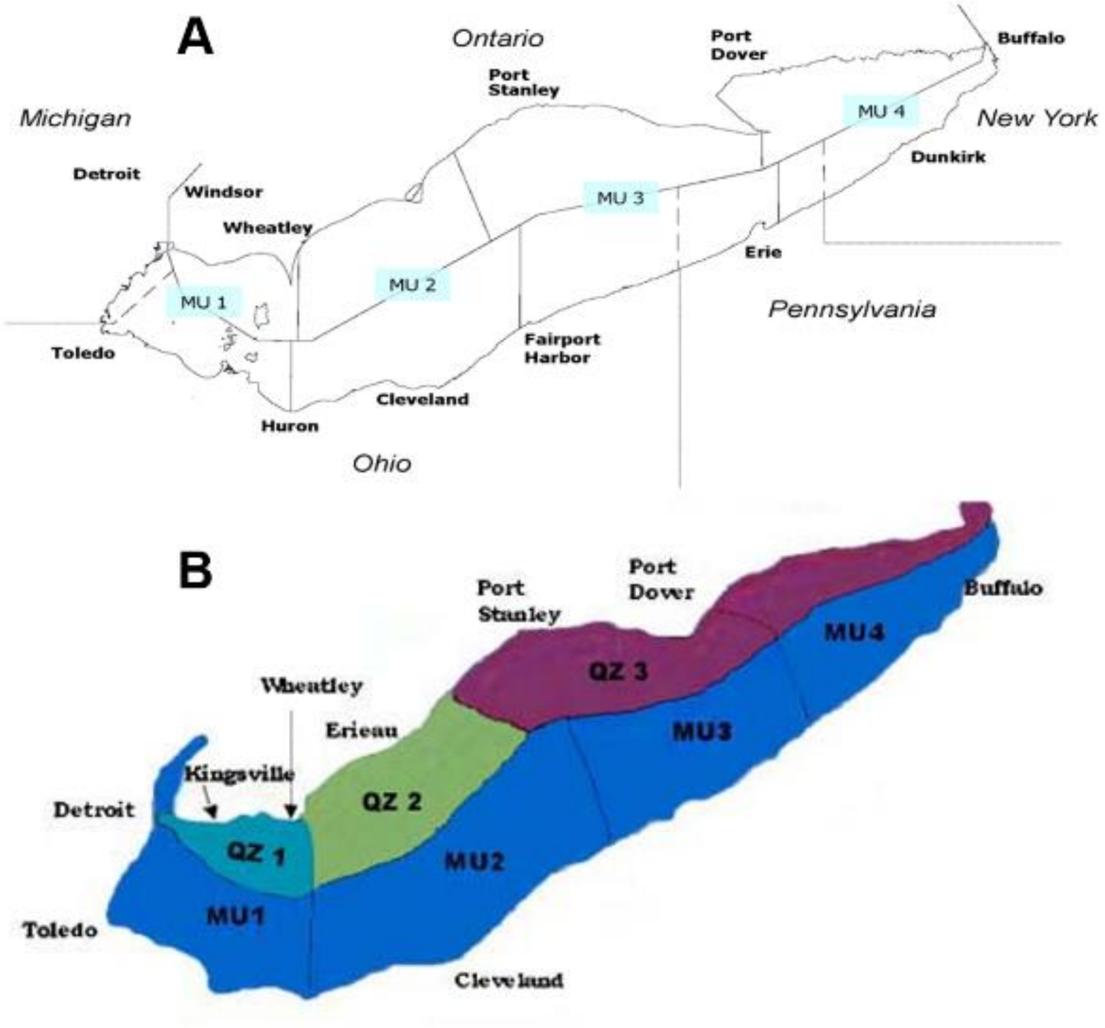


Figure 1. Yellow perch Lake Erie A) management units (MUs) defined by the Yellow Perch Task Group and the Lake Erie Committee and B) quota zones as defined in Canadian waters. MUs 1–4 are under U.S. jurisdiction; QZs 1–3 are under Canadian jurisdiction.

Members of the YPTG from Canada and the United States work co-operatively under the auspices of the GLFC to analyse data through annual surveys to recommend TAC for yellow perch in each of the four units. Following the advice of the YPTG on RAH and stakeholder consultations, annually the LEC announces the TAC for each MU. Jurisdictions within each MU are allocated quota based on an area-based sharing formula. State and provincial agencies have the authority within their jurisdictions to allocate quota among harvesters in the area. Since 1984, the Ontario Ministry of Natural Resources and Forestry (OMNRF) has managed the yellow perch fishery on Lake Erie based on an individual transferrable quota. The GLFC has divided the lake into four MUs for stock assessment purposes and OMNRF has defined three quota zones (QZ) on the lake to which it allocates quota. QZ1 corresponds with boundaries of MU1; similarly QZ2 has boundaries similar to MU2. However, QZ3 combines the quota allocation of MU3 and MU4 (Figure 1B). Yellow perch commercial fishing licences issued by OMNRF on Lake Erie are assigned to one of the three QZs.

In addition to the commercial gill-net fishery in Ontario, yellow perch in Lake Erie are also exploited by other commercial and recreational harvesters in both the United States and Canada. Recreational harvest of yellow perch occurs in all five jurisdictions; however, in comparison to the US, recreational harvest in Ontario is quite small. Gill netting is prohibited in U.S. waters in Lake Erie; however, Ohio supports a commercial yellow perch trap-net fishery and a small-scale commercial fishery exists in Pennsylvania and New York.

Yellow perch populations in Lake Erie have supported a strong fishery since at least 1900. The fishery peaked between 1928 and 1935 and again from the mid-1950s to the mid-1970s (Tavel 2009). The harvest is considerable, as illustrated on a 10-min grid for 2018. Fluctuating year-class strength and reduced recruitment in the 1960s contributed to concerns about the population in the 1970s. Following a period of high abundance in the 1980s, because of poor recruitment and survival yellow perch populations in Lake Erie declined steeply in the 1990s. In the 1990s, Canadian harvest declined from approximately 12 million pounds to 3 million pounds (Tavel 2009). As a result of periodic strong year classes since the mid-1990s, harvest in recent years has increased to 7 to 10 million pounds. As yellow perch stocks recovered in the mid- to late 1990s, the YPTG changed the methodology used to determine RAH to a more conservative approach by altering the fishing mortality calculations regarding age- and gear-specific selectivity to parallel the techniques employed by the Walleye Task Group. The YPTG also introduced a new harvest strategy that incorporated biological reference points, population simulations, and assessment of risk. A draft special management plan implemented from 2000 to 2005 instituted reductions in harvest rates in order to rebuild stocks (see review, Intertek 2015).

Distribution of the harvest in 2018 throughout Lake Erie by 10-min grids emphasizes that current harvest is most intensive in the western and west-central basins and along the north shore (Figure 2). This harvest is associated with three types of fishing effort, also illustrated on a 10-min grid basis, involving the gill-net fishery in Canadian waters (Figure 3A), the trap-net fishery in U.S. waters (Figure 3B), and the sport effort in angler hours (Figure 3C) (YPTG 2019). Yellow perch fishing effort across MUs and gear types has varied considerably over time but, in recent years, has been relatively stable and is appreciably lower in MU4 (Figure 4).

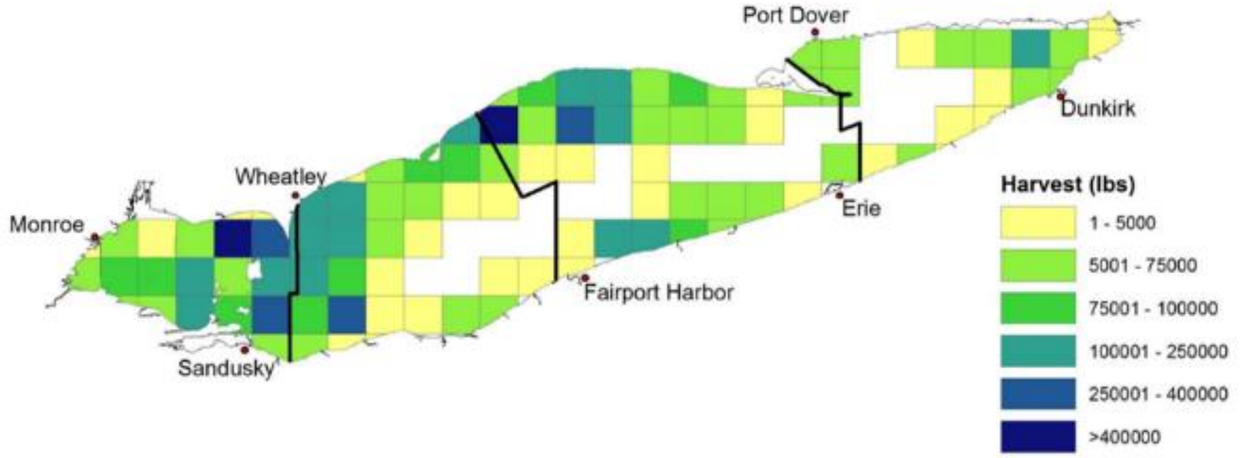


Figure 2. Distribution of yellow perch harvest (pounds) in Lake Erie in 2018 by 10-min grid. From YPTG (2019, Figure 1.5). Dark lines across Lake Erie designate the various basins: from left to right – western, west-central, east-central, and eastern.

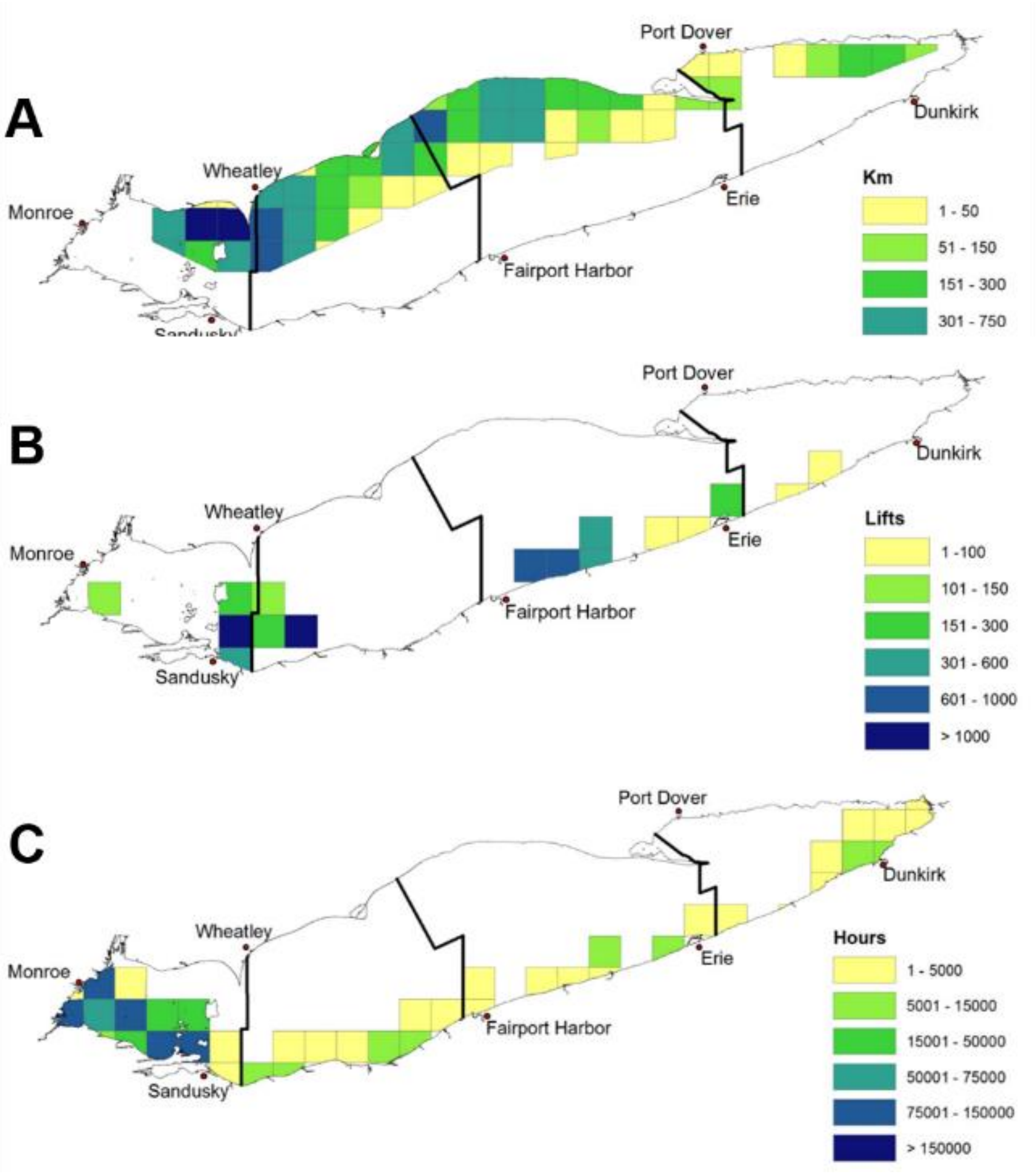


Figure 3. Distribution of fishing effort for yellow perch in Lake Erie in 2018 by 10-min grid for A) fine-mesh gill net (km), B) trap net (lifts), and C) sport fishing (angler-hours). From YPTG (2019, Figures 1.6, 1.7, and 1.8).

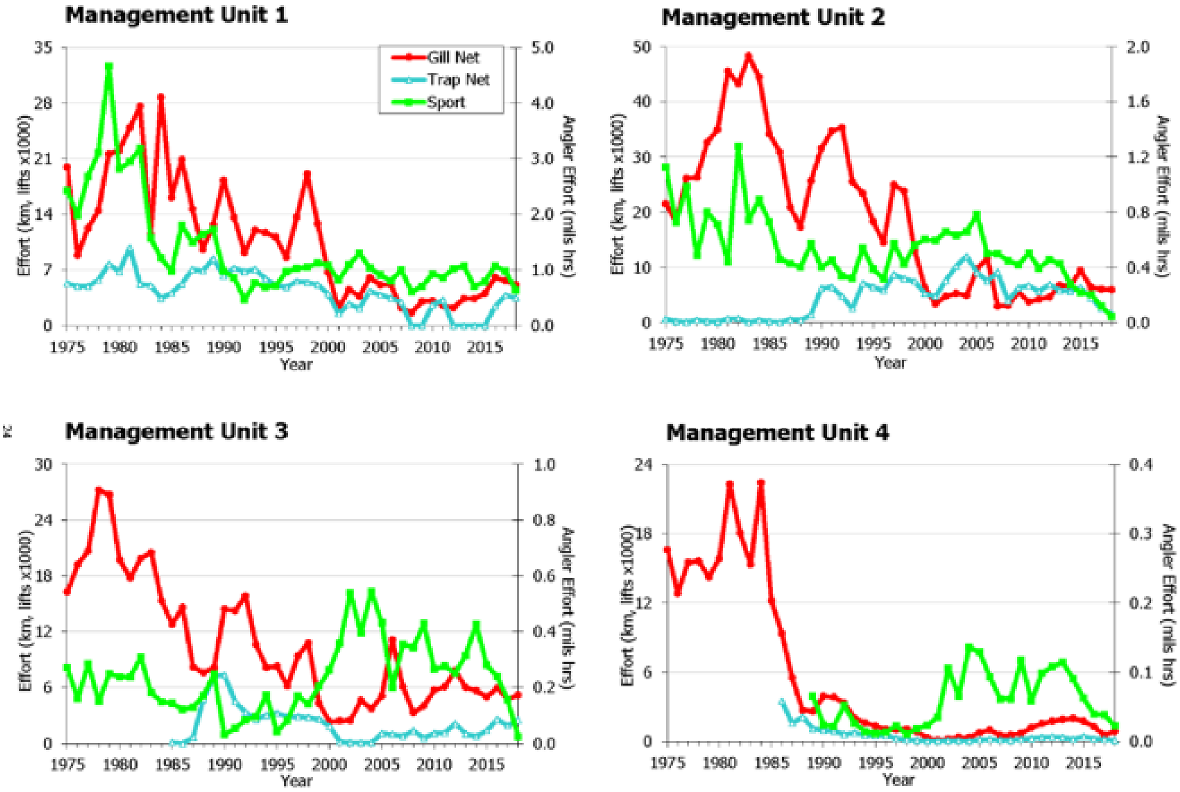


Figure 4. Long-term yellow perch fishing effort by Management Unit and gear type for gill nets (km ×1,000), trap nets (lifts ×1,000), and angling (millions of hours). Gill-net effort is targeted with small mesh (< 3 in.). From YPTG (2019, Figure 1.3).

Age assessment is an important part of yellow perch fisheries management. Female mean age at 50% maturity for MUs 1 to 4 in the early 2000s was 2.9, 2.4, 2.5, and 2.7 years, respectively. Mean age of harvested yellow perch for that decade was 3.9, 3.7, 4.2, and 4.2, respectively (YPTG 2007) In 2018, 51% of the harvest was fish of age 4, with 24% age 3 (Table 7). Mean age of harvested yellow perch for all gears in 2018 for MUs 1 to 4 was 3.7, 3.8, and 2.8, respectively. Overall harvest in MU1 and MU3 was similar, at more than 6 million fish (6.8 and 6.4, respectively), and in MU1 and MU3, 50% and 52%, respectively, of the harvest was age 4. In MU2, approximately 57% was age 4, and harvest compared with MU1 and MU3 was lower, at approximately 4.6 million fish. In MU4, harvest was appreciably lower compared with the other three MUs, at approximately 0.9 million fish. This harvest was considerably younger, with 51% of the fish age 2 and 27% age 3 (Table 7).

Table 7. Age of yellow perch harvested in 2018 by Management Unit and lake-wide totals. Lake-wide harvest by gear type as follows: gill nets accounted for 70.4%, trap nets 18.7%, and recreational harvest 10.9%. Harvest is millions of fish. From YPTG (2019, Table 1.6).

	MU 1		MU 2		MU 3		MU 4		Lake-wide total	
Age	Harvest	%	Harvest	%	Harvest	%	Harvest	%	Harvest	%
1	0.034	0.5	0	0.0	0	0.0	0	0.0	0.034	0.2
2	0.582	8.5	0.241	5.2	0.528	8.2	0.438	50.8	1.790	9.5
3	2.099	30.6	1.221	26.7	0.951	14.8	0.233	27.0	4.504	24.0
4	3.439	50.1	2.632	57.1	3.326	51.8	0.139	16.1	9.536	50.8
5	0.636	9.3	0.224	4.9	0.300	4.7	0.010	1.2	1.170	6.2
6+	0.080	1.6	0.292	6.3	1.320	20.5	0.043	5.0	1.734	9.2
Total	6.871	36.6	4.611	24.6	6.424	34.2	0.863	4.6	18.768	

7.2.2.3 Stock assessment and status

Stock assessment and analysis of the yellow perch population of Lake Erie are derived from several sources, including fishery-dependent and –independent datasets. Several fishery-independent surveys conducted on Lake Erie contribute to the knowledge, understanding, and assessment of fish, including the partnership gill-net index, the western basin interagency trawling index, Long Point Bay index trawl surveys, and the Long Point Bay nearshore fish-community study.

Over time, some changes have been made in the indices that have been used. In 2018 and 2019, the YPTG examined all age 0 and age 1 recruitment indices used in the multi-model inference (MMI) process to improve model stability and transparency. The YPTG determined that some of the indices that had been used in the model should be removed because of potential bias or changes in survey design. Surveys removed from the model included: 1) MU4 Long Point Bay summer gill net age 1 survey. This survey had a change in survey design in 2018 and was no longer a continuous time series. 2) MU2 and MU3, Ohio summer trawl survey age 0 and age 1 were removed because of hypoxia during the survey. A complete list of the surveys that have been excluded along with those that have been included, is detailed in the YPTG 2019 report (YPTG 2019, Appendix Table 4). Indices have been added; for example, in 2018, the New York gill net age 1 recruitment index was added to the MU4 model. Additional central basin recruitment indices were examined but not included at that time (YPTG 2018). In 2019, 19 were used in the multi-model inference process, and it is planned that they be used for the next 5 years or until further assessment research is conducted. These indices are well defined in the 2019 WPTG report (YPTG 2019, Appendix Table 4). For more assessment details, see Yellow Perch Management Plan (draft) 2007, Lake Erie Yellow Perch Gillnet Fishery Pre-Assessment Report (Tavel 2009) and current MSC Certification Report (Intertek 2015).

The partnership gill-net index is a co-operative fisheries assessment program conducted jointly between the Ontario Commercial Fisheries Association (OCFA) and the OMNRF. The program, which has been in place since 1989, and monitors abundance, size, and species composition throughout Lake Erie. Information collected is applied in catch-at-age analyses to estimate population abundance for not only yellow perch but also walleye (OMNR 2008). Until 1997, the index gill-net survey was conducted by volunteer commercial fishers with onboard OMNR industry-selected technicians, who maintained the sampling protocol. However, since 1997, the surveys have been conducted by OCFA/OMNR selected technicians deployed on contract vessels.

The protocol has been for the gill-net index program to be conducted from August to November. For effort, netting details, and other sampling particulars for each MU, see the 2019 YPTG report (YPTG 2019b, Appendix Table 4). All fish caught during the survey are identified, counted, and weighed on bulk basis by species and mesh size. Biological sampling for selected species includes length, weight, sex, maturity status, gonad weight, and collection of age assessment structures. Survey results include total catch, mean species biomass, and age-specific information for yellow perch (OMNR 2008, OMNRF 2016).

The OMNRF has been involved in conducting interagency trawl surveys in the western basin (MU1) since 1987 and in the eastern basin (MU4) since 1980 (see MU locations, Figure 1). The trawl index, a co-operative initiative between Ontario and Ohio, is used to assess year-class strength of species based on catches of young-of-the-year and older yellow perch. Data collected by the surveys are used by the Lake Erie Task Group to project abundance of 2-year-old yellow perch to be recruited into the fishery. The trawl index contributes knowledge of species composition, forage abundance, and growth trends. In addition, yellow perch are subsampled for age interpretation (OMNR 2008).

Annual surveys are conducted in Long Point Bay. Composite indices are acquired that provide complete indicators of the status of age 0 and 1 yellow perch in the bay. These indices encompass all depth strata and have broad spatial coverage. (YPTG 2019b). The surveys, which extend from 1986 to the present, also provide trends in abundance, biomass, and growth of yellow perch.

In addition to the fishery-independent data, fishery-dependent data is collected from logbooks maintained by licence holders and data contained in daily catch reports. The daily catch reports (DCR) are completed and submitted prior to any off-load. DCRs contain landing information (time, date, port, QZ, etc.). Estimates of weight of each species landed, effort details (gear type, target species, as well as duration and length of the set), along with an estimate of the quantity of species discarded or released. Weights recorded on the DCR are verified by weight observer or port officer records.

In addition to fishery-dependent data for the candidate fishery, recreational harvesters participate in a daily log program. Sport fishers record catch and effort data over the course of the season on all species. The recreational program has been in place for 24 years, contributing to the information available on yellow perch that can be used in stock assessment. Creel surveys are also conducted.

The Yellow Perch Task Group stock assessment rely on these fishery-dependent and -independent survey data collected by all management jurisdictions and for each of the four MUs on Lake Erie. Each MU is modelled separately since physical, biological, and environmental characteristics of the various MUs are difference and therefore may have productivity thresholds, rate of harvest, and survivability targets. Recommended allowable harvest (RAH) estimates are generated for each MU, and results are presented to the Lake Erie Committee (LEC) for a final decision regarding the total allowable catch (TAC).

The stock assessment information is documented in the YPTG reports and is briefly described here. On an annual basis, population size for each MU is estimated through catch-at-age analysis using the Auto Differentiation Model Builder (ADMB) computer program with the Ontario commercial selectivity index version, which incorporates commercial gill-net catchability coefficients based on seasonal distribution of harvest and relative catch rates. The model builder program has been used by the YPTG since 2002 (YPTG 2007).

Management considers age 2 as the year of first recruitment into the fishery (Tavel 2009). Age 2 yellow perch recruitment is predicted by linear regression of juvenile trawl indices against catch-at-age analysis estimates of 2-year-old abundance for each MU.

Stock estimates are projected from catch-at-age analysis estimates of population size and age-specific survival rates from the previous year. Projected age 2 yellow perch recruitment is added to the population estimate for older fish in each unit in order to produce the total standing stock.

Long-term standardized recruitment indices for Lake Erie perch are associated with the interagency trawling of western Lake Erie (YPTG 2019b, Appendix Table 4, index codes 00S10 and 00S11) and provide important insights of the status of the yellow perch population. The 31-year (1998–2018) young-of-the-year catch index provided by Ontario and Ohio indicates that from 2014 to 2018, yellow perch young-of-the-year recruitment has been relatively strong (Figure 5). The strongest recruitment for the period occurred in 1996, higher than 2003, while the 2018 year class was the third strongest for the period. If mortality of the 2018 year class remains low, it may be important in building and sustaining the yellow perch population and fishery (SAI Global 2019). The values for this index are provided in Appendix 1.

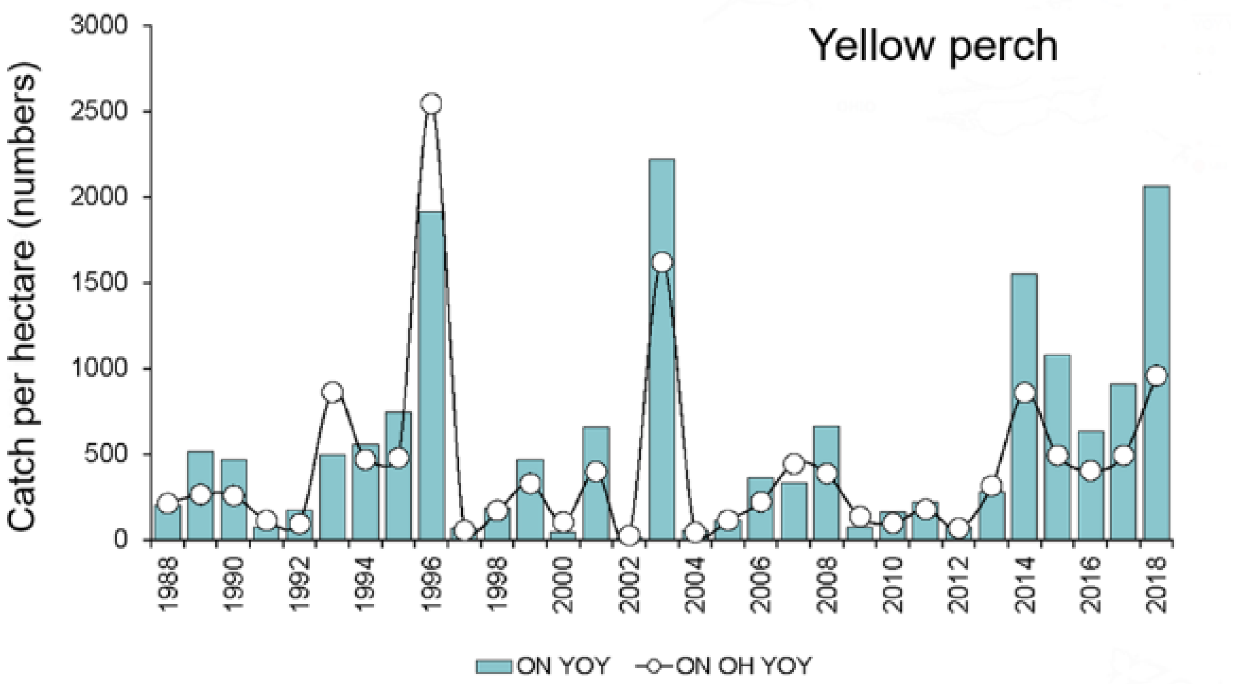


Figure 5. Number of young-of-the-year yellow perch caught per hectare during interagency trawling (1988–2018) in western Lake Erie. Young-of-the-year catches are provided for Ontario and Ohio, with data from Lake Erie Management Unit, Draft Annual Report 2018 and illustrated from OCFA Annual Convention 2019, OMNRF PowerPoint slide deck.

The long-term yellow perch population estimates by MU (Figure 1) indicate that the populations are strong, providing sustainable yellow perch fisheries. Estimates of the number of age 2, as well as age 3 and older, yellow perch in MU1 indicate that since 1975, yellow perch were most abundant in MU1 from the mid-1970s to the late 1980s (Figure 6A). The population was especially low in the early 1990s and the mid-2010s, particularly in 2014 and 2015. In more recent years, abundance has been moderately high but have declined slightly in the past 2 to 3 years (Figure 6A). In MU2, yellow perch were most abundant in the mid- to late 2000s and at moderate and consistent levels over the past decade. There is some evidence of slight declines in the past 3 to 4 years (Figure 7A). In MU3, yellow perch were most abundant in the late 2000s, similar to MU2 (Figure 8A). In recent years, yellow perch in MU3 have been quite abundant and stable. Yellow perch are not as abundant in MU4 as in the other MUs (Figure 9A). Considering this 4½-decade period from 1975 to the present, yellow perch abundance in MU4 has been quite variable but most consistent during the 2000s. Yellow perch in this MU have increased markedly in the past few years.

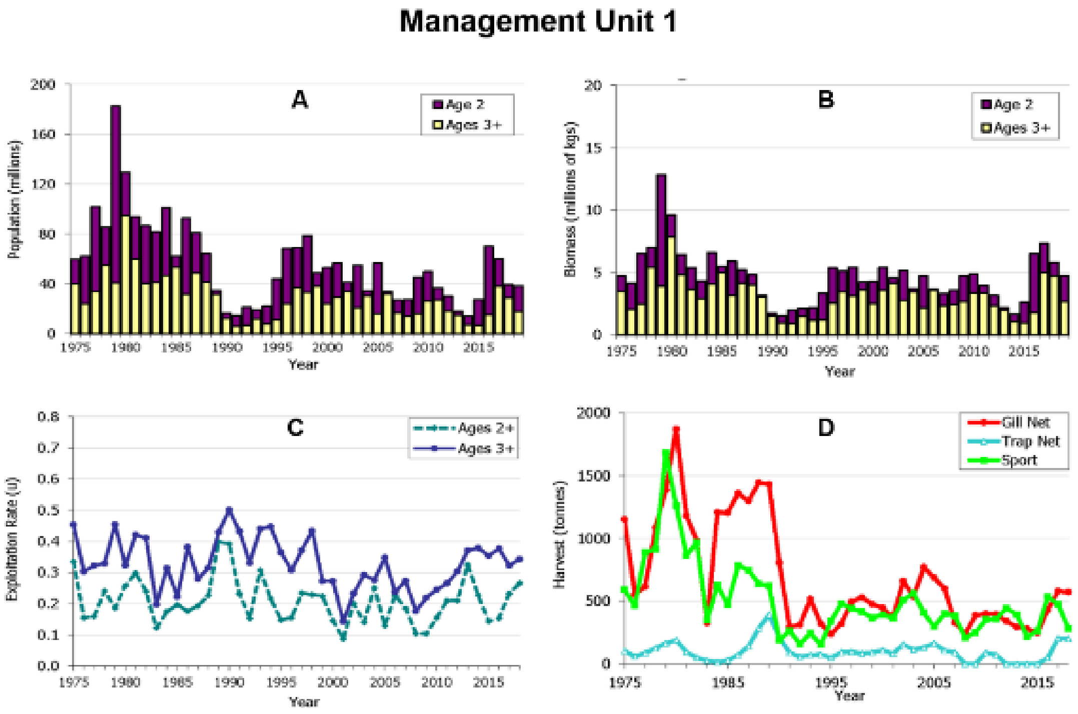


Figure 6. Yellow perch Management Unit 1 population (numbers and biomass), exploitation, and harvest rate from 1975 to the present: A) population estimates (numbers of fish) for age 2 (dark bars) and age 3 and older (light bars) for the PR ADBM model (to 2019), B) biomass estimates (millions of kg) for age 2 (dark bars) and age 3 and older (light bars) for the PR ADBM model (to 2019), C) exploitation rates for age 2 and older (dashed line) and age 3 and older (solid line) (to 2018), and D) harvest (tonnes) by gear type (to 2018). Assembled from YPTG (2019, Figures 1.2, 1.9, 1.10, and 1.12).

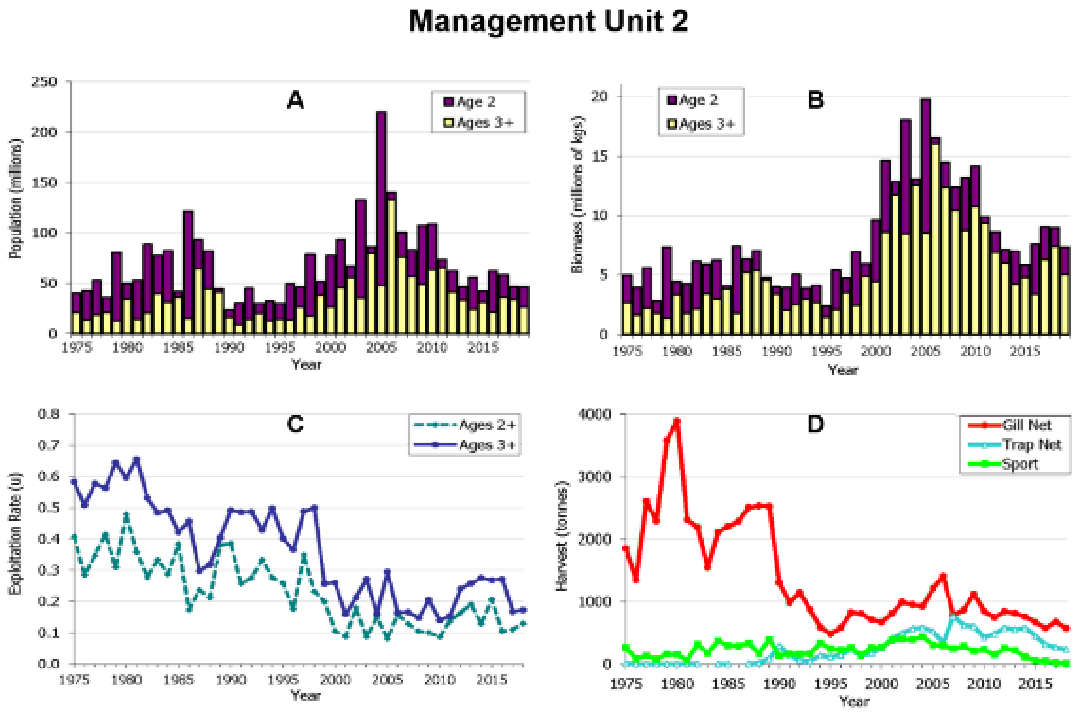


Figure 7. Yellow perch Management Unit 2 population (numbers and biomass), exploitation, and harvest rate from 1975 to the present: A) population estimates for age 2 (dark bars) and age 3 and older (light bars) for the PR ADBM model (to 2019), B) biomass estimates for age 2 (dark bars) and age 3 and older (light bars) for the PR ADBM model (to 2019), C) exploitation rates for age 2 and older (dashed line) and age 3 and older (solid line) (to 2018), and D) harvest by gear type (to 2018). From YPTG (2019) as in Figure 5.

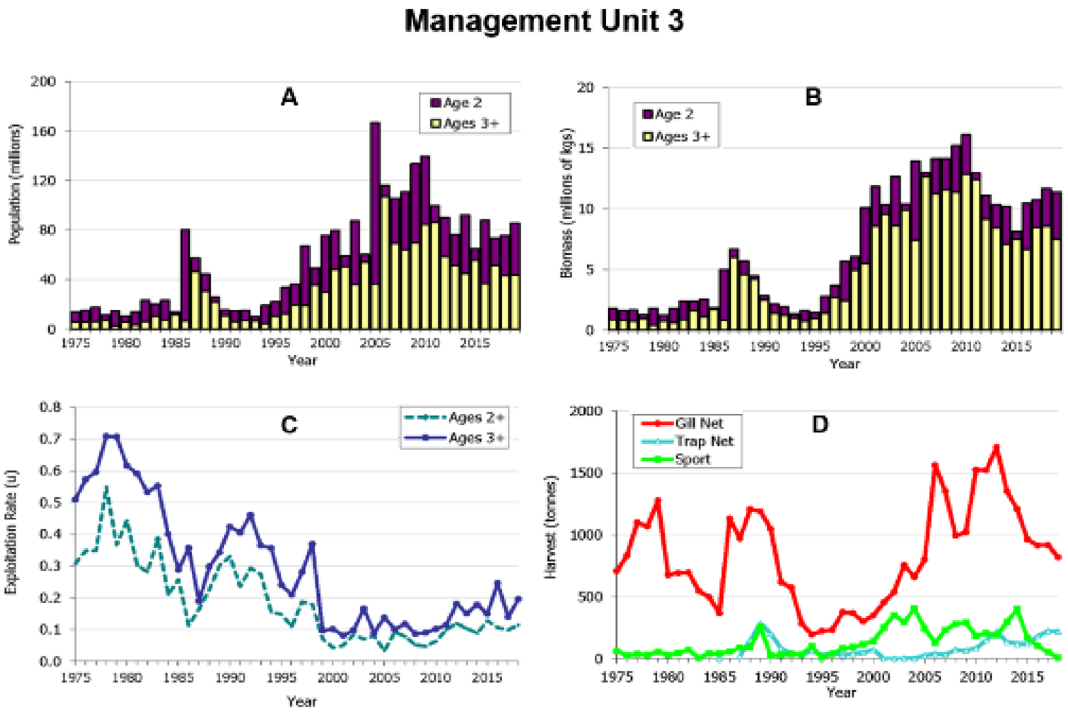


Figure 8. Yellow perch Management Unit 3 population (numbers and biomass), exploitation, and harvest rate from 1975 to the present: A) population estimates for age 2 (dark bars) and age 3 and older (light bars) for the PR ADBM model (to 2019), B) biomass estimates for age 2 (dark bars) and age 3 and older (light bars) for the PR ADBM model (to 2019), C) exploitation rates for age 2 and older (dashed line) and age 3 and older (solid line) (to 2018), and D) harvest by gear type (to 2018). From YPTG (2019) as in Figure 5.

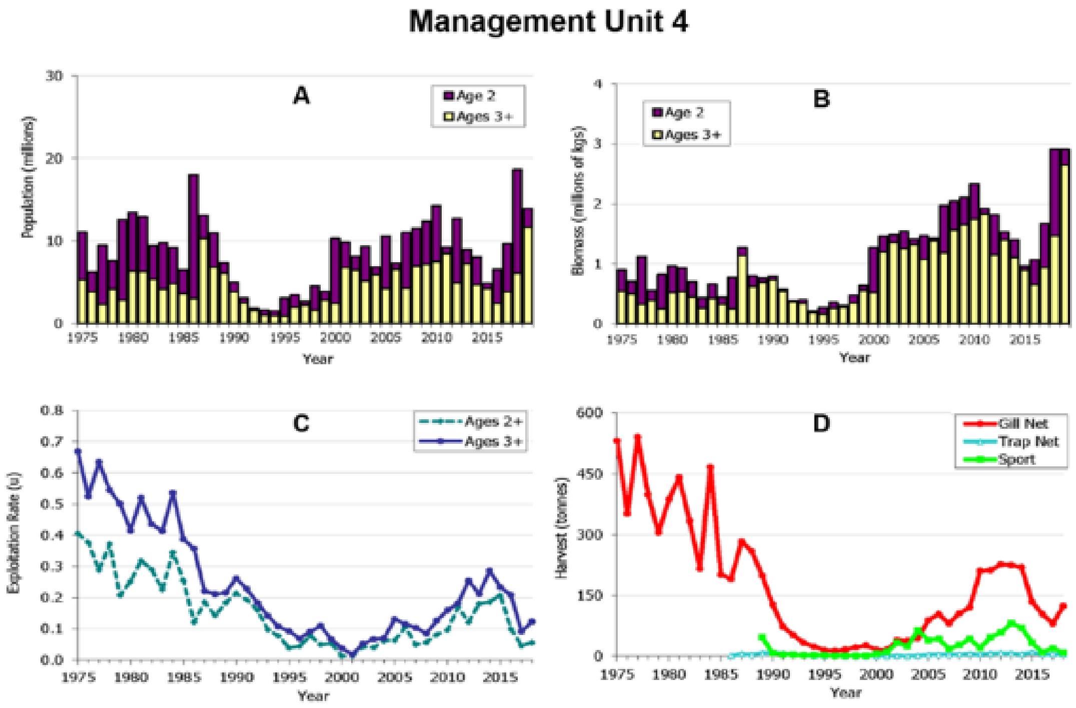


Figure 9. Yellow perch Management Unit 4 population (numbers and biomass), exploitation, and harvest rate from 1975 to the present: A) population estimates for age 2 (dark bars) and age 3 and older (light bars) for the PR ADBM model (to 2019), B) biomass estimates for age 2 (dark bars) and age 3 and older (light bars) for the PR ADBM model (to 2019), C) exploitation rates for age 2 and older (dashed line) and age 3 and older (solid line) (to 2018), and D) harvest by gear type (to 2018). From YPTG (2019) as in Figure 5.

Annually the yellow perch Task Group estimates population biomass from population numbers for each of the MUs. The Task Group routinely updates the yellow perch growth data, considering weight-at-age values recorded annually in the harvest data and length- and weight-at-age values taken from the interagency and gill-net surveys. These are used to calculate population biomass for each MU and to forecast harvest for the upcoming year. Therefore, changes in weight at age are reflected in the overall population biomass and determination of the RAH.

Long-term yellow perch biomass for age 2, as well as age 3 and older fish, provides valuable insights concerning yellow perch status in Lake Erie and especially pertaining to the spawning stock. In all four MUs, the biomass of age 2 and age 3 and older yellow perch has been relatively strong in recent years. In MU1, biomasses in the past 3 to 4 years have been greater than seen since before the 1990s but are showing some very recent declines (Figure 6B). In MU2, biomasses in the past few years have been moderately strong but not as great as during the 2000s (Figure 7B). In MU3, recent biomasses are high compared with high levels seen in the 2000s (Figure 8B) and have remained similarly high for the past 3 to 4 years. In MU4, biomass trends over the past 4½ decades of age 2 walleye, as well as age 3 and older, are somewhat similar to MU2 and MU3. However, yellow perch biomasses in the past few years are quite different and have increased to levels not seen since the mid-1970s (Figure 9B).

7.2.2.4 Harvest strategy, control rules, and reference points

The harvest strategy is composed of linked harvest control rules, as well as tools including regulations, monitoring, and assessment methods to ensure that the management objectives are achieved. This section considers the general strategy control rules and reference points. Monitoring and specifics associated with yellow perch assessment were presented in the previous section on Assessment and Status. In 2005, the YPTG was charged with preparing a draft management plan. Its completion depended upon resolving assessment model issues while establishing population objectives and depended upon a final model configuration and risk outcomes using endorsed data-weighting approaches. A draft Yellow Perch Management Plan (YPTG 2007) was developed that had an exploitation-policy-setting framework designed to achieve four basic outcomes: 1) ensure the sustainability of yellow perch populations; 2) help sustain populations within maintenance thresholds set by LEC; 3) allow user groups to benefit fully from large, sustainable yellow perch populations; and 4) be straightforward so that implementation would be simple to understand and could rely on all stock-status information, as well as incorporate socio-economic information. The yellow perch exploitation policies would apply to each MU, similar to those described for walleye in the 2005 Walleye Management Plan (Locke et al. 2005), and depending on abundance estimate for the MU, exploitation rate would vary. This approach is best described as a sliding scale where populations at lower abundance experience lower exploitation rates than those at higher abundance. A framework was developed that would dictate the exploitation policy (exploitation or fishing rate) to be used at any given population abundance. The scenarios tested included fishing rates for F at preservation, a transition F for rehabilitation, and F at maintenance. Each of these scenarios was tested for each MU (YPTG 2007, Table 3.5.2).

In 2009, a technical review of the exploitation strategies and harvest policies by the Quantitative Fisheries Center at Michigan State University indicated that additional time was required to carry out a thorough review of the harvest strategies and thresholds. Since then, the primary objective of the fishery on each stock has been to maintain F at or below a target level. From 1992 to 2001, the target F was based on $F_{0.1}$. In 2005–2006, the YPTG was charged with reviewing the methodology of assigning weighting factors to data sources in the catch-at-age models. The LEC directed YPTG to provide a single yield strategy for MUs 1 to 3 based on the $F_{0.1}$ spawner recruit (Intertek 2015). These rates were used to recommend harvest levels until 2010, at which time, based on a simulation study, the 50%F_{msy} target F was adopted and has been used since.

Harvest control rules are the rules and associated actions that management takes in response to changes in the fishery and the stock. It is the design of the HCR and control of harvest that are of interest. The intention is to ensure that the stock is kept above the limit reference point (LRP) and attempts to maintain the stock at the desired target reference point (TRP) level. The current HCRs consist of estimates of stock size at the beginning of the assessment (current) year being projected forward one year until a 50%F_{msy} ($F_{0.1}$ prior to 2010) target harvest rate, assuming a range (± one standard deviation of the mean) of the current year stock sizes. The product of selectivity estimates used in the assessment models and the target fishing rate determine the age-specific target instantaneous fishing mortality rates used to measure the minimum, mean, and maximum recommended allowable harvest. The LEC then determines the TAC by consensus.

The fishing rates that were recommended after 2005 were somewhat different. These new harvest strategies were part of the new YPMP (YPTG 2010) and were determined by using an updated yellow perch simulation (YPTG 2010, see stock recruitment simulation). The yellow perch simulations determined that target fishing rates half of the F_{msy} could support viable sport and commercial fisheries without creating excessive biological risk. The target fishing rates in MUs 1 to 3 were 50%F_{msy} – 0.67, 0.67, and 0.70, respectively. In MU4, a conservative fishing rate of 0.30 was chosen as a target rate. It was planned that these fishing rates would continue to form the basis of the exploitation strategy for each MU and would be maximum fishing rates used in the exploitation policy. However, explicit and well-defined fishing targets when yellow perch abundance is below maintenance levels had not been established. The YPTG discussed a range of harvest strategies and stock limit reference points. It appeared that a well-defined harvest control rule would reduce F as stock abundance declined and approached the limit reference point. Limit reference points were not in place and created a condition on the initial MSC certification of yellow perch in Lake Erie (Intertek 2015, conditions YP1 and YP2).

As indicated in the original MSC certification of the Lake Erie multispecies commercial fishery, over the years a number of potential reference points (RP) were discussed to guide management of the fishery. For instance, the YPMP (2007) described RPs based on Schaefer production models. These models indicated long-term yellow perch productivity changes by MU. Reference points (e.g., K, F_{msy}, MSY, r) were reported for these models, although they were not used as the basis for management. During 1992 to 2001, the main reference point used to inform management decisions was the target F_{OPT} based on $F_{0.1}$. The YPTG used a simulation to derive $F_{0.1}$ and describe the risk associated with various levels of F. $F_{0.1}$ was based on the ratio of average yield to average recruitment plotted against fishing rates in simulations that assumed a gamma stock-recruitment (S/R) relationship between 1975–2003 stock and recruitment estimates (YPTG 2007). In 2001, an independent review (Myers and Bence 2001) identified issues with the $F_{0.1}$ implementation. For instance, a key part of the process had been the determination of the fishery age-specific selectivity pattern during the current year based on the weighted (by fleet share) average of the assessed selectivity patterns. This resulted in the overall fishery's full selection being less than one, which was inconsistent with the assumptions made in the determination of $F_{0.1}$. In response, during 2001 to 2004, the YPTG modified the estimation of $F_{0.1}$ and examined several alternative harvest strategies.

In 2010, YPTG used an updated yellow perch simulation, which employed a Ricker rather than the gamma (to reduce the number of model parameters) stock-recruit relationship to evaluate alternative HS involving fishing rates associated with MSY (F_{msy}) and fractions of F_{MSY} (i.e. 50%F_{msy}). The 2010 simulations applied to populations in each MU allowed the YPTG to quantify risk associated with various harvest rates while giving consideration to stock-recruitment patterns and environmental influences experienced by yellow perch during recent decades. These simulations determined that harvest rates that were 50% of F_{msy} could support viable sport and commercial fisheries without inviting excessive biological risk. Specifically, exploiting the stocks at 50%F_{msy} was, over the long term, expected to maintain the four stocks at their maintenance and above their preservation levels. Since 2010, these target harvest rates were applied to the current population estimates and their standard errors were used to determine minimum, mean, and maximum RAH for each MU. The 50%F_{msy} management targets for MUs 1–3 (lower in MU4), along with the previous $F_{0.1}$ estimates for MUs 1–4 were as follows: for $F_{0.1}$ 2005 to 2009 – 0.720, 0.661, 0.703, and 0.230, respectively and for 50%F_{msy} 2010 to 2014 – 0.67, 0.67, 0.70, and 0.30, respectively. These original and newer target harvest rates were similar, implying that consistent fishing mortality reference points have been used to support the management objectives from 2005 up to time of the initial MSC certification (Intertek 2015). The lower harvest rate management targets for MU4 are based upon the perceived need for greater conservation given its likely sub-stock structure (Myers and Bence 2001).

MSC certification stipulates that where neither B_{msy} nor B_{limit} are analytically determined, MSC defaults of LRP = B_{limit} = 20%SSB_0 and TRP = B_{msy} = 40%SSB_0 can be used. The simulations conducted by the YPTG in 2010 (YPTG 2010) used to determine the 50%F_{msy} fishing mortality reference point explicitly identified an estimate of the SSB_0. For these MSC defaults of LRP and TRP by MU, see the initial MSC certification (Intertek 2015, Table 9); they will be provided subsequently. As noted above, explicit estimates of SSB_{msy} for each MU are not used in the management of the fishery, nor were they explicitly identified in the simulation files (YPTG 2010). The intention of the MSC certification is to evaluate whether or not SSB is at or above a target level consistent with SSB_{msy}. As indicated in the original certification (Intertek 2015), at that time, SSB in MU1 was close to the MSC default TRP. It was considered useful to use information provided in the 2010 YPG simulations to provide an additional estimate of an SSB level that would be consistent with SSB_{msy}. Using the input assumptions (e.g., natural mortality, recruitment, etc.) present in the files, the simulation for MU1 was run by the assessment team, using twice the target management F as an estimate of F_{msy}. This provided an SSB_{msy} of 34.8% of SSB_0, which was comparable to the MSC default of 40% SSB_0 (Intertek 2015). The estimate and the MSC default of 40%SSB_0 provide a range of SSB consistent with SSB_{msy} (Intertek 2015).

In the original MSC certification, the harvest control rules did not employ either an explicit target or limit biomass reference point in the annual estimation of RAH by MU (Intertek 2015). But the LEC (2007) and YPTG (2010) referred to the probability of attaining low levels of abundance comparable to those observed during 1993–94, implying that these have been examined as potential estimates of an LRP. These were the observed lowest levels of SSB in the four MUs. However, these had not been formally implemented in management. On the other hand, 50% F_{msy} was used as the management target harvest rate, implying a target stock biomass of at least B_{msy}. Since neither B_{msy} nor B_{limit} are analytically determined, MSC defaults of TRP = SSB_{msy} = 40%SSB_0 and LRP = SSB_{limit} = 20%SSB_0 were used (Intertek 2015). The 2010 YPTG simulations used to determine the 50%F_{msy} fishing mortality reference point explicitly identified an estimate of the SSB_0 for the four MUs. Intertek in 2015 used the MSC defaults of TRP = 40%SSB_0 and LRP = 20%SSB_0 estimated from SSB_0 for MUs 1–4 of 5.485, 8.414, 4.828, and 1.197, respectively, providing the following: LRP – 1.097, 1.683, 0.966, and 0.239, respectively; and TRP – 2.194, 3.366, 1.931, and 0.479, respectively. Since explicit estimates of SSB_{msy} for each MU were not used to manage the fishery and were not explicitly identified in the 2010 YPTG simulation files, conditions were placed on the original MSC certification of the yellow perch fishery (Intertek 2015, conditions YP1 and YP2).

As will be discussed subsequently, condition YP1 was satisfied and closed in the third surveillance audit (Hough et al. 2019) when analytically based limit reference points were developed and new harvest policies for yellow perch announced (YPTG 2019a). In 2019, the associated condition YP2 was satisfied and removed when these new harvest policies and control rules were applied to the Lake Erie yellow perch fishery as stipulated in that condition (SAI Global 2019).

To develop a new revised YPMP, the LEC, STC, QFC, and stakeholder groups from all Lake Erie jurisdictions formed the Lake Erie Percid Management Advisory Group (LEPMAG) to address stakeholder objectives, modelling concerns, and exploitation policies for Lake Erie percids. The LEPMAG was formed in 2011 and, in 2012, began discussions on stakeholders' objectives and catch-at-age modelling concerns for yellow perch. The LEPMAG began a review of existing YPTG models, which resulted in the development of what became known as the YPTG model. Population size for each management unit is estimated by statistical catch-at-age analysis (SCAA) using the Auto Differentiation Model Builder (ADMB) computer program. The YPTG model uses harvest and effort data from commercial gill-net, commercial trap-net, and recreational fisheries. Survey catch at age for age 2 and older fish from gill-net and trawl surveys are also included. The YPTG model incorporates commercial gill-net selectivity derived from index gill-net data, involving back-calculation of length at age and weightings based on monthly distribution of harvest at age. The Ontario Partnership gill-net index catch rates are adjusted for selectivity bias associated with mesh size configuration with an assumed selectivity of 1 for all age groups. Commercial gill-net catchability coefficients based on seasonal distribution of harvest and relative catch rates are also used. The YPTG model uses catchability blocks for each type of harvest gear and constant catchability for surveys.

In 2014, a technical review committee was engaged to review potential modifications to the yellow perch assessment model. The proposed changes included model estimated selectivities, constrained random walk catchability, commercial selectively time blocks, catchability connection to account for breaks in time series in MU3 and MU4 (Ontario survey), multidistribution for age composition data, and the inclusion of additional datasets in the model. Additional suggested modifications included incorporating sexual dimorphism in the model and expanding the number of age groups. These suggestions were to be evaluated during subsequent years (YPTG 2016).

In 2015, the LEPMAG, facilitated by the QFC, began to address issues raised concerning the YPTG assessment model. The QFC provided for the LEGMAG a preliminary length/sex-based SCAA model designed to account for sexual dimorphism in growth. After diagnostic analysis and revision, an updated YPTG model incorporated a subset of changes similar to those made to the Walleye Task Group model. The QFC presented to the LEPMAG a simulation model designed to examine the potential management importance of using a sex-specific assessment model.

In 2016, the QFC and LEPMAG worked on developing the new statistical catch-at-age model, the Peterson-Reilly model or PR model. The development model has been under various stages of development since 2014 (YPTG 2017). In 2016, the QFC added age 0 and age 1 recruitment survey data to the model. In many ways, the PR model is similar to the earlier YPTG model but with the inclusion of recruitment data.

The PR model, currently being used, uses the same data sources as the YPTG model, with the addition of age 0 and age 1 recruitment data (YPTG 2018). The PR model estimates selectivity for all ages in the fishery and surveys. Since survey selectivities are estimated in this model, Ontario Partnership catch rates are not adjusted for selectivity bias. Catchabilities for all fisheries and surveys vary as a random walk. The model is fit to total catch and proportions at age (multinomial age composition) as separate datasets. The PR model is run as a three-step process. In the first step, an ADMB model without recruitment data is run iteratively until the maximum effective sample size for the multinomial age composition stabilizes and does not change by more than 1 or 2 units. Second, age-2 abundance estimates from the first model are added to age 0 and age 1 recruitment data in a multi-model inference (MMI) R-based model to determine parameters for estimating recruitment. Surveys are not weighted equally in the models; the surveys that are more highly correlated with ADMB age-2 estimates are weighted more heavily and have greater influence on the recruitment predictions. In the third step, the age 0 and age 1 recruitment data are added to the ADMB model along with the MMI coefficients from step two. This allows the model to estimate age 2 recruitment for each year class available in the recruitment data and adds this as a dataset in the objective function. This model is then run iteratively until the maximum effective sample size for the multinomial age composition stabilizes.

The YPTG used the YPTG model to make recommendations in 2017 and 2018 (YPTG 2017, 2018), and the PR model was used in 2019. The task group previously discussed the merits of using the PR model relative to the YPTG model in terms of model fit and performance presented at LEPMAG meetings, and while the task group generally felt the PR model provided advantages relative to the YPTG models, a formal harvest policy risk assessment, management strategy evaluation, had yet to be completed using the PR models (YPTG 2017). This was conducted during 2018–2019 and is an important part of the development of the new YPMP. Application of the PR model is an integral part of the current draft YPMP, which is now undergoing review. Adoption of the draft YPMP is to be considered by the LEPMAG during an upcoming webinar.

Spawning stock biomass (SSB) trends over time provide important indicators of the status of the yellow perch populations in the four MUs. The spawning biomass of MU1 was above the MSC default target reference point (TRP) of 40%SSB_0 during the late 1990s to early 2000s. It then declined and averaged about 90% of the TRP during 2007 to 2011 (about one generation, or 5.5 years) before dropping to 80% of the default TRP in 2012 (Intertek 2015). In comparison to an estimate of SSB_{msy} from the 2010 YPTG simulation study, during 2007 to 2012, SSB averaged about 101% of SSB_{msy}. The 2015 assessment indicated no change in age 3+ biomass in 2013, a modest decline in 2014, and stability in 2015. Further, since 2007, fishing mortality had been significantly below the 50%F_{msy} target, and certainly well below F_{msy} since the mid-1990s, implying that SSB should increase in response to a relatively conservative harvest rate. These observations suggest that SSB in MU1 up to the mid-2010s was at a level consistent with SSB_{msy}. Based upon the assessment-model-derived annual estimates of uncertainty (Delta method) in the SSB, the probability was that SSB was above the MSC default limit reference point (LRP) and averaged about 97% during 2007 to 2012 (Intertek 2015). The fluctuations in SSB were primarily due to pulses of incoming recruitment although there has also been a long-term decline in fishing mortality (F), which had been significantly below the 50%F_{msy} management target in the mid-2010s. In MU2, SSB was likely at 20%SSB_0 until the late 1990s and had been more than double the MSC default TRP (40%SSB_0) up to the early 2010s. The fluctuations in SSB were primarily due to pulses of incoming recruitment although there was also a long-term decline in F, which in 2012 was below the 50%F_{msy} management target. In MU3, SSB was likely at 20%SSB_0 until the late 1990s and had been over three times the MSC default TRP (40%SSB_0) up to the mid-2010s. In MU4, SSB was below 20%SSB_0 until the late 1990s and was well above the MSC default TRP (40%SSB_0) up to the time of additional certification (Intertek 2015). The fluctuations in SSB were due both to pulses of incoming recruitment and a long-term decline in F, which in the early 2010s was below the 50%F_{msy} management target.

The YPTG model was used up to and including 2017, and results were compared between the two models relating to retrospectivity, standard errors, and sensitivity to natural mortality and data weightings. It was decided to retain one model for MU4 because of wide errors bounds on the separate models, and the merits of the PR model were reviewed. The PR model provided similar abundance estimates, and the general opinion was that the PR model provided advantages relative to the YPTG model but a management strategy evaluation had yet to be completed. In 2017, LEPMAG discussed stakeholder objectives and began work on a management-strategy evaluation to assess current and alternative harvest strategies for the PR model.

In 2018, the YPTG used the two models as part of the ongoing LEPMAG review of yellow perch management. The YPTG again recommended using the YPTG model in 2018 for their recommendations. Use of the PR model depended upon a formal polity risk assessment, which had yet to be completed. The PR model is sensitive to recruitment data, and different recruitment surveys may be selected each year during the MMI process, leading to instability in abundance estimates. Additional concerns existed when running the MU3 PR model because the maximum effective sample size for the multinomial age composition would not converge after several model runs. The fishing rates applied to abundance estimates from the PR model were the same as those used for the YPTG model (fishing rates MUs1–4, 0.67, 0.67, 0.70, and 0.30, respectively) primarily because a formal risk assessment and related new harvest policy had not been developed for the PR model.

In 2018 and 2019, the YPTG examined all age 0 and age 1 recruitment indices used in the MMI model to improve model stability and transparency. The YPTG determined that some of the indices that had been used in the model should be removed because of potential bias or changes in survey design. Surveys removed from the model included: 1) MU4 Long Point Bay summer gill net age 1 survey; this survey had a change in survey design in 2018 and was no longer a continuous time series; 2) MU2 and MU3, Ohio summer trawl survey age 0 and age 1 were removed because of hypoxia during the survey. A complete list of the surveys that were included, along with those that have been excluded, is detailed in the YPTG 2019 report (YPTG 2019, Appendix Table 4). Indices have been added; for example, in 2018, the New York gill net age 1 recruitment index was added to the MU4 model. Additional central basin recruitment indices were examined but not included at that time (YPTG 2018).

In February 2019, the LEC announced the development of the new yellow perch management policies for Lake Erie (LEC 2019a). The deliberations had been ongoing for 3 years. The LEGMAG provided the LEC with detailed and well-vetted recommendations about how to move forward with future management of yellow perch in Lake Erie. The outcome had resulted from the guidance and analytical facilitation of the QFC. The QFC had provided detailed updates of the assessment model and had carried out the appropriate management strategy evaluations. All stakeholder members of the LEPMAG had been actively involved, resulting in a new yellow perch assessment model as well as advice on fishery-based performance metrics and recommendations for new harvest policies. Discussions were leading to a subsequent revision of the Lake Erie Yellow Perch Management Plan, and drafts were developed. This plan would supersede the previous draft management plan (YPTG 2007). Considerable progress had been made on the management strategy evaluation, as indicated by detailed minutes of LEPMAG meetings conducted April 2016, May 2017, January 2018, and May 2018. On January 2019, a slide deck of the MSE scenario survey was circulated (see review and details MSC 3rd Surveillance Audit, Hough 2019). This led to the announcement by the LEC of the new yellow perch exploitation policies in February 2019. These new policies resulted in analytically based limit reference points to help ensure sustainability of the recreational and commercial fisheries. The reference points and exploitation rates developed and recommended would shape the forthcoming Lake Erie Yellow Perch Management Plan. This plan currently is in draft and under final review and is fundamental to an explanation of the development and use of the updated yellow perch catch-at-age models and analytically based new harvest control rules and reference points. These resulted from consensus by the LEPMAG during the MSE process.

In February 2019, the LEC and LEPMAG announced new harvest control rules for yellow perch (Appendix 2).

The harvest control rules are composed of:

- Target fishing mortality as a per cent of the fishing mortality at maximum sustainable yield (F_{msy}). F_{msy} that will remain constant for the duration of the YPMP, a 5-year period
- Biomass limit reference point of the biomass at maximum sustainable yield (B_{msy}). The biomass limit reference points were as follows: MU1 = 29%SSB_0; MU2 = 28%SSB_0; MU3 = 28%SSB_0; MU4 = 27%SSB_0
- All MUs would be at a risk tolerance level of P-star, P* = 0.05
- All MUs would be at a limit on maximum change in TAC of ±20%
- Target fishing rates F would be MU1 = 0.77, MU2 = 0.70, MU3 = 0.79, and MU4 = 0.40

This announcement by LEC indicated that these exploitation policies and HCRs would start in the current year and that the policies would form the core for the next 5 years of yellow perch management through the newly drafted and upcoming YPMP (LEC 2019a).

Target fishing rates and limit reference points are estimated annually using SCAA model results. Estimating reference points and recommended allowable harvest is a three-step process (YPTG 2019). First, estimated recruitment and spawning stock biomass from the SCAA model, along with maturity, weight, and selectivity at age, are entered into an ADMB model that estimates the parameters of a Ricker stock-recruitment relationship and the abundance of spawning stock biomass without fishing (SSB_0). The stock-recruitment relationships for MUs 1, 2, and 3 are fit using a hierarchical framework, while MU 4 is fit independently. In the second step, maturity, weight, and selectivity at age, along with the parameters of the stock-recruitment relationship, are entered into an R-based model. This model estimates F_{msy} and B_{msy} for the harvest control rule. Finally, F_{msy}, F_{target} (as a per cent of F_{msy}) and B_{msy} (as a per cent of SSB_0) are entered into the PR ADMB model to estimate RAH in each MU. In 2019, the YPTG used the new PR model developed by the QFC. If the model estimates that fishing at F_{target} exceeds a 5% probability (P*) that the projected spawning stock biomass will be equal to or less than the limit reference point (SSB_{msy}), then the fishing rate is reduced until the probability is less than 5%. Values for 2019 of SSB_0, SSB_{msy}, F_{msy}, and F_{target} for each MU can be found in Table 8 (extracted from YPTG 2019). In 2019 in MU2, P* exceeded the 5% level, so the target fishing rate was reduced from 0.721 to an actual rate of 0.353. Target fishing rates are applied to population estimates and their standard errors to determine minimum, mean, and maximum RAH values for each MU. In addition, as indicated, RAH values may be subject to a ± 20% limit on the annual change in TAC.

The recommended allowable harvest indicated by the RP model in 2018, using the 2008 to 2017 exploitation policy, was as follows: MU1 to MU4 = 2.516, 3.698, 3.633, and 0.478, respectively. The new 2019 policy resulted in a recommended annual harvest of 2.817, 3.816, 3.980, and 0.623, respectively (LEC 2019a). The new 2019 policy resulted in a relative change in exploitation, according to MUs 1 to 4, of +12.2%, +3.6%, +9.6%, and +30.3%, respectively.

Table 8. Yellow perch spawning stock biomass (millions of kg), limit reference points, and target and actual fishing rates for each management unit, 2019. F_{actual} was reduced from F_{target} when P* > 5%. From YPTG (2019, extracted from Table 2.1).

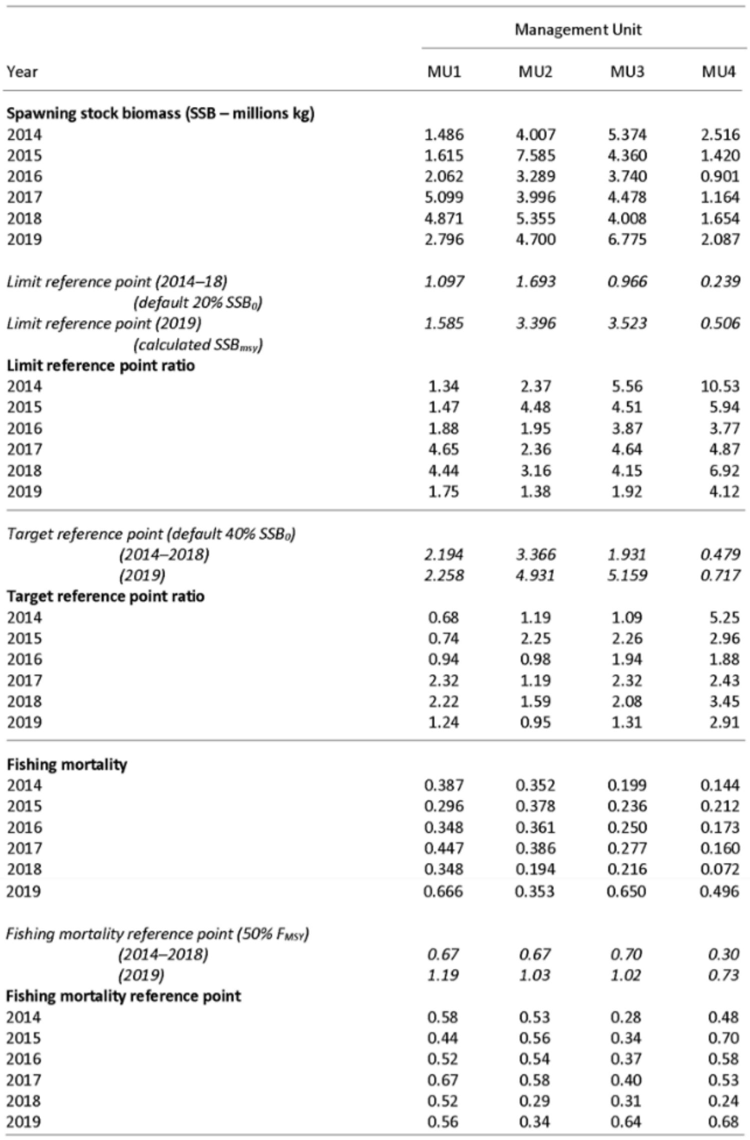
	Spawning stock biomass (unfished population)		Spawning stock biomass (kg)		Biomass at MSY (limit reference point)			Fishing rate			
Unit	SSB_0	SD($logSSB_0$)	2019	2020[a]	B_{msy}	$\%SSB_0$	P*	F_{msy}	$\%F_{msy}$	F_{target}	F_{actual}[b]
MU1	5,645	0.22	2,795	3,171	1,585	29	0.54	2.38	28	0.666	0.666
MU2	12,378	0.19	4,700	4,076	3,395	27	18.12	2.06	35	0.721	0.353
MU3	12,895	0.22	6,775	7,236	3,542	27	0.30	2.03	32	0.650	0.650
MU4	1,791	0.21	2,087	1,791	596	28	0.00	1.46	34	0.496	0.496

[a] Spawning stock biomass when population is fished at target fishing rate.

[b] In MU2, fishing at F_{target} exceeds a 5% probability (P*) that the projected spawning stock biomass will be equal to or less than the limit reference point (B_{msy}); therefore, the fishing rate, F_{actual}, was reduced until the probability was < 5%.

Long-term trends in yellow perch spawning stock biomass (SSB – millions of kilograms) for the four Lake Erie MUs indicate that in recent years, this biomass has been above the long-term average, as discussed previously and provided to the present for MUs 1–4 (Figures 6B, 7B, 8B, and 9B, respectively). The statistical catch-at-age analysis (SCAA), using the Auto Differentiation Model Builder program (ADMB) estimate of the yellow perch SSB in 2019 (Table 8), as reported by the Yellow Perch Task Group (YPTG 2019), showed a decrease in MU1 and MU2 compared with 2018 (Table 9). Actual SSB values for each of the MUs are provided (Table 9) with previous and current reference points for the recent years (2014–2019) and since the first certification was completed in 2014 (Intertek 2015). In 2019, the MUs 1–4 age 3+ (mature individuals) biomass was 2.796, 4.700, 6.775, and 2.087 million kg, respectively (Table 3, YPTG 2019) compared with the 2018 values of 4.871, 5.355, 4.008, and 1.654 million kg, respectively (Table 8, Table 9). In MU1, the decrease in SSB in 2019 from 2018 was 42.6%, and in MU2 it was 12.2%.

Table 9. Yellow perch performance indicators applying the harvest control rules by management unit in Lake Erie, indicating limit reference points and target reference points and ratios, as well as fishing mortality reference points and ratios. Mean spawning stock biomass and fishing mortality from YPTG (2014, 2015, 2016, 2017, 2018, 2019); harvest control rules from Intertek (2015), LEC (2019a), and YPTG (2019).



	Management Unit			
Year	MU1	MU2	MU3	MU4
Spawning stock biomass (SSB – millions kg)				
2014	1.486	4.007	5.374	2.516
2015	1.615	7.585	4.360	1.420
2016	2.062	3.289	3.740	0.901
2017	5.099	3.996	4.478	1.164
2018	4.871	5.355	4.008	1.654
2019	2.796	4.700	6.775	2.087
Limit reference point (2014–18) (default 20% SSB_0)	*1.097*	*1.693*	*0.966*	*0.239*
Limit reference point (2019) (calculated SSB_{msy})	*1.585*	*3.396*	*3.523*	*0.506*
Limit reference point ratio				
2014	1.34	2.37	5.56	10.53
2015	1.47	4.48	4.51	5.94
2016	1.88	1.95	3.87	3.77
2017	4.65	2.36	4.64	4.87
2018	4.44	3.16	4.15	6.92
2019	1.75	1.38	1.92	4.12
Target reference point (default 40% SSB_0)				
(2014–2018)	*2.194*	*3.366*	*1.931*	*0.479*
(2019)	*2.258*	*4.931*	*5.159*	*0.717*
Target reference point ratio				
2014	0.68	1.19	1.09	5.25
2015	0.74	2.25	2.26	2.96
2016	0.94	0.98	1.94	1.88
2017	2.32	1.19	2.32	2.43
2018	2.22	1.59	2.08	3.45
2019	1.24	0.95	1.31	2.91
Fishing mortality				
2014	0.387	0.352	0.199	0.144
2015	0.296	0.378	0.236	0.212
2016	0.348	0.361	0.250	0.173
2017	0.447	0.386	0.277	0.160
2018	0.348	0.194	0.216	0.072
2019	0.666	0.353	0.650	0.496
Fishing mortality reference point (50% F_{MSY})				
(2014–2018)	*0.67*	*0.67*	*0.70*	*0.30*
(2019)	*1.19*	*1.03*	*1.02*	*0.73*
Fishing mortality reference point				
2014	0.58	0.53	0.28	0.48
2015	0.44	0.56	0.34	0.70
2016	0.52	0.54	0.37	0.58
2017	0.67	0.58	0.40	0.53
2018	0.52	0.29	0.31	0.24
2019	0.56	0.34	0.64	0.68

The spawning stock biomass limit reference (SSB_{limit}) and the target reference point (B_{target}) performance indicators used in the assessments up to 2018 for MUs 1–4 were 1.097, 1.693, 0.966, and 0.239 and 2.194, 3.366, 1.931, and 0.479, respectively (Intertek 2015) (Table 9). As indicated, the new analytically based LFPs were applied in 2019 (YPTG 2019) (Table 8). This was indicated by the new yellow perch exploitation policies announced by the Lake Erie Committee (LEC 2019a). These policies satisfied condition YP1 of the MSC certification, providing an analytically based LRP rather than the default MSC LRP of 20% of the unfished spawning stock biomass (SSB_0) previously used (Intertek 2015). The target reference point (TRP) continues to use the default 40%SSB_0. These new analytically based LRPs using the calculated spawning stock biomass at maximum sustainable yield (B_{msy}) were applied in 2019. For 2019, these MU 1–4 LRPs were 1.585, 3.396, 3.523, and 0.506, respectively (Table 8, Table 9).

The ratios of the SSB in relation to the LRPs provide a good relative indication of the status of the various stocks. The age 3+ biomass/B_{limit} ratios for MUs 1–4 indicates that in 2019, compared with 2018 (Hough et al. 2019), there was a reduction across all MUs and most markedly in MU2, which had an LRP of 1.38 (Table 9). This ratio was the lowest of all MUs in recent years, except for MU1, which had a ratio of 1.34 back in 2014. All the ratios for the MUs have been above 1 in the past 6 years. In 2019, the ratio remained relatively high in MU4 at 4.12 but was lower and intermediate in MU1 at 1.75 and in MU3 at 1.92. The latter two had declined from the 2017 and 2018 values, when they were above 4 (Table 9). Overall, the 2018 ratios were high, similar to 2017, in both years ranging from 2 to 4. Even though there were decreases in 2019 in all MUs, the LRP ratios were >1 (Table 9) and the SSBs for all MUs remain above the biomass limit reference points in recent years. In summary, this indicates that the SSBs in all MUs remained strong in recent years (2014–2019) although decreasing somewhat in MU2, MU1, and MU3 in 2019. A graphic illustration of the SSB and the LRP ratios (Figure 10) indicates that the SSB trends over the past 15 years (2005–2019) remain relatively stable (Figure 10A), as do the ratios (Figure 10B), although there is a consistent decline in all MUs in 2019 (Figure 10B).

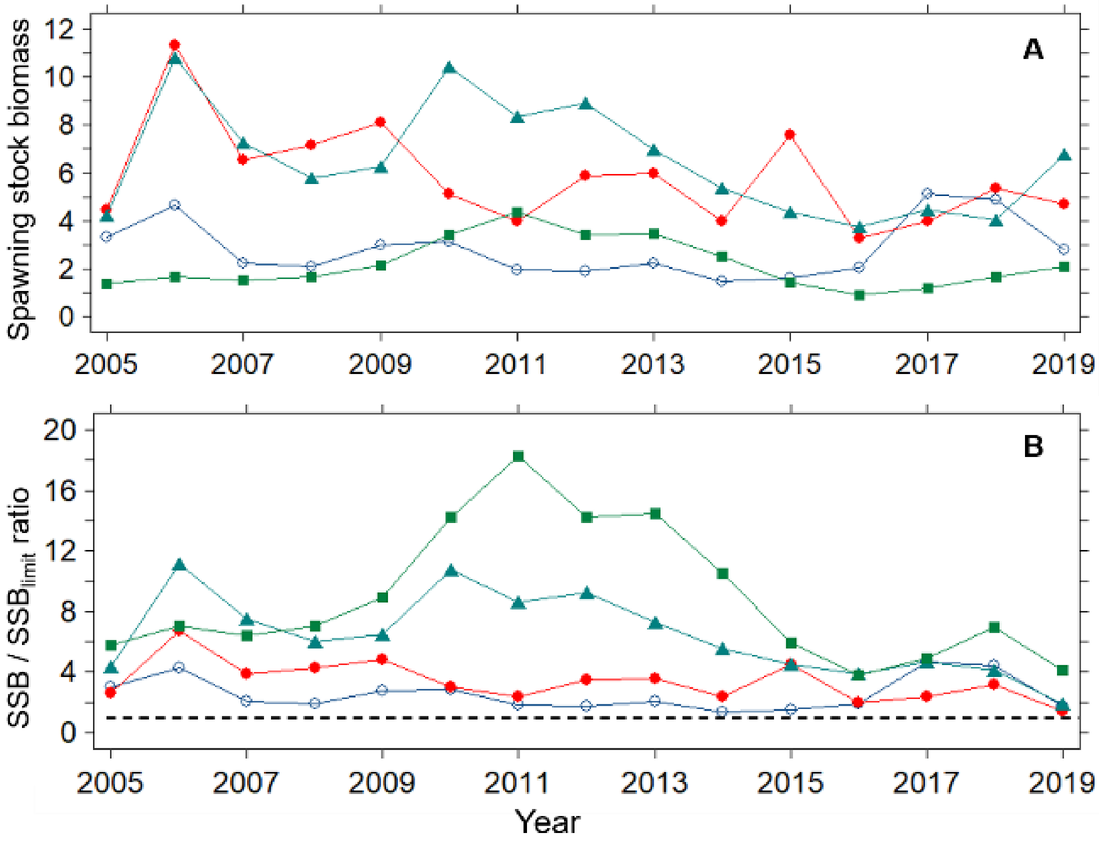


Figure 10. Yellow perch A) spawning stock biomass (SSB) and B) SSB/SSB limit reference point (SSB_{limit}) ratio for Management Units 1–4 from 2005 to 2019. Ratio of 1 is indicated by dashed line. Management unit symbols are: MU1 – open circle, MU2 – closed circle, MU3 – closed triangle, MU4 – closed square. Fishing mortality from YPTG reports 2005 to 2019 and SSB_{limit} from Table 9.

The SSB for recent years was examined in relation to the TRPs, using the default 40%SSB_0, which gave four MUs 1–4 for 2014 to 2018 of 2.194, 3.386, 1.931, and 0.479 million kg, respectively (Intertek 2015) and for 2019, 2.258, 4.931, 5.159, and 0.717 million kg, respectively (calculated from YPTG 2019) (Table 9). TRP ratios, the age 3+ biomass/B_{target} in all MUs, decreased in 2019 and fell below 1 in MU2, a value of 0.95. Indeed, the 2019 ratios in all cases were lower than in 2017 and 2018 (Table 9). Overall, the TRP ratios indicate an improvement in recent years (2017–18), particularly in MU1, but in 2019, there were marked declines in MU2, MU1, and MU3. Although stock status appears to be declining somewhat, the SSB remains above the TRP in all MUs. There may be some very recent concern around the status of yellow perch in MU2; however, this is being addressed by the YPTG and LEC, and precautionary management measures are being taken around fishing rates to protect its sustainability.

Fishing mortality has been relatively stable over the past 15 years in all MUs but increased uniformly in all MUs in 2019 (Figure 11A). F_{target} was reduced in MU2 from 0.721 to 0.353 because the MU2 fishing at F_{target} exceeded the 5% probability (P*) that the projected SSB would be equal to or less than the LRP (B_{msy}) (Table 2). The fishing mortality target reference points (FTR) (50%F_{msy}) for MUs 1–4 were 0.67, 0.67, 0.70, and 0.30, respectively (Intertek 2015) but for 2019 were 1.19, 1.03, 1.02, and 0.73 (Table 8, Table 9).

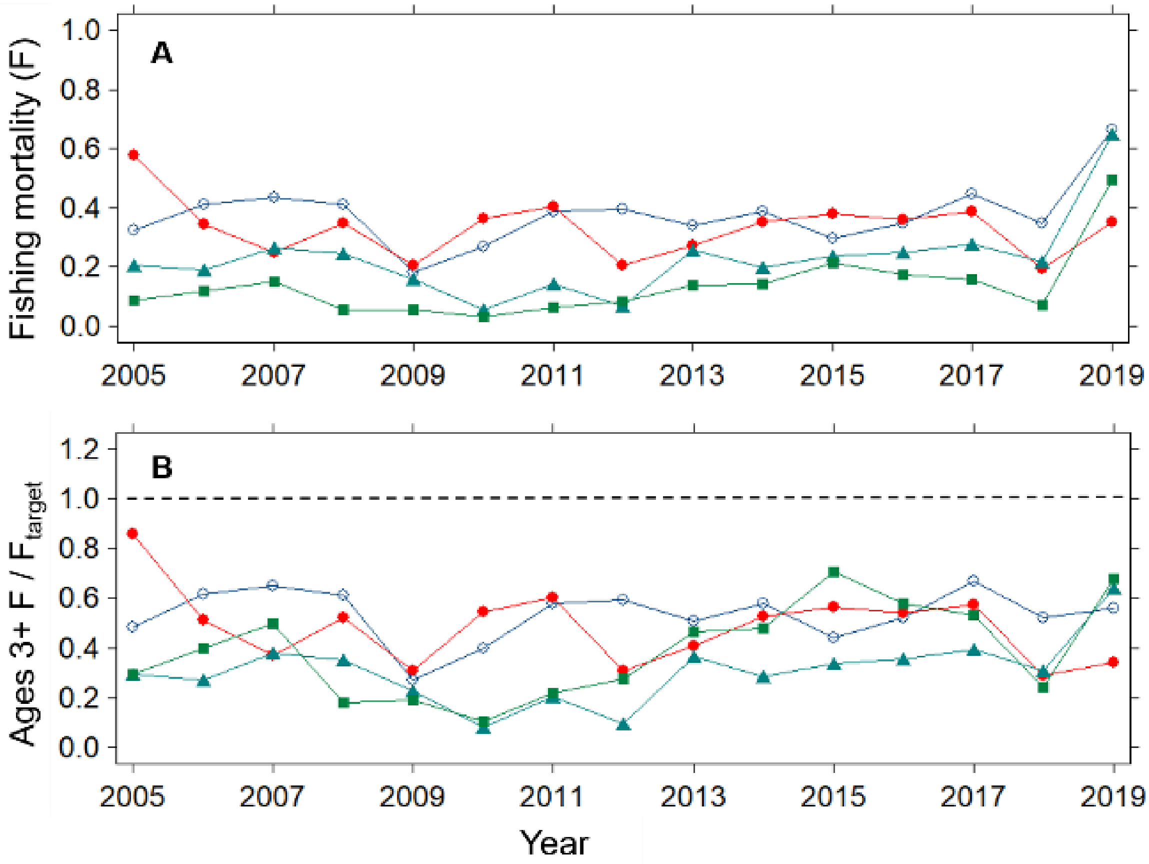


Figure 11. Yellow perch A) ages 3 and older fishing mortality (F) and B) age 3+ F/F_{target} ratio for Management Units 1–4 from 2005 to 2019. Ratio of 1 is indicated by dashed line. Management unit symbols are: MU1 – open circle, MU2 ¬– closed circle, MU3 – closed triangle, MU4 – closed square. Fishing mortality from YPTG reports 2005 to 2019 and F_{target} from Table 9.

The age 3+ F/F_{target} ratios in 2019 for MUs 1–4 were 0.56, 0.34, 0.64, and 0.68, respectively, all higher than 2018 but, compared with 2017, lower in MUs 1 and 2 and higher in MUs 3 and 4 (Table 9). For the past 15 years, the fishing morality reference points have been, and remain, well below the ratio of 1 (Figure 11B).

The exploitation rate in MU1 has fluctuated fairly widely over the years but shows no trend over the long term, 1975–2018 (Figure 6C). In MU2, there has been a decrease over time and is quite low now compared with 2000–2010 (Figure 7C). In MU3, the exploitation rate has also showed a similar decline over time but has increased slightly in recent years (Figure 8C). In MU4, there has also been a decline trend over the past 4½-decade period but a prominent increase in recent years except for 2018–2019, when the rate decreased markedly but is still slightly above the levels in the 10-year period following the 1990s.

In all yellow perch management units in Lake Erie, there is certainty that the yellow perch biomass remains above B_{limit} and has remained so since the last MSC certification. The degree of certainty around the TRP is somewhat less for MU2 since the TRP ratios for this MU are the lowest of all the MUs for the past 4 years – 0.98 for 2016, 1.19 for 2017, 1.59 for 2018, and 0.95 for 2019 (Table 9) but appear to be oscillating slightly above the TRP.

7.2.2.5 Catch profiles

Yellow perch catches, as exemplified by harvest, have been substantial over the years. The average for the past 10 years was 8.640 million pounds (Table 10). Over this time, harvest has decreased slightly, from approximately 9 million pounds to 7 million pounds. Over this 10-year period, mean harvest of MU3 was the highest, at 3.400 million pounds, representing 39% of the overall harvest. The next greatest harvest was in MU2 at 2.986 million pounds, representing 34.2%, followed by MU1 at 1.786 million pounds, or 21.5%. The smallest harvest came from MU4, at only 0.468 million pounds and 5.3% of the overall harvest. Over this 10-year period, the harvest of MU3 has remained relatively constant but has decreased rather substantially in MU2, from 47% of the harvest in 2009 to 27% of the harvest in 2018. Harvest in MU1 has increased, virtually doubling over the period, while MU4, like MU2, has decreased somewhat (Table 10).

Table 10. Yellow perch harvest (millions of pounds) by Management Unit and lake-wide in Lake Erie, 2009–2018. Relative harvest by MU, along with means and 95% confidence intervals (CI) for the 10-year period, also provided. From YPTG (2019, Table 1.1).

	MU 1		MU 2		MU 3		MU 4		Lake-wide total harvest
Year	Harvest	%	Harvest	%	Harvest	%	Harvest	%	
2009	1.404	15.4	4.298	47.0	3.055	33.4	0.381	4.2	9.137
2010	1.853	19.1	3.347	34.5	3.965	40.9	0.525	5.4	9.689
2011	1.813	18.8	3.064	31.9	4.156	43.2	0.586	6.1	9.620
2012	1.729	16.0	3.729	34.6	4.677	43.4	0.651	6.0	10.786
2013	1.515	15.7	3.525	36.5	3.935	40.7	0.691	7.1	9.666
2014	1.100	12.5	3.222	36.7	3.818	43.4	0.652	7.4	8.792
2015	1.122	16.2	2.621	37.9	2.782	40.2	0.393	5.7	6.918
2016	2.230	30.9	2.076	28.7	2.651	36.7	0.266	3.7	7.223
2017	2.773	35.6	2.142	27.5	2.639	33.9	0.235	3.0	7.789
2018	2.326	34.3	1.830	27.0	2.323	34.2	0.303	4.5	6.782
Mean	1.786	21.5	2.986	34.2	3.400	39.0	0.468	5.3	8.640
± 95% CI	0.385	6.2	0.573	4.3	0.573	2.9	0.124	1.03	0.987

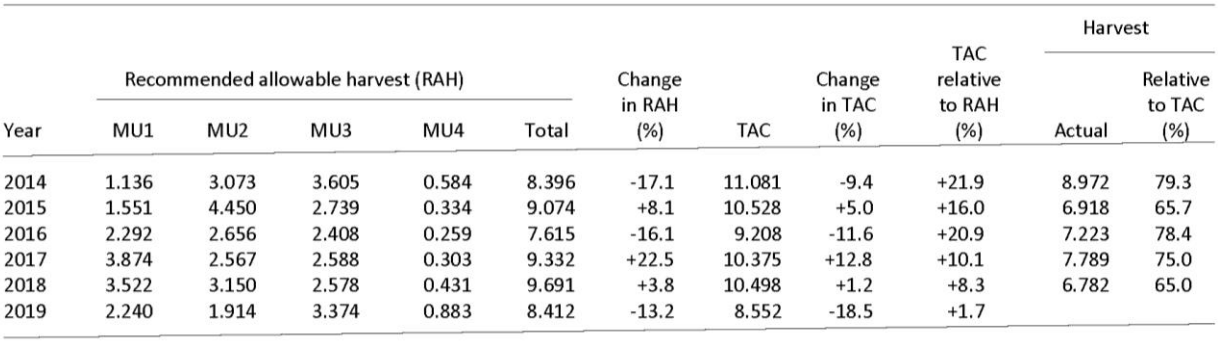
Long-term changes in catch profiles for MU3, which has had the highest yellow perch catches, indicate that by gear, trap-net and sport harvest have remained relatively low but increasing over time, whereas gill-net harvest has fluctuated rather dramatically and was higher in the 2010s than at any time in more than four decades (Figure 8D). However, harvest in MU3 has dropped rather markedly in the past 6 years. The gill-net harvest in MU3 is appreciably higher than the trap-net and sport harvest (Figure 8D). MU2 has provided the next greatest harvest over time; the three types of harvest methods have been relatively constant since the mid-1990s (Figure 7D). Harvest from the gill-net fishery was substantially higher for the two decades prior to that. The gill-net harvest was appreciably greater than the two harvests over the entire 44-year period from 1975 to 2018. There is some evidence in MU2 that harvests of all three gears have declined over the past 4 to

6 years (Figure 7D). Harvest in MU1, which overall has been somewhat less than MUs 2–3 and more than 4, has been relatively consistent since the mid-1990s like MU2 but fluctuating somewhat (Figure 6D). The gill-net and sport harvests in MU1 are at approximately the same level, with the trap-net harvest appreciably lower. The gill-net and trap-net harvests are associated with different areas in Lake Erie. The trap-net harvest remained low and fairly uniform over the past four decades. From the mid-1970s to the mid-1990s, gill-net and sport-fishing harvests were appreciably higher than current levels (Figure 6D). The lowest harvest in Lake Erie comes from MU4. Considering the past 44 years, the gill-net harvest was relatively high but declined dramatically from the mid-1970s to the mid-1990s, then increased somewhat to the 2010s but in recent years shows some decline (Figure 9D). The sport harvest is appreciably lower and was fairly stable from 2000 to the early 2010s but is also showing a recent decline.

7.2.2.6 TAC and catch data

The Lake Erie Committee, at the Great Lakes Fishery Commission spring Lake Committee meetings, announces the yellow perch total allowable catch for Lake Erie. The LEC uses the recommended allowable harvest (millions of pounds) for each MU that year, provided by the Yellow Perch Technical Group resulting from their analysis of the previous year’s modelling data. The RAH values may be subject to a limit on the annual change in TAC of ±20%. Over the past 6 years, 2014 to 2019, the RAH has remained relatively constant, between 7.615 and 9.691 million pounds (Table 11). The RAH in 2019 was somewhat lower than in former years, at 8.412 million pounds. The change in RAH in 2019 was -13.2%, but over that period, the largest reduction occurred in 2014 at 17.1% and the greatest increase in 2017 at 22.5%. The TAC has ranged between approximately 8.552 million pounds in 2019 and 11.081 million pounds in 2015. The change in TAC in 2019 relative to former years showed the greatest decrease, -18.5%. Actual harvest from 2014 to 2018 varied between 6.782 million pounds in 2018 and 8.972 million pounds in 2014. The harvest relative to TAC ranged between 65% in 2018, the lowest for the period, and 79% in 2014, the highest for the period (Table 11).

Table 11. Yellow perch harvest (millions pounds), 2014–2019, including relative changes in the mean recommended allowable harvest and total allowable catch. From YPTG (2014, 2015, 2016, 2017, 2018, 2019); and LEC (2014, 2015, 2016, 2017, 2018, 2019b).



	Recommended allowable harvest (RAH)									Harvest	
Year	MU1	MU2	MU3	MU4	Total	Change in RAH (%)	TAC	Change in TAC (%)	TAC relative to RAH (%)	Actual	Relative to TAC (%)
2014	1.136	3.073	3.605	0.584	8.396	-17.1	11.081	-9.4	+21.9	8.972	79.3
2015	1.551	4.450	2.739	0.334	9.074	+8.1	10.528	+5.0	+16.0	6.918	65.7
2016	2.292	2.656	2.408	0.259	7.615	-16.1	9.208	-11.6	+20.9	7.223	78.4
2017	3.874	2.567	2.588	0.303	9.332	+22.5	10.375	+12.8	+10.1	7.789	75.0
2018	3.522	3.150	2.578	0.431	9.691	+3.8	10.498	+1.2	+8.3	6.782	65.0
2019	2.240	1.914	3.374	0.883	8.412	-13.2	8.552	-18.5	+1.7		

7.2.2 Walleye

7.2.2.1 Biology – brief description

Walleye (*Sander vitreus*) is a cool-water species that is abundant throughout its extensive native North American range; Lake Erie might be considered as the centre of the North American distribution of the species. The species consists of, or did until recently, two subspecies: yellow and blue walleye, the latter also referred to as “blue pike” by Lake Erie fishermen. It was once abundant in Lake Erie and had a different spawning time and habitat association, a slower growth rate, and a smaller ultimate size and depth distribution. They were also referred to as “hards,” and inter-grades occurred. Nevertheless, the yellow phase now dominates. Walleye is a particularly important commercial and sport fish species and is probably the most economically valuable species in Canadian inland waters.

The biology of this species in Canada has been studied extensively (Scott and Crossman 1973). It is a keystone predator in many environments, affecting forage-fish communities and lower trophic levels through extensive and selective predation and encompassing a broad range of trophic conditions (Hartman 2009). It spawns in spring; eggs are broadcast, falling into crevices in the substrate or on mats of vegetation. The preferred summer temperature range of adults is 11°C to 25°C (Lester et al. 2004), with a mean optimum temperature for growth of 22.2°C (Casselman 2002). Walleye have a slightly lower preferred and optimum temperature compared with yellow perch. Thermal-optical habitat area is defined as the area of lake bottom where temperature is between 11°C and 25°C and light intensity is between 8 and 68 lx. (Lester et al. 2004). In the study of habitat conditions, Lester et al. (2004) examined the effects of these conditions on walleye abundance and production. Walleye harvest increased in proportion to the thermal optimal habitat area times the square root of total dissolved solids (an index of nutrient level) and the optimum water clarity for walleye typically existing at Secchi depths around 2 m. They found that increases in water clarity recently observed in the Great Lakes Basin, resulting from phosphorus control and dreissenid invasion, reduced the amount of thermally optimal walleye habitat and would probably have a negative effect on production.

Walleye are important and abundant predators in Lake Erie, particularly the western basin. They become obligate piscivores early in life, selecting soft-rayed over spiny-rayed fishes. The western basin of Lake Erie is a major spawning and nursery area for walleye (Markham and Knight 2017). Walleye are the most abundant top predator in the central basin during summer and fall, and throughout the 2000s, walleye diets were dominated by gizzard shad (*Dorosoma cepedianum*), rainbow smelt (*Osmerus mordax*), and *Notropis (*Markham and Knight 2017). Walleye populations in the central basin of Lake Erie mostly depend upon production of young from stocks that spawn in the western basin even though there are tributaries and reef-spawning aggregations there. Age 3 and older female walleye migrate seasonally from the western basin into and through the central basin. In the eastern basin in the late 2000s, rainbow smelt continued to dominate walleye diets, with minor contributions from other species. Discrete stocks of walleye spawn at a number of locations; e.g., Ontario’s Grand River and New York’s Cattaraugus Creek (Markham and Knight 2017). Historically, resident stocks in the eastern basin were considered to be spatially and genetically distinct from those of the western and central basins. However, various studies have confirmed that considerable mixing occurs seasonally in the eastern basin between resident walleye and those migrating from the western basin (SAI Global 2019).

Walleye recruitment can be sporadic. Over the past three decades in Lake Erie, walleye have produced five relatively strong year classes, particularly in 2003 and most recently in 2018, by far the strongest for the period. These year classes have been important in increasing walleye abundance and sustaining important commercial and recreational fisheries.

Environmental conditions have a strong influence on recruitment and fish production. The walleye population of Lake Erie has been under intensive multi-jurisdictional co-management since the early 1980s. Zhang et al. (2018) reviewed ecological and evolutionary mechanisms by which harvest could affect exploitation over the past four decades and concluded that, as with yellow perch, dynamics were affected more strongly by environment than by exploitation. Somewhat additional supporting evidence is found in the fact that very strong year classes of walleye and yellow perch occurred in synchrony in the same year, exemplified best by 2003 and to a lesser extent by 2018.

Walleye does not fit the profile of a lower-trophic-level species as defined by MSC Fisheries Standard v2.01 (MSC 2018).

7.2.2.2 Fishery – brief description

Walleye have supported important commercial and recreational fisheries in Lake Erie for more than 150 years. Gill netting was first introduced in the Great Lakes in the 1830s in Georgian Bay, Lake Huron. In the 1870s to the 1890s, fishing efficiency increased with steam-operated tugs and powered net lifters. This allowed fishermen to increase their fishing effort, and gill nets gained increasing popularity in the late 1800s as they were less labour- and capital-intensive than the other primary capture gear, pound nets. Gill nets can be moved easily and fished in deeper water; this greatly increased fishing effort and exploitation across the Great Lakes. The Lake Erie commercial large-mesh gill-net fishery uses mostly monofilament (canned or midwater gill nets). The walleye fishery uses large-mesh gill nets with a minimum allowable stretch mesh size of 89 mm.

Governance of Lake Erie percid fisheries is complex, involving multiple jurisdictions, diverse stakeholders, and varied interests, which historically combined to create variable ecological and stock differences. The Great Lakes Fishery Commission (GLFC), established in 1955 by the Canadian and United States Convention on Great Lakes Fisheries, coordinates the maintenance of Lake Erie fisheries. Walleye are a highly migratory species and cross jurisdictional boundaries, creating complex fisheries management. To address these challenges, Great Lakes agency administrators and scientists work together to compile information, solve problems, and set fisheries-management goals under the auspices of the GLFC and its 1980 Joint Strategy Plan for Management of Great Lakes Fisheries. Coordinated management of walleye in Lake Erie is accomplished through the Lake Erie Committee (LEC), a binational committee of state and provincial agencies. The LEC established a technical task force for walleye (WTG) and also for yellow perch to compile harvest data and analyse trends and population abundance. The LEC supports the maintenance of mesotrophic conditions across much of Lake Erie, believing that these will provide the most optimal environmental conditions for sustainable and predictable fish-community objectives, maximizing potential benefits. The total allowable catch (TAC) for Lake Erie walleye, as with yellow perch, is determined each spring by the LEC, and quotas are allocated based on a shared surface-area formula. This system has been in place since 1976 for walleye, earlier than for yellow perch, which was 1990. Prior to the 1980s, the U.S. fishery in Lake Erie was dominated by commercial fisheries, with only minor use by recreational fishers. Following the lake-wide closure of the commercial walleye fishery in 1970s and the recovery of percid stocks, commercial fisheries in U.S. waters were greatly reduced and only sport walleye fisheries exist currently.

For management purposes, the WTG designates five management units (MUs) in Lake Erie (Figure 12) (WTG 2019). MUs 1 to 3 represent the water area for allocating annual TAC determinations involving both U.S. and Canadian waters. MU1 includes the western basin of Lake Erie, MUs 2 and 3 cover the central basin, MU4 covers the Pennsylvania Ridge area, and the areas surrounding Long Point Bay and Presque Isle as the lake transitions from the central and eastern basins, and MU5 covers the eastern basin (WMP 2015) (Figure 12).

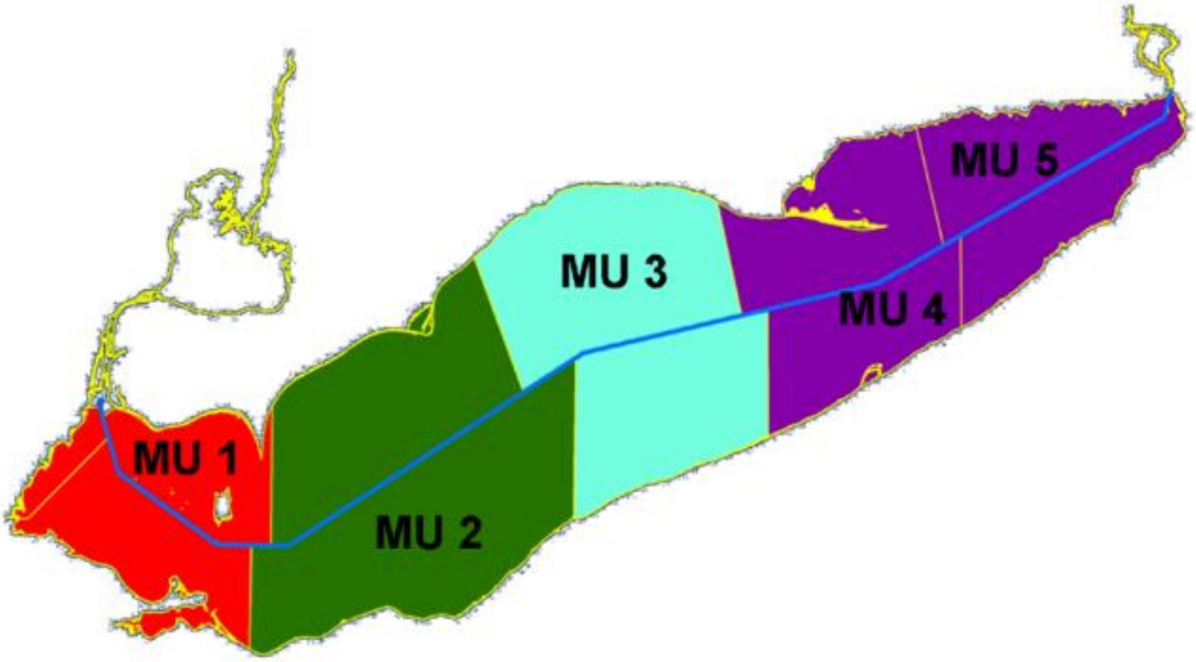


Figure 10. Walleye management units of Lake Erie defined by the Walleye Task Group and the Lake Erie Committee.

In Lake Erie, commercial walleye catches varied in the early 1900s but peaked in 1956 and 1957 at approximately 6,000 tonnes. Catches declined dramatically in the late 1950s and early 1960s, when the population decreased because of exploitation, eutrophication, and degradation of spawning habitat (see review, Intertek 2015). In 1970, the commercial walleye fishery was closed because of mercury contamination and was reopened to only limited harvest after 1972, when mercury levels decreased. The fishery largely remained closed for another 3 years to allow the stocks to rebuild. Walleye harvest from the western and central basins increased steadily from 1976 to 1988. During that time, harvest was primarily by recreational fishers. After peak abundance in 1988, harvest of walleye fluctuated between 3.6 and 8.2 million fish up to 1999, with the Ontario commercial fishery taking the majority of the harvest (see review, Intertek 2015). By late 2004, a record year class of walleye (2003) started to enter the fishery, peaking in 2015, declining over the next 5 years, but increasing substantially to similar levels in 2018 but at levels not seen since the mid-1990s and especially the late 1980s.

Walleye sport-fishing effort over the years has been substantial, peaking at well over 15 million angler-hours in 1988, then reaching a low of just under 2 million angler-hours in 2011 (WTG 2019). Effort has remained fairly constant in recent years, approaching 3 million angler hours (Figure 13A). Commercial gill-net effort has been quite variable, peaking in 1998 with more than 50,000 km of nets set annually, to a low in 2010 of just under 5,000 km (Figure 13B). During the past 5 years, netting effort has been fairly consistent at 15,000 to 20,000 km. Catch per unit effort over the past four decades has fluctuated quite widely. Average angler harvest ranged from a low of approximately 0.3 fish per hour during the 1990s to a high of about 0.8 walleye per angler-hour in 2018. Over this period, commercial harvest ranged from a low of approximately 50 fish per km of gill net in 1977 to a peak in 2006 of approximately 250 walleye per km of gill net (Figure 13).

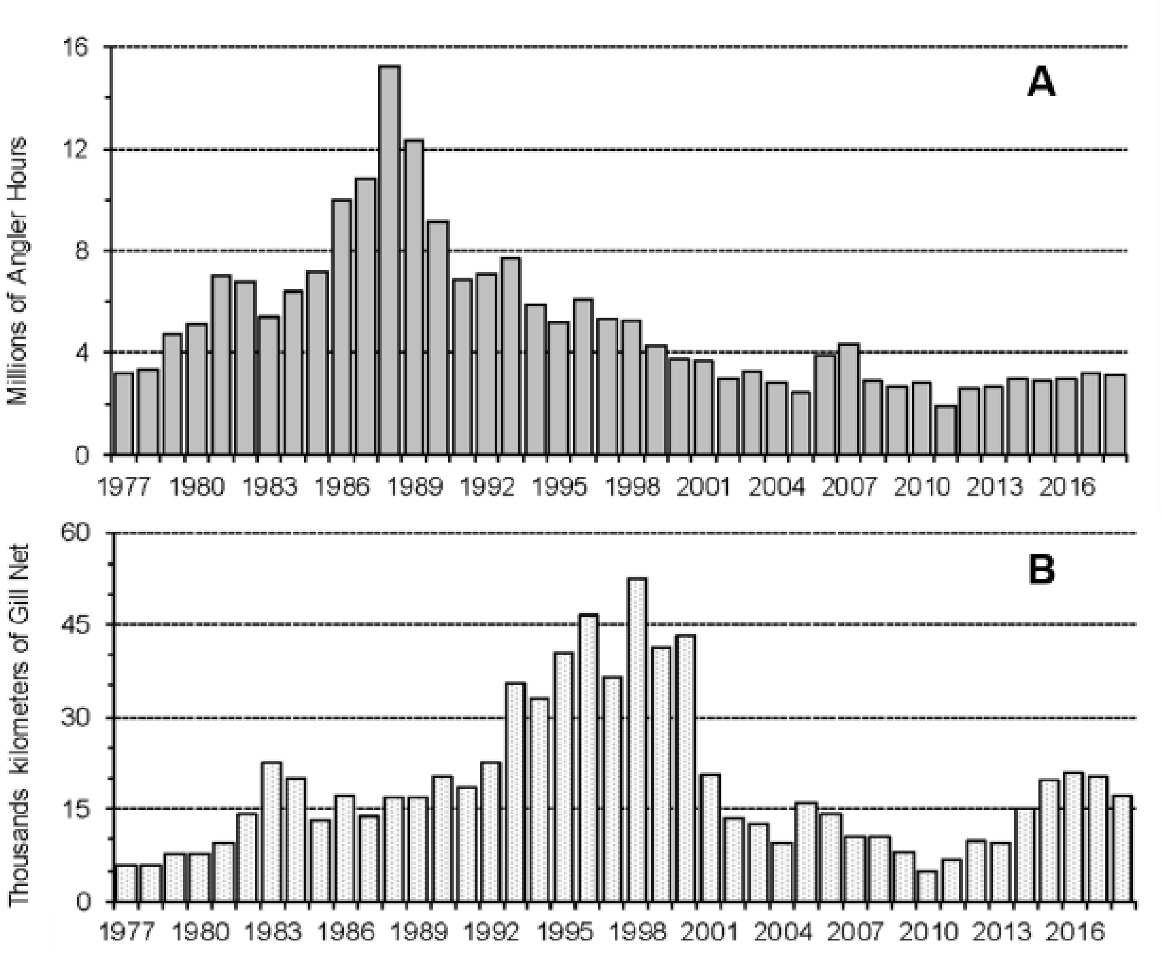


Figure 11. Walleye fishing effort for Lake Erie, 1977 to 2018: A) sport fisheries (millions of angler-hours), B) commercial fisheries (thousands km of gill net). From WTG (2019, Figures 3 and 4).

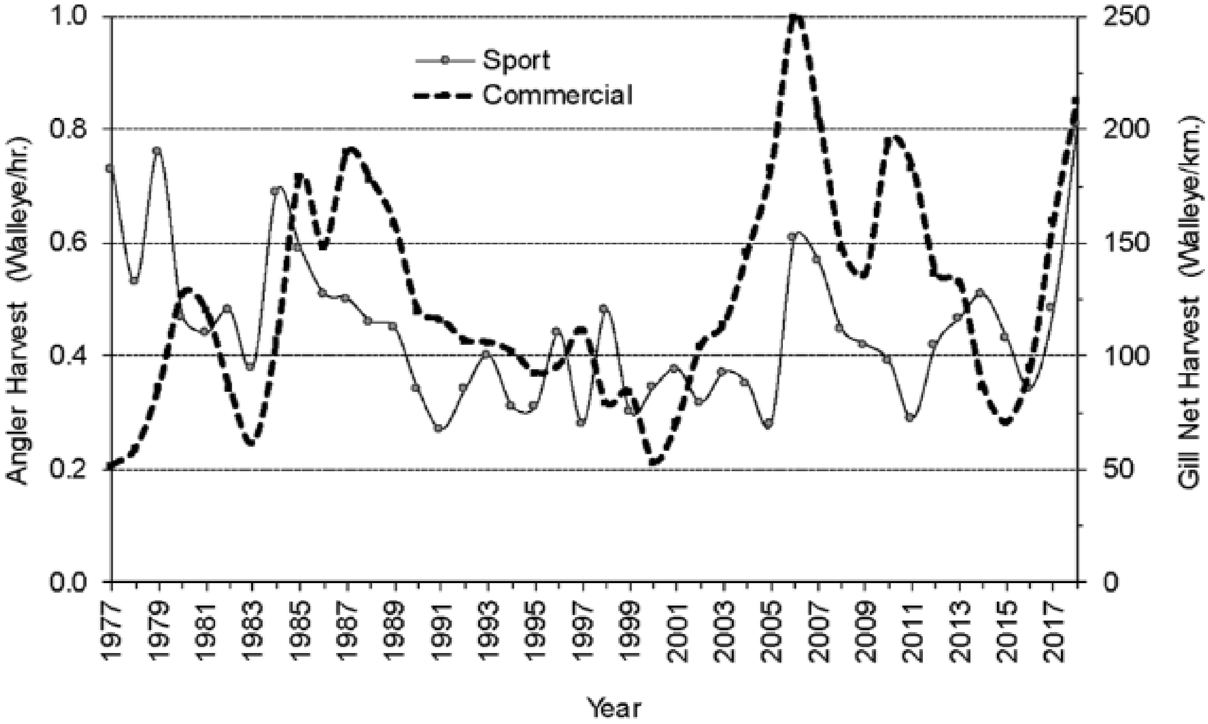


Figure 12. Walleye harvest per unit effort for the sport (N·h^{-1}) and commercial (N·km^{-1}) fisheries of Lake Erie, 1977 to 2017. From WTG (2019, Figure 5).

Age is an important variable in assessing population dynamics and determining RAH. Statistical catch-at-age (SCAA) population estimates for walleye ages 2 to 7 were combined annually with fishery and assessment survey data, using Auto Differentiation Model Builder (ADMB) software. A separate stock recruitment ADMB model provides estimates of weight at age, maturity at age, along with recruitment and spawner biomass, and M, which are used to generate the unfished spawning stock biomass (SSB_0), MSY, and F_{msy} estimates and associated error. Mean age of the sportfish harvest over the past 20 years, 1999 to 2019, shows a progressive increase down the lake from MU1 to MUs 4 and 5 ranging from 4.76 years to 7.22 years (Table 12). The sportfish harvest contains older fish with a mean age over this period of 5.18 years compared with the Ontario commercial harvest of 4.32 years. These overall trends have also been similar from the mid-1970s to the present (Table 12). Mean age of the catch between the sport and commercial harvests has changed somewhat in unison over time and, in 2018, was much lower than in recent years (Figure 15). Overall, combined by gear type and MU, in 2018 73% of the walleye harvested were age 3 and 15% were age 4 (Table 13). In 2018, the majority of walleye harvested were age 3 regardless of method or MU. As will be discussed later, this relates to year-class strength, which increased substantially in 2018. Across all jurisdictions, the mean age of walleye harvested in 2018 ranged from 3.6 to 4.9 years old in the sport fishery, and from 3.2 to 4.2 years old in the Ontario commercial fishery. For all gear, the mean age was 3.5 years in 2018 (Table 13). Since the late 1970s, mean age of the harvest has fluctuated between approximately 3.6 and 7.5 years; mean age of the sport harvest is greater than the commercial harvest by slightly less than 1 year (Figure 15).

Table 12. Walleye harvest by mean age, management unit, and gear type, 1999–2018. Means and 95% confidence intervals (CI) for this 20-year period are provided, along with the overall means for the 43-year period 1975–2017. Ages in Management Unit 1 include Ohio, Michigan, and Ontario; Units 2 and 3, Ohio and Ontario; Units 4 and 5, Ontario, Pennsylvania, and New York. From WPG (2019, Table 7).

	Sport fishery						
	Management unit						Total
						Commercial	all
Year	MU1	MU2	MU3	MUs 4 and 5	Total	Ontario	gear types
1999	3.63	5.48	6.18	9.32	4.55	3.81	3.89
2000	3.76	4.12	6.36	9.75	4.55	4.11	4.12
2001	3.57	4.09	6.14	8.01	3.99	3.57	3.75
2002	3.81	4.57	5.46	7.25	4.21	3.54	3.78
2003	4.59	4.67	5.87	8.40	4.90	4.09	4.46
2004	4.70	5.12	6.42	7.41	5.01	2.96	3.82
2005	5.12	4.21	5.53	6.68	5.15	3.66	3.96
2006	3.73	3.68	4.57	4.55	3.85	3.26	3.50
2007	4.62	4.79	4.89	5.27	4.71	4.26	4.50
2008	5.46	5.90	5.21	6.10	5.57	5.29	5.42
2009	5.30	6.14	6.43	6.56	5.70	4.93	5.33
2010	5.69	6.37	7.30	7.16	6.12	4.64	5.44
2011	5.68	7.79	8.03	8.13	6.74	5.31	5.78
2012	4.91	5.78	8.13	8.35	5.60	5.34	5.47
2013	5.10	6.91	8.09	8.55	5.95	5.24	5.60
2014	5.80	7.13	8.30	8.17	6.57	6.02	6.31
2015	6.20	6.88	8.73	7.89	6.74	6.14	6.42
2016	5.15	5.46	6.91	7.83	5.68	4.07	4.61
2017	4.52	3.52	3.67	4.63	4.14	2.93	3.32
2018	3.88	3.56	3.95	4.35	3.88	3.28	3.53
Mean	4.76	5.31	6.31	7.22	5.18	4.32	4.65
± 95% CI	0.38	0.60	0.69	0.73	0.44	0.46	0.46
1975 to 2017 Mean	4.16	4.53	5.56	7.03	4.45	3.84	4.09

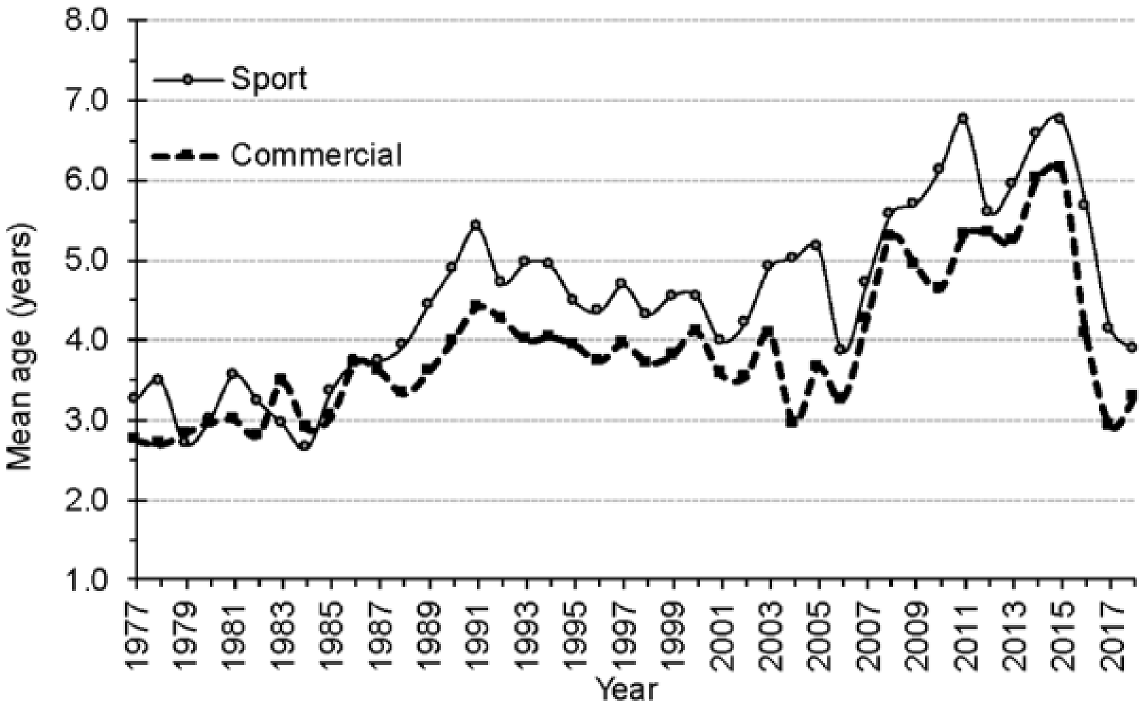


Figure 13. Walleye mean age (years) for the sport and commercial fisheries of Lake Erie, 1977 to 2017. From WTG (2019, Figure 6).

Table 13. Walleye harvest by age, management unit, and gear type, along with percent of the total, 2018. Walleye Management Units 4 and 5 are combined. Sport harvest in U.S. includes the states of Ohio, Michigan, New York, and Pennsylvania. Harvest is millions of fish except for numbers in parentheses, which are actual numbers. From WTG (2019, Table 5).

Management unit	Age	Sport U.S. waters		Commercial Ontario		Total all gear type	
		Harvest	%	Harvest	%	Harvest	%
1	1	(10)	0.0	0.031	2.1	0.032	1.2
	2	0.005	0.4	0.155	10.2	0.159	6.0
	3	0.795	70.2	1.007	66.1	1.802	67.9
	4	0.210	18.6	0.251	16.5	0.461	17.4
	5	0.032	2.8	0.032	2.1	0.063	2.4
	6	0.009	0.8	0.013	0.8	0.022	0.8
	7+	0.081	7.1	0.034	2.3	0.115	4.3
	Total	1.131		1.523		2.654	
2	1	0	0.0	0.034	2.4	0.034	1.6
	2	0.003	0.4	0.035	2.4	0.037	1.8
	3	0.514	77.2	1.182	82.5	1.696	80.8
	4	0.107	16.1	0.135	9.4	0.242	11.5
	5	0.012	1.7	0.013	0.9	0.024	1.2
	6	0.003	0.5	0.007	0.5	0.010	0.5
	7+	0.027	4.0	0.028	1.8	0.055	2.6
	Total	0.666		1.433		2.099	
3	1	0	0.0	0.002	0.5	0.002	0.3
	2	(623)	0.2	0.007	1.6	0.008	1.0
	3	0.244	69.4	0.375	83.3	0.619	77.2
	4	0.064	18.3	0.052	11.5	0.116	14.5
	5	0.010	3.0	0.008	1.9	0.019	2.4
	6	0.003	0.9	0.002	0.5	0.005	0.7
	7+	0.029	8.2	0.003	0.6	0.032	3.9
	Total	0.351		0.451		8.021	
4 and 5	1	0	0.0	0	0.0	0	0.0
	2	0.009	2.2	0.005	2.2	0.014	2.2
	3	0.267	67.8	0.153	61.0	0.419	65.1
	4	0.050	12.8	0.042	16.6	0.092	14.3
	5	0.006	1.6	0.010	4.1	0.017	2.6
	6	0.015	3.8	0.009	3.6	0.024	3.7
	7+	0.047	11.8	0.031	12.5	0.078	12.1
	Total	0.394		0.250		0.644	
All	1	(10)	0.0	0.068	1.9	0.068	1.1
	2	0.017	0.7	0.202	5.5	0.219	3.5
	3	1.819	71.6	2.718	74.3	4.537	73.2
	4	0.432	17.0	0.479	13.1	0.912	14.7
	5	0.060	2.4	0.063	1.7	0.123	2.0
	6	0.031	1.2	0.031	0.8	0.062	1.0
	7+	0.183	7.2	0.097	2.6	0.279	4.5
	Total	2.542		3.657		6.199	

7.2.2.3 Stock assessment and status

In Lake Erie, there are two walleye stocks in the western and eastern basins. The former is predominantly in the central to western areas of the lake, which support the fishery subject to assessment and previous MSC certification (Intertek 2015). There are four MUs in Lake Erie defined by the Walleye Task Group and the Lake Erie Committee. For purposes of the walleye population assessment and management, Lake Erie is divided into five management units (Figure 12). MU1 includes the western basin of Lake Erie, MUs 2 and 3 cover the central basin of the lake, and MU4 covers the Pennsylvania Ridge area and the area surrounding Long Point Bay and Presque Isle as the lake transitions between the central and eastern basins. MU5 encompasses the eastern basin.

Various fisheries-dependent and -independent surveys are conducted annually throughout Lake Erie. A combination of four general surveys is used to assess walleye in Lake Erie (Kayle et al. 2015, Table 1.1). Gill-net monitoring in Ontario involves commercial gill nets and a partnership gill-net survey. These provide harvest, effort, and age data from the collection of structures (Kayle et al. 2015). Two fall gill-net assessments are conducted by New York, as well as Michigan and Ohio. These assessments provide catch-per-unit-effort data and age structures. An important young-of-the-year trawl survey conducted by Ontario and Ohio provides catch-per-unit-effort data. Sport-fishing surveys conducted by four states – Ohio, Michigan, New York, and Pennsylvania – provide harvest effort data and age structures. As well, creel census surveys are conducted.

The partnership gill-net index is a co-operative fisheries assessment program conducted jointly between the Ontario Commercial Fisheries Association (OCFA) and the OMNRF. The program, which has been in place since 1989, monitors abundance, size, and species composition throughout Lake Erie. Information collected is applied in catch-at-age analyses to estimate population abundance for walleye, as well as yellow perch (OMNR 2008). Until 1997, the index gill-net survey was conducted by volunteer commercial fishers with onboard OMNR industry-selected technicians, who maintained the sampling protocol. However, since 1997, the surveys have been conducted by OCFA/OMNR selected technicians deployed on contract vessels. Since 1997, surveys are completed much quicker, which is beneficial when assessing migratory species such as walleye.

Standard survey gears are used in Ontario, Ohio, and Michigan to assess the population of ages 2 and older walleye across the Lake Erie TAC area (Kayle et al. 2015). Ontario uses a lake-wide partnership fall index gill-netting survey program at stratified random sites, while Michigan uses fall gill nets at index stations and Ohio uses a fall gill-net survey at stratified random sites across the western and central basins. All fish caught during the surveys are identified, counted, and weighed on a bulk basis by species and mesh size. Biological sampling for selected species includes length, weight, sex, maturity status, gonad weight, and collection of age assessment structures. Survey results include total catch, mean species biomass, and age-specific information for walleye.

Ohio and Ontario assess the age 0 hatch each year by combining data from the August trawl surveys performed across the western basin. The OMNRF has been involved in conducting interagency trawl surveys in the western basin (MU1) since 1987 and in the eastern basin (MU4) since 1980 (see MU locations, Figure 1). The trawl index is used to assess year-class strength of species based on catches of young-of-the-year and older walleye. Data collected by the surveys are used by the Lake Erie Walleye Task Group to project abundance of 2-year-old walleye in advance of recruitment into the fishery. The trawl index contributes knowledge of species composition, forage abundance, and growth trends. In addition, walleye are subsampled for age interpretation (OMNR 2008, OMNRF 2016). These data are calculated in catch per ha and the fishery year performance factors are employed to account for differences in gear and employment methods (see Tyson et al. 2016).

All these data, along with the harvest assessment data, are used to inform the ADBM catch-ag-age models for population estimates and age 2 recruitment using a standard regression method between age 0 trawl values and age 2 population estimates (WTG 2019). A Blue Ribbon Panel was convened in 2004 and 2005 to ensure that all best management practices were being used to assess the performance of the fisheries and the status of the Lake Erie percid populations (Lester et al. 2005), and the Standing Technical Committee directed and assisted the percid task groups with implementation strategies (STC 2006).

The walleye statistical catch-at-age (SCAA) population estimates of age 2 to 7 and older walleye for the western and central basins combined are generated annually with fishery and assessment survey data, using the ADMB model software. The model includes fisheries-dependent data from the Ontario commercial fishery (MUs 1–3) and sport fisheries in Ohio (MUs 1–3), and Michigan (MU1). Since 2002, the WTG model has included data collected from three fishery-independent gill-net surveys (i.e., Ontario partnership, Michigan, and Ohio). Beginning in 2011, Michigan and Ohio gill-net survey data were pooled in the SCAA because of similarities in the surveys. In 2016, Ohio switched from multifilament to monofilament gill nets after completing several years (2007, 2008, and 2010–2013) of comparison netting, using the two gear types (Vandergoot et al. 2011, Kraus et al. 2017). The ODNR multifilament gill nets were 1,300 ft in length, 6 ft deep, with 1,300-ft panels consisting of mesh sizes ranging from 2 to 5 in, with twine diameter of 0.37 mm. The monofilament gill nets are 1,200 ft long, a similar depth, with 1,200-ft panels with mesh sizes ranging from 1.5 to 5.7 in and twine diameter that varies with mesh size from 0.20 to 0.33 mm. Michigan did not similarly change gear types. In 2017, to address the change in gear types, age-specific corrections of monofilament to multifilament catches were created using age-specific linear regression models for the Ohio survey data and again pooled with the Michigan data in the SCAA model. The same methods were used again for the 2019 analyses (WTG 2019), and the Quantitative Fisheries Center at Michigan State University continues to evaluate options for incorporating the new Ohio dataset into the SCAA model.

Several models have been used to estimate Lake Erie walleye population parameters over the years (Kayle et al. 2015, Table 1.2), but since 2005, the ADMB model has been used, with an exploitation rate incorporating a sliding-F policy on walleye abundance after Quinn and Deriso (2001) and the former walleye management plan (Locke et al. 2005). The models described are used to generate the RAH for the western and central basin quote zones (MU1–MU3) for the next year. The actual SCAA model employed uses data from 1978 to the most recent year for the fisheries and assessment surveys. Recruitment estimates for the incoming age 2 fish to project abundance and projected selectivity and fishing mortality at age for the upcoming year are then incorporated to determine the RAH.

Although the models used assume that information collected from fisheries and surveys track the same cohorts through time, it has been shown that walleye resources in the eastern basin during harvest season are a mixture of walleye subpopulations from both the western and the eastern basins (Kayle et al. 2015). Recently Zhao et al. (2011) estimated that about 90% of the walleye harvested in the eastern basin were seasonal migrants from the western basin. The walleye population of the eastern basin consists of mixed stocks, including those originating from eastern basin shoals, the Grand River (Ontario), U.S. tributaries, and migrants from the western portion of the lake (OMNRF 2016). Representation of walleye is typically greater in eastern Lake Erie compared with other regions of the lake. The average age of walleye in eastern basin is due in part to the contribution of older migratory individuals originating from the western basin. Given regional differences in productivity, recruitment dynamics, stock composition, and socio-economic considerations, the walleye RAH on which the TAC is based encompasses only Lake Erie MUs 1 to 3 (Kayle et al. 2015).

The Lake Erie Percid Management Advisory Group (LEPMAG) developed an updated walleye model, which the WTG began using in 2013. The model includes 1) estimated selectivity for all ages within the model without the assumptions of known selectivity at age; 2) integrated age 0 trawl survey data into the model; 3) a multinomial distribution for the age-composition data; and 4) time-varying catchability using a random walk for fishery and survey data, including the age 0 trawl-survey instantaneous natural mortality. It is assumed to be constant (*M* = 0.32) among years (1978–2018) and ages (ages 2 through 7 and older). Abundances at age were derived from the estimated parameters, using an exponential survival equation.

Currently the young-of-the-year index for the interagency western basin bottom-trawl survey (Figure 16) is integrated into the SCAA model to estimate age 2 walleye abundance and forecast recruitment. The interagency bottom-trawl survey is considered to be a robust recruitment predictor. Inclusion of addition young-of-the-year and yearling indices to form a composite recruitment index could supplement recruitment estimates (see two limiting factors detailed by the WTG 2019).

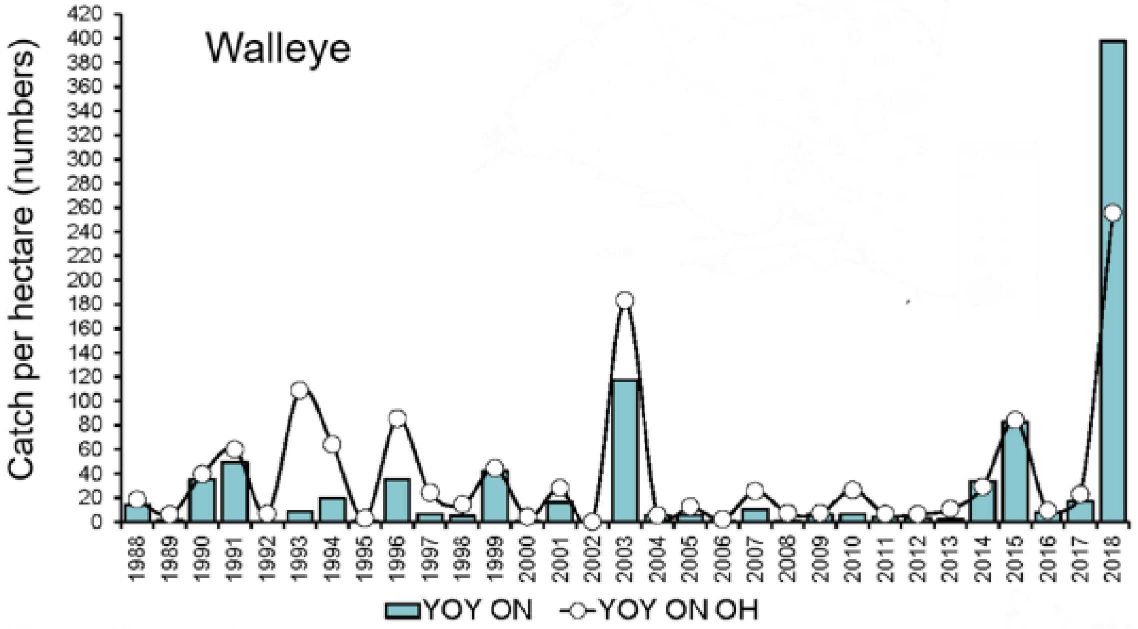


Figure 14. Number of young-of-the-year walleye caught per hectare during interagency trawling in western Lake Erie, 1988 to 2018. Young-of-the-year catches are provided for Ontario and Ohio, with data from Lake Erie Management Unit, Draft Annual Report 2018 and illustrated from OCFA Annual Convention 2019, OMNRF PowerPoint slide deck.

Young-of-the-year recruitment indices provide important insights concerning possible trends in spawning-stock biomass. Also young-of-the-year walleye enter the fishery quite consistently 2 years later (WTG 2019). Recently the 2014 and 2015 year classes have been quite strong, and the 2018 year class was exceptionally large, by far the largest in the past 31 years (Figure 17). Walleye recruitment has increased in recent years after a low period from the mid-2000s to the early 2010s. The 2018 year class far surpasses the size of the 2003 year class, one of the largest over the past three decades. Earlier, the 1983 and 1987 year classes were also quite strong. Those year classes were associated with strong El Nino conditions, supporting the conclusions of Zhang et al. (2018) that successful fisheries management as practised now in Lake Erie resulted in dynamics more affected by environment than by harvest. The values for the young-of-the-year recruitment indices in numbers of fish per ha are provided in Appendix 1.

In the past 3 years, there has been an increase in abundance of walleye age 2 and older in the west and central basins in Lake Erie (Figure 16). This is a substantial increase over the early 2010s. Considering the abundance of walleye over the past four decades, they were most abundant from the mid- to late 1980s (Figure 16). Numbers were lower and at more moderate levels from the early 1990s until the strong 2003 year class appeared. As mentioned, the abundance in the 1990s was in part driven by the strong El Nino year classes of 1983 and 1987. The very strong 2003 year class created record-high abundance of walleye in 2005 to 2007 in Lake Erie. The abundance of age 2 and older walleye increased to more than 120 million age 2 and older walleye in 2005. In subsequent years, estimates of abundance for this year of strong recruitment increased. By 2007, without another strong year class to buoy up the population, walleye abundance began to decline, and the 2009 population again decreased to just above an estimated 50 million age 2 and older walleye. Abundance in the mid- to late 2000s was the highest seen in the past 42 years (WTG 2019). Given the exceptional strength of the recent 2018 year class and the overall increase in abundance of walleye, this important target species in Lake Erie remains highly productive and populations remains sustainable, supporting important and valuable fisheries (SAI Global 2019).

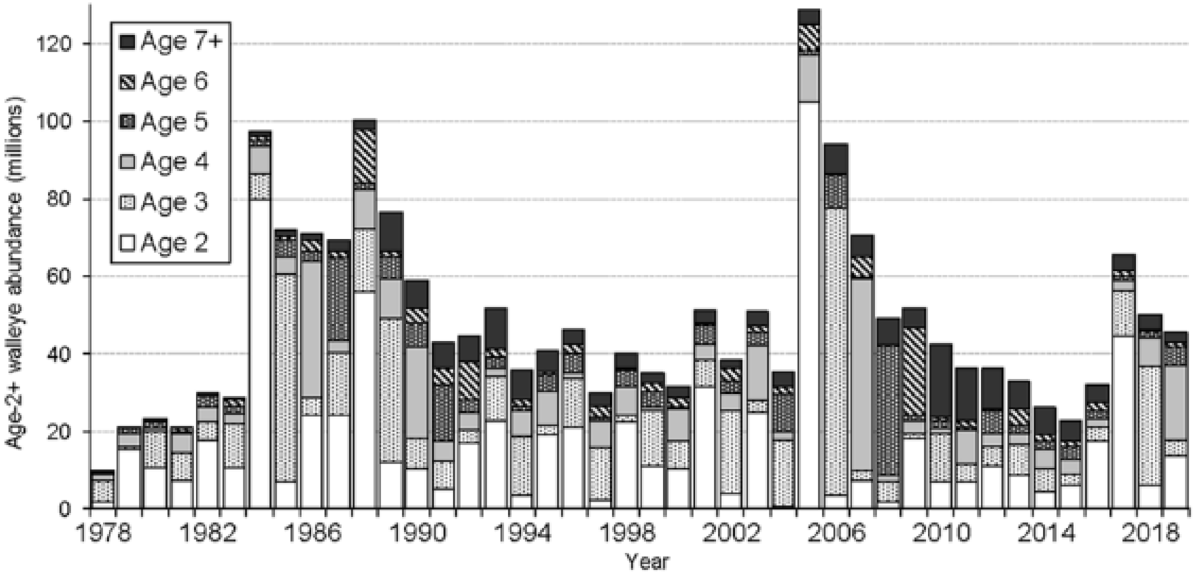


Figure 15. Abundance at age for ages 2 and older walleye (millions) in the west and central basins of Lake Erie, 1978 to 2019, from the 2019 ADMB integrated model analysis. From WTG (2019, Table 8, Figure 7).

7.2.2.4 Harvest strategy, control rules, and reference points

The harvest strategy is composed of linked harvest control rules, tools in the form of regulations, monitoring, and assessment procedures to ensure that management objectives are successfully achieved. These objectives operate through the use of reference points. Following a 1970 harvest moratorium resulting from walleye mercury levels exceeding consumption standards, walleye quotas were introduced internationally in 1976 for Lake Erie (Kayle et al. 2015). Over the past four decades, the Walleye Task Group and the LEC have used a number of different techniques, models, and harvest strategies to manage Lake Erie walleye populations and fisheries. These are provided in the various Walleye Management Plans and specifically documented and listed in the 2015–2019 plan (Kayle et al. 2015). Changes over time reflect changes in knowledge and fisheries management practices.

Low population abundance levels and spatial structure can lead to circumstances where recruitment can be affected and associated fisheries may not be sustainable. Therefore, management actions must be implemented to constrain fisheries to protect the spawning stock. These population thresholds represent limit reference points that determine when a change in fisheries policy is warranted and implemented.

In the 1970s, the Walleye Task Group estimated walleye abundance by sequential projection, using fishery harvest data, estimated mortality rates, and western basin young-of-the-year trawl indices. In the early 1980s, the WTG started adjusting fishing rights to better align with the fishing harvest and estimates of walleye abundance. In the late 1980s, because of concerns that techniques were underestimating year-class strength, the WTG began using catch-at-age modelling. By 1990, the WTG had revised the population model and harvest rule, replacing the sequential projection method with new CAGEAN methods. Over the following decade, CAGEAN-based and optimal fishing mortality policies were used to determine annual total allowable catch. In the late 1990s, the scaling method was changed so that individual age groups would not be fished at rates higher than target (Kayle et al. 2015).

In response to population declines precipitated by a combination of fishing pressure, poor recruitment, and environmental changes influenced by dreissenid invasion, the LEC initiated the Coordinated Percid Management Strategy for 3 years from 2001 to 2003, in which the annual TAC was set at a maximum of 3.4 million fish and subsequently at 30% of this level because of continued population decline. The strategy defined two primary objectives: first, to reduce declines and rebuild percid stocks, and second, to improve methods used to estimate percid abundance and determine harvest levels that would be sustainable. The WTG explored moving to more state-of-the-art population modelling involving Auto Differentiation Model Builder (ADMB), Statistical Catch-at-Age (SCAA) software (Quinn and Deriso 1999).

The LEC decided that a new Walleye Management Plan was required to help ensure that the population would not require such a rapid and dramatic management action as was needed during the Coordinated Percid Management Strategy. In 2005, the first Lake Erie Walleye Management Plan (Locke et al. 2005) was adopted, with the key components of establishing sustainability and defining fishery-quality objectives that the LEC employed as a basis for walleye management. The primary objectives for the fishery in this plan were to: 1) secure a balance in the cool-water fish community with walleye as a keystone predator in the western and central basins and the nearshore waters of the eastern basin; 2) provide sustainable harvests of walleye throughout; 3) maintain and promote genetic diversity and maintain walleye catches and sport and commercial harvest at average or better levels.

As part of the 2005 management plan review, management options were identified, along with key uncertainties, including catchability, sensitivity at age, *M*, current abundance, stock recruitment relationship, and the relationship between angler effort and abundance. The performance of the management options was evaluated. Simulations indicated that the walleye population is influenced more by recruitment than by fishing mortality. The LEC recommended a review of the WMP, which was implemented in 2009. Conclusions from the review are varied. Some fisheries catch-rate objectives were achieved (commercial catch rates), while others, such as angler catch rates, were not. Instability in harvest and TAC, in part because of recruitment variances, concerned both fisheries managers and stakeholders. Final recommendations were not made, but action items were considered.

The LEC formed the LEPMAG to update the management plan with increased stakeholder engagement and transparency. From 2010 to 2012, LERGMAG members were involved in a series of five facilitated workshops that defined fisheries objectives for the Lake Erie walleye population and described the current assessment programs, data sources, stock assessment model and LEC HCR. In early 2012, a Technical Review Panel of modelling and fisheries management experts reviewed the SCAA stock assessment model and made recommendations for LEPMAG to consider for improving the stock assessment model. The QFC was involved and incorporated these recommendations into a formal Walleye Management Strategy Evaluation (see below) (WTG 2013).

Discussion and analysis of the management options evolved into a full management-strategy evaluation of the walleye fishery in an attempt to evaluate the robustness of achieving management objectives in the face of observational process and implementation uncertainties. The MSE is generally accepted as a highly effective means of defining robust management plans. This MSE was conducted during 2010 to 2013 and resulted in a comprehensive examination of the harvest control rules.

Early implementation of the Lake Erie Walleye Harvest Control Rules involved setting a Fishing Rate and calculating RAH by altering fishing mortality based on estimates of the walleye population, biological parameters such as unfished virgin biomass B_0, von Bertalanffy growth parameters, and calculations of F_{opt}. The first iteration of the Lake Erie Walleye Management Plan set appropriate harvest strategies after completing a QFC-WTG decision-analysis exercise that incorporated various recruitment and harvest scenarios. The Harvest Management Policy adopted by LEC in the first WMP (Locke et al. 2005) was a sliding F-scale that has feedback and varied targeted fishing mortality rates based on population abundance. While these previous models incorporated fishery target F levels and biological-limit reference points in the decision process, some felt that more effort should be devoted to examining Limit Reference Points and target levels. The QFC analysis guiding the LEPMAG process considered a range of MSY fishing mortality rates as their fishery target and limit scenarios.

Model runs by the QFC were composed of current WTG ADMB model components of fishery and survey catch, effort, age distributions, numbers of aged fish, natural mortality, weighting factors, and weight- and maturity-at-age. The model incorporated random walk catchability, model-estimated selectivity for all ages and gears, multinomial distributions for model fitting of age data, and an integrated age-0 regression method for estimating incoming recruitment. Also in a separate stock-recruitment ADMB model, estimates of recruitment, spawner biomass, weight- and maturity-at-age, selectivity and M were used to generate SSB_0, MSY, and F_{msy} parameter estimates and associated error bounds. The first ADMB model would inform parameters in the second ADMB model, which would then inform parameters that would go back into a modified version of the first ADMB model for walleye population simulation projections. Harvest control rules were varied by defining different fishery targets and biological reference points and summarizing outcomes and performance metrics generated from the simulations. Multiple simulations showed population and fisheries performance over a suite of fishing.

The QFC presented a number of different scenarios for assessing target fishing mortality in the HCR model process for inclusion in a revised Walleye Management Plan. Several limit reference points were examined to explore where thresholds could be set that, when crossed as populations decline, would determine a change in fishing mortality. The reference points were based on population-maturity information and stock-recruitment estimation. From these data, an ADMB model was built and run to estimate the unfished spawning stock biomass (SSB_0). A range of options, beginning with a benchmark reference point of $20\%SSB_0$, was considered. Based on recommendations from the LEPMAG, the QFC presented a probabilistic control rule to the harvest policy strategy scenarios to determine the risk of falling below the SSB_0 limit reference point in the year following implementation of the TAC at the harvest-policy fishing rate. This probabilistic risk value, known as P* (P star), is defined as *a priori* in advance of the model runs as an input value. P* represents the risk tolerance for management decisions that would result in the probability SSB slipping below a specific percent of SSB_0. Various levels were examined. TAC constraints were considered as they pertain to sustaining harvest, which would benefit not only commercial fishing operations but also charter-boat enterprises. Different population models were run, with various percentages of F_{msy} and SSB_0, as well as P* specifications. In the MSE modelling process, the QFC addressed concerns regarding inequality and lag caused by a 20% TAC reduction. The QFC presented model results and performance outcomes to the LEPMAG and WTG. The LEPMAG members reviewed the model output and performance of the metrics against various walleye population and fisheries indicators, such as abundance, biomass, recruitment, commercial yield, and angler catch rates.

The QFC circulated surveys to ascertain the range of stakeholder preferences for the fisheries performance benchmarks, target F, limit reference point thresholds, and risk factors. At an October 2013 meeting, the QFC discussed with the stakeholders various HCR MSE outcomes and the preferences that LEPMAG participants desired. This process helped stakeholders realize relative risks and trade-offs for various stakeholder sectors and set a course of action for the recommended management strategies for implementing the latest WMP Harvest Control Rule (HCR). Based upon the MSE, the LEPMAG recommended an HCR that included:

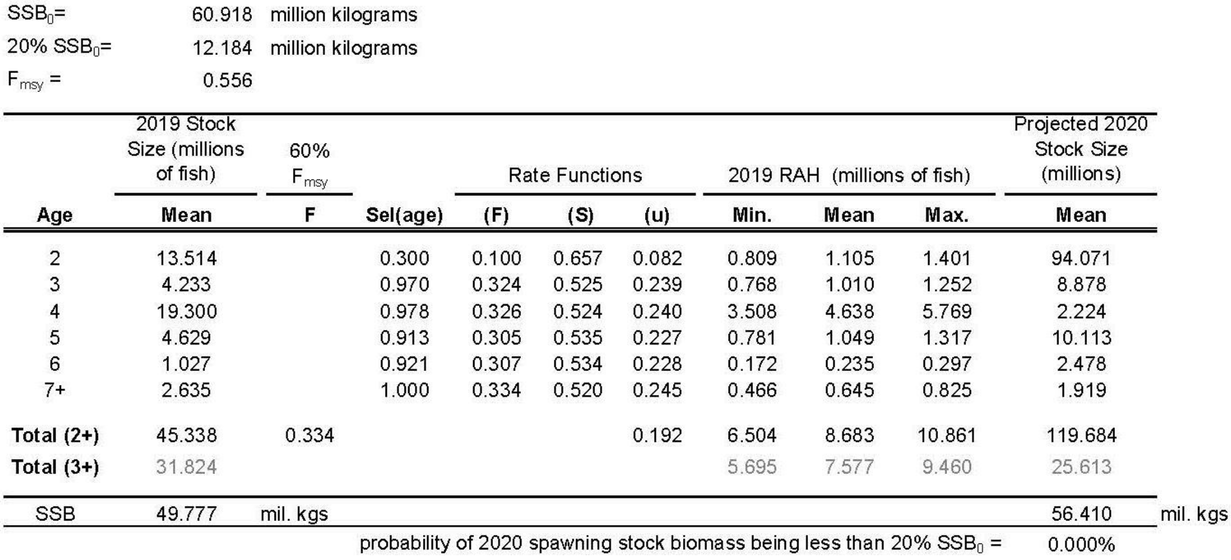
- Target fishing mortality at 60% of the Maximum Sustainable Yield ($60\%F_{msy}$)
- Threshold limit reference point of 20% of the unfished spawning stock biomass ($20\%SSB_0$)
- Would be at a risk tolerance level of P-star, P* = 0.05
- Probabilistic control rule, risk tolerance level of P star, P* = 0.05

- A limitation on the annual change in TAC of ±20%

After further deliberation, the LEC adopted the recommended HCR advanced by LEPMAG in March 2014.

Using results from the 2019 integrated SCAA model as an example, the estimated abundance of age 2 and older walleye in 2019 was 45.338 million, with the HCR being TRP = 60%F_{msy} and LRP = 20%SSB_0 (Table 14). The SSB_0 in 2019 was estimated to be 60.918 million kg. The calculated mean RAH for 2019 was 8.683 million walleye, with a range from 6.504 (minimum) to 10.861 (maximum) million walleye (Table 14). The target fishing rate (60%F_{msy} = 0.334) in the HCR was applied, since the probability that the projected spawner biomass at the beginning of 2020 (56.410 million kg) could fall below the LRP (20%SSB = 12.184 million kg) after fishing at 60%F_{msy} in 2019 was less than 5% (the probability of the 2020 spawning stock biomass being less than 20%SSB_0 = 0.000%). Thus the probabilistic control rule that might reduce the target fishing rate to conserve spawner biomass was not invoked in 2019.

Table 14. Estimated recommended allowable harvest (RAH) of walleye (millions of fish) for 2019 and population projection for 2020 when fishing with 60%F_{msy}. The 2019 and 2020 projected spawning stock biomass (millions kg) are from the ADMB 2019 recruitment integrated model. The range in RAH was calculated by using ± one standard deviation from the mean RAH. From WTG (2019, reproduced from Table 9).



SSB_0=	60.918	million kilograms
20% SSB_0=	12.184	million kilograms
F_{msy} =	0.556	

	2019 Stock Size (millions of fish)	60% F_{msy}		Rate Functions			2019 RAH (millions of fish)			Projected 2020 Stock Size (millions)
Age	**Mean**	**F**	**Sel(age)**	**(F)**	**(S)**	**(u)**	**Min.**	**Mean**	**Max.**	**Mean**
2	13.514		0.300	0.100	0.657	0.082	0.809	1.105	1.401	94.071
3	4.233		0.970	0.324	0.525	0.239	0.768	1.010	1.252	8.878
4	19.300		0.978	0.326	0.524	0.240	3.508	4.638	5.769	2.224
5	4.629		0.913	0.305	0.535	0.227	0.781	1.049	1.317	10.113
6	1.027		0.921	0.307	0.534	0.228	0.172	0.235	0.297	2.478
7+	2.635		1.000	0.334	0.520	0.245	0.466	0.645	0.825	1.919
Total (2+)	45.338	0.334				0.192	6.504	8.683	10.861	119.684
Total (3+)	31.824						5.695	7.577	9.460	25.613
SSB	49.777	mil. kgs								56.410 mil. kgs

probability of 2020 spawning stock biomass being less than 20% SSB_0 = 0.000%

The original certification assessment examined F_{target} (FTR), which had been set at 60%F_{msy} (2013 –0.296), which was 93% of *M* (Intertek 2015). Zhou et al. (2012), in an empirical study of F target reference points , noted that targets which are 87% of M provided the best management results. This F_{target} was consistent with this finding. The HCR does not explicitly use a biomass target reference point, although fishing at 60%F_{msy} implied an SSB of 27.889 million kg, which is 65% of SSB_0. When the LRP is set to 20%SSB_0, the MSC default TRP consistent with SSB_{msy} may be assumed to be two times the LRP, or 40%SSB_0. The Intertek (2015) review emphasized that the implied SSB target of the HCR and fishing at 60%F_{msy} was significantly more precautionary than fishing toward SSB_{msy}.

During the most recent 6-yr period (2014–2019), encompassing the time after the initial MSC certification of the walleye fishery, the unfished SSB_0 of walleye in Lake Erie has increased substantially, from approximately 50 million kg to 60 million kg (Table 15). The SSB has shown a progressive increase over the period of time, ranging from approximately 29 million kg in 2014 to 50 million kg in 2019. The LRP, using the MSC default 20%, SSB_0 has increased from 10 to approximately 12 million kg. On a relative scale, the LRP ratio has increased considerably, from approximately 2.5 to 4.0, and is well above 1. Similarly, the TRP of 40%SSB_0 has increased over this 6-yr period, and the TRP ratios have been relatively stable, greater than 1, and show an increasing trend from approximately 1.3 to 2.0 (Table 15).

Table 15. Lake Erie walleye spawning-stock biomass and recommended allowable harvest (RAH) and total allowable catch (TAC) (millions kg), including relative changes in these, 2014–2019. Includes biomass limit reference points (LRP) and target reference points (TRP) and ratios, as well as fishing mortality and associated reference points and ratios. From WTG (2014a, b); WTG (2015a, b); WTG (2016a, b); WTG (2017a, b); WTG (2018a, b); WTG (2019a, b); and LEC (2014, 2015, 2016, 2017, 2018, 2019b).

															Harvest	
Year	SSB_0	SSB	LRP 20% SSB_0	LRP ratio	TRP 40%SSB_0	TRP ratio	F	60% F_{MSY}	F ratio	Total RAH	Change in RAH (%)	TAC	Change in TAC (%)	TAC relative to RAH (%)	Actual	Relative to TAC (%)
2014	50.208	28.886	10.042	2.88	20.083	1.44	0.104	0.320	0.325	4.207	+45.7	4.027	+20.0	-4.3	2.869	71.2
2015	55.438	28.634	11.088	2.58	22.175	1.29	0.126	0.316	0.399	4.114	-2.2	4.114	+2.2	0	2.713	65.9
2016	63.865	32.437	12.773	2.54	25.546	1.27	0.107	0.318	0.336	4.998	+21.5	4.937	+20.0	-1.2	3.078	62.3
2017	61.613	37.583	12.335	3.05	24.670	1.52	0.097	0.289	0.336	6.965	+39.4	5.924	+20.0	-14.9	4.913	81.9
2018	60.774	44.958	12.155	3.70	24.310	1.85	0.097	0.323	0.297	8.809	+26.5	7.109	+20.0	-19.3	6.271	88.2
2019	60.918	49.777	12.184	4.09	24.368	2.04	0.129	0.334	0.386	8.683	-1.4	8.531	+20.0	-1.8		

Considering the recent period since 2014, F_{msy} has varied between 0.481 in 2017 (WTG 2017) and 0.556 in 2019 (WTG 2019). The 60%F_{msy} target fishing mortality has varied somewhat, from a low in 2017 of 0.289 to a high in 2019 of 0.334 (Table 15). Age 2+ fishing mortality has shown an increasing trend in recent years, commencing in 2012 (Figure 18). Fishing mortality increased markedly in 2018 after 2 years of decline and is now the highest since 2000 and slightly greater than in 2015, which was also high (Figure 18). On a relative scale, the fishing mortality/60%F_{msy} target ratio has ranged between 0.297 and 0.399 in the last 6 years and has remained well below 1 (Table 15).

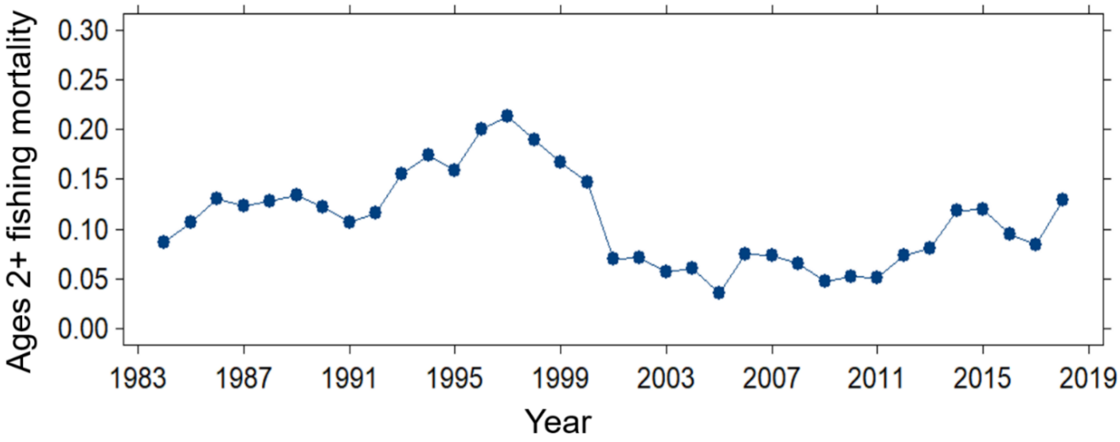


Figure 16. Comparison of walleye ages 2 and older, west-central fishing mortality (F) for Lake Erie, 1984 to 2018, assessed by the Walleye Task Group, 2019; data from respective assessments. From WTG (2019, Table 8).

Overall, the most recent assessments (WTG 2019) indicate an increase in walleye stock status, with SSB being well above the B_{limit} and B_{target} reference points. Even though fishing mortality has increased since 2011, there was a slight decrease in 2016 and 2017 (Figure 18), with an appreciable increase in 2018; all years remain well below target.

Concerning the management strategies and plans associated with the Lake Erie walleye population and fisheries, the 2005 Walleye Management Plan guided the walleye fishery until a new 2015–2019 plan was developed and adopted in 2015 (Kayle et al. 2015). The plans are considered to be living documents, with planned evaluation after 5 years to determine if they continue to meet goals and objectives. This most recent plan was in place until 2019. In July 2018, the LEC announced an extension of the walleye plan of 2015–2019 (Appendix 3). This decision was made after a review of available data and consultation with all stakeholders of Lake Erie jurisdictions. This decision would extend the plan, and a performance evaluation would commence in 2024. This decision was based on the following facts: 1) the current plan was working well, with harvest policy adapting to annual fluctuation and abundance; 2) recruitment of strong year classes in 2014 and 2015 minimizing the risk to the walleye fishery, and now there appears to be an exceptionally strong year class in 2018; 3) fisheries, both sport and commercial, are performing well; 4) would allow agencies to continue to shift efforts toward completion of the development of a revised Yellow Perch Management Plan; and 5) would allow the completion of current research over the next 4 years, considering the extent of the eastern basin stock contribution, migration rates from west to east basin, composition of the mixed-stock fisheries, and a refinement of the estimates of natural mortality. The LEC is committed to monitoring data trends to ensure overall sustainability of the walleye populations and the fisheries that depend on them.

7.2.2.5 Catch profiles

Over the past 20 years, harvest of walleye in Lake Erie by all types of gear provides a catch profile that indicates that during 2006 and 2007, as well as 2017 and 2018, there was a prominent increase to 5 to 6 million fish. Mean overall catch for all methods in Lake Erie during this 20-year period was 3.355 thousands of fish (Table 16). This was somewhat lower than for the approximately four-decade period from 1975, which was 4.296 thousands of fish. Over the past 20 years, commercial harvest in Ontario averaged 1.955 million fish, while the sport harvest accounted for 1.401 million fish (Table 16). The commercial harvest accounted for 57.2% of the overall catch, whereas the sport harvest accounted for 42.8%. During the same period, MU1 accounted for the greatest overall sport harvest, 0.866 million fish. This is less than half of the harvest for that MU over the 43-year period since 1975 – 1.758 million fish. Peak harvests during this period were in 2018, followed by 2006, next by 2017, and then 1999 (Table 16). The sport harvest in MU1 of 0.866 million fish accounted for 62.5% of the overall sport harvest of the species in Lake Erie. The highest sport harvest was in MU1, followed by MU1, then MU3, and finally MUs 4 and 5, with an absolute and relative sport harvest in the latter three of 0.266 (18.4%), 0.148 (10.7%), and 0.122 (8.5%) million fish, respectively. Considering the 44-year period since 1975, harvest rates in MU2 and MU3 in recent years are almost comparable but MUs 4 and 5 are much greater, almost double, in (Table 16).

Table 16. Walleye harvest (thousands of fish), by management unit and gear type along with percent by gear type and total, 1999–2018. Means and 95% confidence intervals for this 20-year period are provided, along with the overall means for the 43-year period 1975–2017. Sport fishery for Management Unit 1 includes Ohio, Michigan, and Ontario; Units 2 and 3, Ohio and Ontario; Units 4 and 5, Ontario, Pennsylvania, and New York. From WPG (2019, Table 2).

	Sport fishery												
	Management Unit										Commercial Ontario		Total all gear types
	MU1		MU2		MU3		MUs 4 and 5		Total				
Year	Harvest	%	Harvest	%	Harvest	%	Harvest	%	Harvest	%	harvest	%	
1999	986	73.1	144	10.7	88	6.5	131	9.7	1,349	27.9	3,477	72.0	4,827
2000	961	71.0	170	12.6	98	7.2	125	9.2	1,354	37.1	2,291	62.9	3,645
2001	1,135	78.3	176	12.1	51	3.5	87	6.0	1,449	49.6	1,475	50.4	2,924
2002	744	74.4	146	14.6	51	5.1	59	5.9	1,000	41.5	1,409	58.5	2,409
2003	878	69.6	237	18.8	73	5.8	73	5.8	1,261	46.9	1,427	53.1	2,688
2004	664	63.8	274	26.3	72	6.9	30	2.9	1,040	42.9	1,386	57.1	2,426
2005	438	60.4	112	15.4	126	17.4	49	6.8	725	19.9	2,920	80.1	3,645
2006	1,526	63.8	505	21.1	170	7.1	191	8.0	2,392	40.4	3,532	59.6	5,924
2007	1,607	64.2	580	23.2	169	6.8	147	5.9	2,502	53.6	2,167	46.4	4,669
2008	689	50.9	335	24.7	225	16.6	105	7.8	1,354	46.4	1,565	53.6	2,919
2009	691	59.3	288	24.7	128	11.0	58	5.0	1,166	52.0	1,079	48.1	2,244
2010	686	59.5	259	22.5	115	10.0	93	8.1	1,152	54.5	962	45.5	2,115
2011	318	53.6	106	17.9	90	15.2	79	13.3	593	32.9	1,208	67.1	1,801
2012	726	63.8	235	20.7	93	8.2	84	7.4	1,138	46.0	1,338	54.0	2,476
2013	855	66.8	192	15.0	136	10.6	96	7.5	1,280	50.4	1,260	49.6	2,540
2014	996	63.2	190	12.0	231	14.6	160	10.1	1,577	55.0	1,292	45.0	2,869
2015	857	64.7	200	15.1	153	11.5	115	8.7	1,325	48.9	1,388	51.2	2,713
2016	688	63.1	152	13.9	153	14.0	97	8.9	1,090	35.4	1,988	64.6	3,078
2017	694	42.4	330	20.2	367	22.4	246	15.0	1,636	33.3	3,277	66.7	4,913
2018	1,177	44.8	679	25.8	365	13.9	407	15.5	2,627	41.8	3,657	58.2	6,284
Mean	866	62.5	266	18.4	148	10.7	122	8.4	1,401	42.8	1,955	57.2	3,355
± 95% CI	148	4.3	73	2.4	42	2.3	39	1.5	252	4.4	426	4.4	604
1975 to 2017 Mean	1,758	77.2	275	12.1	179	7.9	67	2.9	2,259	52.6	2,037	47.4	4,296

The long-term (42-year) catch profiles of walleye harvested in Lake Erie in millions of fish emphasize the importance and value of this targeted species. The fishery was at record-high levels in the late 1980s but may not have been sustainable. Since the early 1990s, both commercial and sport harvest have fluctuated somewhat, slightly higher in the 1990s and higher in 2006 and 2007 as a result of the 2003 year class, but increased in recent years (Figure 19). Overall, harvest in the past two decades has been quite consistent, typical of a well-managed, sustainable commercial and sport fisheries.

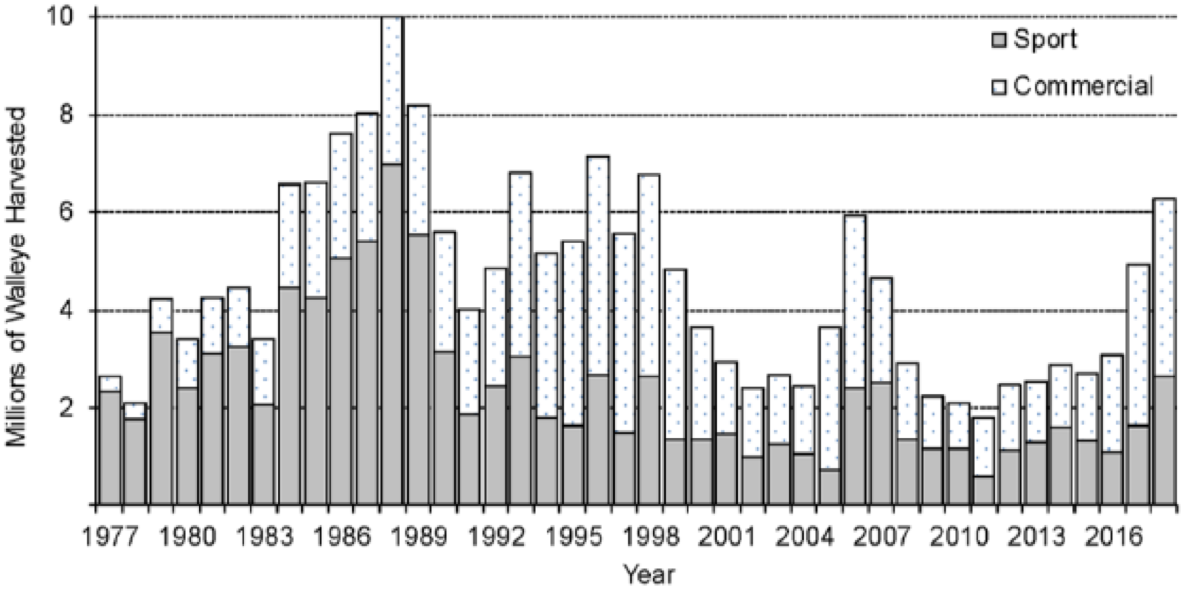
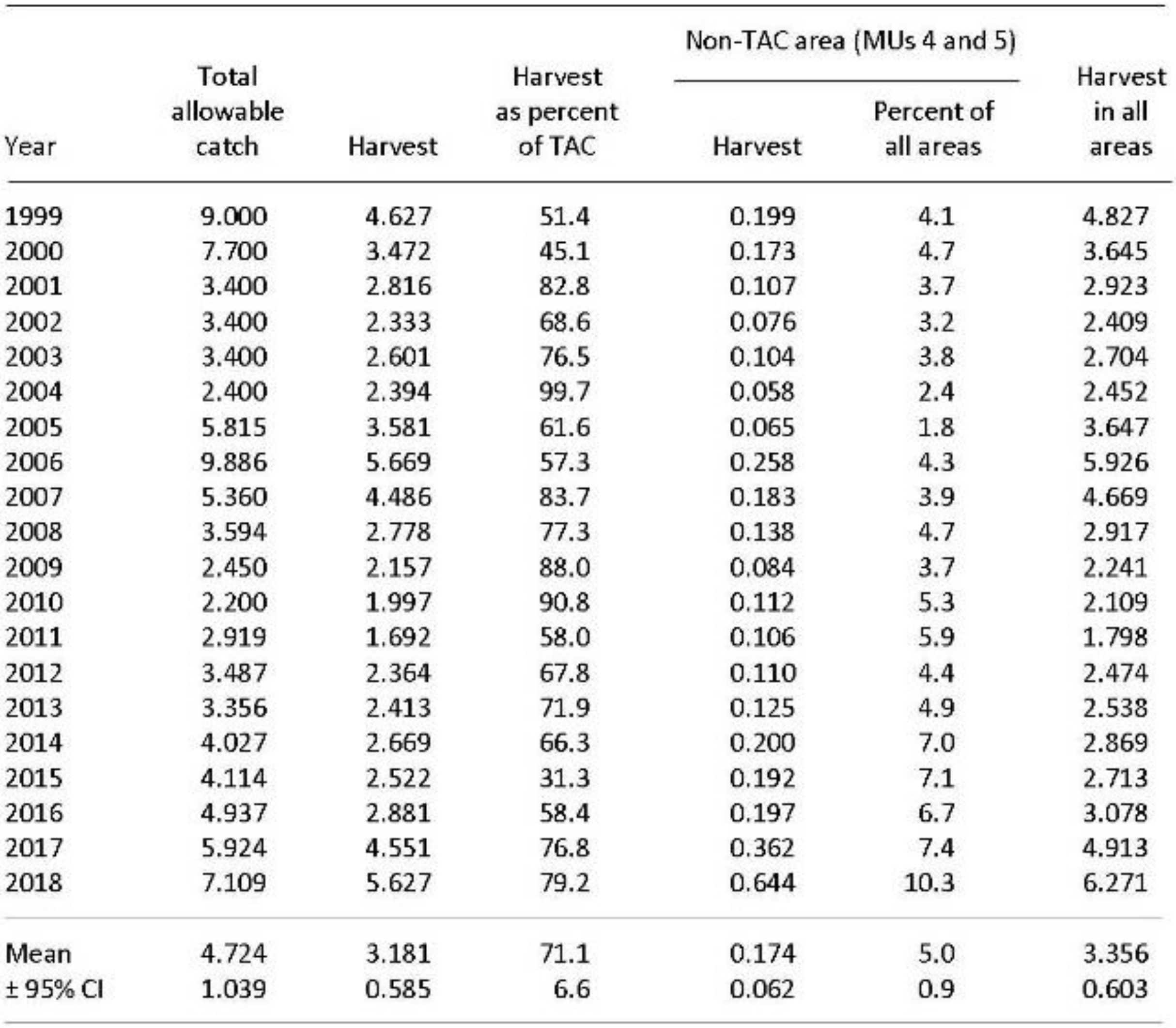


Figure 17. Walleye harvest (millions of fish) for the sport and commercial fisheries of Lake Erie, 1977 to 2018. From WTG (2019, Figure 2).

7.2.2.6 TAC and catch data

The Lake Erie Committee each spring establishes and announces the walleye TAC at the annual spring lake meeting of the Great Lakes Fishery Commission. The TAC is based on the recommended allowable harvest provided by the Walleye Technical Group. An examination of the TAC for a 20-year period from 1999 to 2018 indicates that the highest TAC was set in 2006, at 9.886 million walleye, with the lowest in 2010 at 2.200 million fish (Table 17). The average TAC for the period was 4.724 million walleye. The TAC in 2018 was set at 7.109 million fish, which was the third highest annual value for the period. The others were two decades earlier, in 1999 and 2000. Average overall harvest for the period was 3.181 million fish, which was 71.1% of the TAC. The percent harvest in relation to the TAC was lowest in 2015, at 31.3%, and highest in 2004, at 99.7%. There is a non-TAC area (MUs 4 and 5), which constitutes a relatively small harvest, on the average 0.174 million walleye (Table 17). The harvest, including all areas, for the 20-year period averaged 3.356 million fish, with the highest in 2018, 6.271 million fish, and the lowest in 2011, 1.798 million walleye.

Table 17. Total allowable catch and measured harvest of walleye (millions) by area (MU1, MU2, MU3) and non-TAC area (MU4 and 5), along with totals and percent by area, 1999–2018. Means and 95% confidence interval (CI) for this 20-year period are provided. Total allowable catch for areas MU1, 2, 3 include Michigan, Ohio, and Ontario, and non-TAC catch for area MUs 4 and 5 includes New York, Pennsylvania, and Ontario. From WTG (2019, Table 1).



				Non-TAC area (MUs 4 and 5)		
Year	Total allowable catch	Harvest	Harvest as percent of TAC	Harvest	Percent of all areas	Harvest in all areas
1999	9.000	4.627	51.4	0.199	4.1	4.827
2000	7.700	3.472	45.1	0.173	4.7	3.645
2001	3.400	2.816	82.8	0.107	3.7	2.923
2002	3.400	2.333	68.6	0.076	3.2	2.409
2003	3.400	2.601	76.5	0.104	3.8	2.704
2004	2.400	2.394	99.7	0.058	2.4	2.452
2005	5.815	3.581	61.6	0.065	1.8	3.647
2006	9.886	5.669	57.3	0.258	4.3	5.926
2007	5.360	4.486	83.7	0.183	3.9	4.669
2008	3.594	2.778	77.3	0.138	4.7	2.917
2009	2.450	2.157	88.0	0.084	3.7	2.241
2010	2.200	1.997	90.8	0.112	5.3	2.109
2011	2.919	1.692	58.0	0.106	5.9	1.798
2012	3.487	2.364	67.8	0.110	4.4	2.474
2013	3.356	2.413	71.9	0.125	4.9	2.538
2014	4.027	2.669	66.3	0.200	7.0	2.869
2015	4.114	2.522	31.3	0.192	7.1	2.713
2016	4.937	2.881	58.4	0.197	6.7	3.078
2017	5.924	4.551	76.8	0.362	7.4	4.913
2018	7.109	5.627	79.2	0.644	10.3	6.271
Mean	4.724	3.181	71.1	0.174	5.0	3.356
± 95% CI	1.039	0.585	6.6	0.062	0.9	0.603

7.2.1 Total Allowable Catch (TAC) and catch data

Table 18. Total Allowable Catch (TAC) and catch data by UoA.

Yellow Perch UoC 1 and UoC 5				
TAC	Year (Most recent fishing year)	2018	Amount	10,498,000 lbs.
UoA (MU1) share of TAC	Year (Most recent fishing year)	2018	Amount	3,031,000 lbs.
UoC 1 share of TAC	Year (Most recent fishing year)	2018	Amount	1,231,000 lbs.
UoC 5 share of TAC	Year (Most recent fishing year)	2018	Amount	1,525,000 lbs.
Total green weight catch in UoC 1	Year (Most recent fishing year)	2018	Amount	1,248,042 lbs.
	Year (second most recent)	2017	Amount	1,271,282 lbs.
Total green weight catch in UoC 5	Year (Most recent fishing year)	2018	Amount	439,720 lbs.
	Year (second most recent)	2017	Amount	447,263 lbs
Yellow Perch UoC 2 and UoC 6				
TAC	Year (Most recent fishing year)	2018	Amount	10,498,000 lbs.
UoA (MU2) share of TAC	Year (Most recent fishing year)	2018	Amount	3,237,000 lbs.
UoC 2 share of TAC	Year (Most recent fishing year)	2018	Amount	1,476,000 lbs.
UoC 6 share of TAC	Year (Most recent fishing year)	2018	Amount	1,761,000 lbs.
Total green weight catch in UoC 2	Year (Most recent fishing year)	2018	Amount	1,203,738 lbs.
	Year (second most recent)	2017	Amount	1,434,716 lbs.
Total green weight catch in UoC 6	Year (Most recent fishing year)	2018	Amount	528,234 lbs
	Year (second most recent)	2017	Amount	590,447 lbs.
Yellow Perch UoC 3 and UoC 7				
TAC	Year (Most recent fishing year)	2018	Amount	10,498,000 lbs.
UoA (MU3) share of TAC	Year (Most recent fishing year)	2018	Amount	3,776,000 lbs.
UoC 3 share of TAC	Year (Most recent fishing year)	2018	Amount	1,975,000 lbs.
UoC 7 share of TAC	Year (Most recent fishing year)	2018	Amount	1,223,000 lbs.
Total green weight catch in UoC 3	Year (Most recent fishing year)	2018	Amount	1,743,212 lbs.
	Year (second most recent)	2017	Amount	1,964,728 lbs.
Total green weight catch in UoC 7	Year (Most recent fishing year)	2018	Amount	439,233lbs.
	Year (second most recent)	2017	Amount	449,979 lbs
Yellow Perch UoC 4				
TAC	Year (Most recent fishing year)	2018	Amount	10,498,000 lbs.
UoA (MU4) share of TAC	Year (Most recent fishing year)	2018	Amount	454,000 lbs.
UoC 4 share of TAC	Year (Most recent fishing year)	2018	Amount	263,000 lbs.
Total green weight catch in UoC 4	Year (Most recent fishing year)	2018	Amount	272,067 lbs.
	Year (second most recent)	2017	Amount	177,475 lbs.
Walleye UoC 8 (QZ1, QZ2, QZ3-W)				
TAC	Year (Most recent fishing year)	2018	Amount	7,109,000 (# of fish)
UoA share of TAC	Year (Most recent fishing year)	2018	Amount	7,109,000 (# of fish)
UoC 8 share of TAC	Year (Most recent fishing year)	2018	Amount	2,989,135 (# of fish)
Total green weight catch in UoC 8	Year (Most recent fishing year)	2018	Amount	6,934,794 lbs.
	Year (second most recent)	2017	Amount	6,370,707 lbs.

7.2.2 Principle 1 Performance Indicator scores and rationales

PI 1.1.1 – Stock status – Yellow Perch (All MUs 1–4 / UoAs 1-7)

PI 1.1.1		The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing		
Scoring Issue		SG 60	SG 80	SG 100
a	**Stock status relative to recruitment impairment**			
	Guide post	It is **likely** that the stock is above the point where recruitment would be impaired (PRI).	It is **highly likely** that the stock is above the PRI.	There is a **high degree of certainty** that the stock is above the PRI.
	Met?	**Yes All MUs**	**Yes All MUs**	**Yes All MUs**

Rationale

Yellow perch biomass of all MUs in recent years has been well above the LRP as determined by the default 20%SSB$_0$ 2014, 2018, and the analytically calculated LRP in 2019. As indicated in the text, the new analytically based LRP was applied in 2019 (YPTG 2019) (Table 8). This was indicated by the new yellow perch exploitation policies announced by the Lake Erie Committee in 2019 (LEC 2019a) (Appendix 2). These new policies satisfied and closed condition YP1 of the original MUs certification and provided an analytically based LRP rather than the default LRP of 20%SSB$_0$ used prior to 2019. These new analytically based LRPs satisfied and closed condition YP2 of the original certification report (Intertek 2015). The long-term biomass estimates for MUs 1–4 are illustrated in Figures 6B, 7B, 8B, and 9B. The actual SSB values are provided for each of the MUs (Table 9), along with the previous and current reference points for recent years (2014–2019) and since the first certification was completed in 2014 (Intertek 2015). The ratios of the SSB in relation to the LRPs provide a good relative indication of the status of the various stocks. The age 3+ biomass/B$_{limit}$ ratios for MUs 1–4 indicate that in 2019, compared with 2018, there was a reduction across all MUs, most markedly in MU2, which had an LRP of 1.38 (Table 9). This ratio was the lowest of all MUs in recent years, except for MU1, which had a ratio of 1.34 in 2014. All ratios for the MUs have been above 1 in the past 6 years. In 2019, the ratio remained relatively high in MU4 at 4.12 but was lower and intermediate in MU1 at 1.75 and in MU3 at 1.92. The latter two had declined from the 2017 and 2018 values, when they were above 4 (Table 9). Overall, the 2018 ratios were high, similar to 2017, in both years ranging from 2 to 4. Even though there were decreases in 2019 in all MUs, the LRP ratios were >1 (Table 9) and the SSBs for all MUs remain well above the biomass limit reference points in recent years. This indicates that the SSBs in all MUs remained strong in recent years (2014–2019) although decreasing somewhat in MU2, MU1, and MU3 in 2019. A graphic illustration of the SSB and the LRP ratios (Figure 10) indicates that the SSB trends over the past 15 years (2005–2019) remain relatively stable (Figure 10A), as do the ratios (Figure 10B), although there is a consistent decline in all MUs in 2019 (Figure 10B).

There is a high degree of certainty that the stock is above the PRI. SG 80 and 100 could be met. This applies to all Mus (and YP UoAs).

b	**Stock status in relation to achievement of Maximum Sustainable Yield (MSY)**			
	Guide post		The stock is at or fluctuating around a level consistent with MSY.	There is **a high degree of certainty** that the stock has been fluctuating around a level consistent with MSY or has been above this level over recent years.
	Met?		**Yes All MUs**	**Yes All MUs**

Rationale

PI 1.1.1	The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing

In all MUs, given the results in recent years, for the 6-yr period 2014–2019 there was a high degree of certainty that the stock has been fluctuating above or at least around the TFP. The TRPs, using the MSC default, 40%SSB_0, for MUs 1–4 for 2014 to 2018 were 2.194, 3.386, 1.931, and 0.479 million kg, respectively and for 2019, 2.258, 4.931, 5.159, and 0.717 million kg, respectively (calculated from YPTG 2019) (Table 9). TRP ratios, the age 3+ biomass/B_{target} in all MUs, decreased in 2019 and fell below 1 in MU2, a value of 0.95. Indeed, the 2019 ratios in all cases were lower than in 2017 and 2018 (Table 9). Overall, the TRP ratios indicate an improvement in recent years (2017 and 2018), particularly in MU1, but in 2019, there were marked declines in MU2, MU1, and MU3. Although stock status appears to be declining somewhat, the SSB remains above the TRP in all MUs. There may be some very recent concern around the status of yellow perch in MU2; however, this is being addressed by the YPTG and LEC, and precautionary management measures are being taken around fishing rates to protect its sustainability. F_{target} was reduced in MU2 from 0.721 to 0.353 because the MU2 fishing at F_{target} exceeded the 5% probability (P*) that the projected SSB would be equal to or less than the LRP (B_{msy}) (Table 8). The means and 95% confidence limits of the ratios for the past 6 years (provided below) confirm that MU2 and MU1 have yellow perch populations that require the greatest attention, and it is apparent that the YPTG is carefully and appropriately monitoring their status. In all MUs, fishing mortality has been relatively stable over the past 15 years but increased somewhat and uniformly across the MUs in 2019 (Figure 11A).

There is a high degree of certainty that the stock has been fluctuating around a level consistent with MSY or has been above this level over recent years. SG 80 and 100 could be met. This applies to all MUs.

References

Intertek. 2015. The Lake Erie yellow perch and walleye commercial fisheries. Public Certification Report. August 2015.

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Yellow Perch Task Group (YPTG). 2014. Report of the Lake Erie Yellow Perch Task Group, March 27, 2014. Presented to the Standing Technical Committee, Lake Erie Committee, Great Lakes Fishery Commission. 43 pages.

Yellow Perch Task Group (YPTG). 2015. Report of the Lake Erie Yellow Perch Task Group, March 23, 2015. Presented to the Standing Technical Committee, Lake Erie Committee, Great Lakes Fishery Commission. 42 pages.

PI 1.1.1	**The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing**

Yellow Perch Task Group (YPTG). 2016. Report of the Lake Erie Yellow Perch Task Group, March 30, 2016. Presented to the Standing Technical Committee, Lake Erie Committee, Great Lakes Fishery Commission. 42 pages.

Yellow Perch Task Group (YPTG). 2017. Report of the Lake Erie Yellow Perch Task Group, March 23, 2017. Presented to the Standing Technical Committee, Lake Erie Committee, Great Lakes Fishery Commission. 51 pages.

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Yellow Perch Task Group (YPTG). 2019. Report of the Lake Erie Yellow Perch Task Group, March 29, 2019. Presented to the Standing Technical Committee, Lake Erie Committee, Great Lakes Fishery Commission. 39 pages.

Stock status relative to reference points

	Type of reference point	**Value of reference point**	**Current stock status relative to reference point**
Reference point used in scoring stock relative to PRI (SIa)	20%SSB_0	LRP for 6-yr period 2014–2019. LRP using default 20%SSB_0 for 2014–2018 were MU1 = 1.097 million kg, MU2 = 1.693 million kg, MU3 = 0.966 million kg, MU4 = 0.239 million kg and LRP, analytically calculated for 2019 were MU1 = 1.585 million kg, MU2 = 3.396 million kg, MU3 = 3.523 million kg, MU4 = 0.506 million kg. (See Table 9).	LRP ratio 6-yr period 2014–2019 (mean ± 95% CI) MU1 = 2.59 ± 1.60, MU2 = 2.67 ± 1.14, MU3 = 4.11 ± 1.28, MU4 = 6.03 ± 2.62. For annual values for the period, see Table 9.
Reference point used in scoring stock relative to MSY (SIb)	40%SSB_0	TRP for 6-yr period 2014–2019, TRP using default 40%SSB_0 for 2014–2018 were MU1 = 2.194 million kg, MU2 = 3.366 million kg, MU3 = 1.931 million kg, MU4 = 0.479 million kg and TRP, calculated for 2019 were MU1 = 2.258 million kg, MU2 = 4.931 million kg, MU3 = 5.159 million kg, MU4 = 0.717 million kg. (See Table 9).	TRP ratio 6-yr period 2014–2019 (mean ± 95% CI) MU1 = 1.36 ± 0.77, MU2 = 1.36 ± 0.52, MU3 = 1.83 ± 0.54, MU4 = 3.15 ± 1.22. For annual values for the period, see Table 9.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	Applicable SGs/elements likely met	

PI 1.1.1		**The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing**			
		SG60	SG80	SG100	Likely overall PI score
UoA 1 and 5	MU 1	1 of 1	2 of 2	2 of 2	≥ 80
UoA 2 and 6	MU 2	1 of 1	2 of 2	2 of 2	≥ 80
UoA 3 and 7	MU 3	1 of 1	2 of 2	2 of 2	≥ 80
UoA 4	MU 4	1 of 1	2 of 2	2 of 2	≥ 80
Information gap indicator		Information sufficient to score PI			
Overall Performance Indicator scores added from Client and Peer Review Draft Report					
Individual scoring elements (add rows as required; delete if not scoring by elements)		Applicable SGs met per individual scoring element			Scoring element scores
		SG60	SG80	SG100	
1		X of x	X of x	X of x	
2		X of x	X of x	X of x	
3		X of x	X of x	X of x	
4		X of x	X of x	X of x	
Overall Performance Indicator score		Applicable SGs/elements met			Overall score
		SG60	SG80	SG100	
		X of x	X of x	X of x	
Condition number (if relevant)					

PI 1.1.2 – Stock rebuilding (All MUs 1–4 / UoAs 1-7)

PI 1.1.2		**Where the stock is reduced, there is evidence of stock rebuilding within a specified timeframe**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Rebuilding timeframes**			
	Guide post	A rebuilding timeframe is specified for the stock that is the **shorter of 20 years or 2 times its generation time**. For cases where 2 generations is less than 5 years, the rebuilding timeframe is up to 5 years.		The shortest practicable rebuilding timeframe is specified which does not exceed **one generation time** for the stock.
	Met?	**NA**		**NA**

Rationale

At present, stock score 80 or above on PI 1.1.1 (SA2.3.2)

The yellow perch stocks are currently above the upper stock reference points and PI 1.1.2 is not evaluated.

This applies to all MUs.

b	**Rebuilding evaluation**			
	Guide post	Monitoring is in place to determine whether the rebuilding strategies are effective in rebuilding the stock within the specified timeframe.	There is **evidence** that the rebuilding strategies are rebuilding stocks, **or it is likely** based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the stock within the **specified timeframe**.	There is **strong evidence** that the rebuilding strategies are rebuilding stocks, **or it is highly likely** based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the stock within the **specified timeframe**.
	Met?	**NA**	**NA**	**NA**

Rationale

At present, stock score 80 or above on PI 1.1.1 (SA2.3.2)

The yellow perch stocks are currently above the upper stock reference points and PI 1.1.2 is not evaluated.

This applies to all MUs.

References

Intertek. 2015. The Lake Erie yellow perch and walleye commercial fisheries. Public Certification Report. August 2015.

Lake Erie Management Unit. 2018. 2017 Draft Annual Report of the Lake Erie Management Unit. Ontario Ministry of Natural Resources and Forestry, Blenheim, Ontario. 65 pages.

Markham, J.L., and Knight, R.L. [eds]. 2017. The state of Lake Erie in 2009 [online]. Available online from:

PI 1.1.2	Where the stock is reduced, there is evidence of stock rebuilding within a specified timeframe

http://www.glfc.org/pubs/SpecialPubs/Sp17_01.pdf.

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Yellow Perch Task Group (YPTG). 2019. Report of the Lake Erie Yellow Perch Task Group, March 29, 2019. Presented to the Standing Technical Committee, Lake Erie Committee, Great Lakes Fishery Commission. 39 pages.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

<table>
<tr><td colspan="2" rowspan="2">Individual scoring elements (add rows as required; delete if not scoring by elements)</td><td colspan="3">Applicable SGs <u>likely</u> met per individual scoring element</td><td rowspan="2"><u>Likely</u> scoring element scores</td></tr>
<tr><td>SG60</td><td>SG80</td><td>SG100</td></tr>
<tr><td>1</td><td>Scoring element 1</td><td>X of x</td><td>X of x</td><td>X of x</td><td></td></tr>
<tr><td>2</td><td>Scoring element 2</td><td>X of x</td><td>X of x</td><td>X of x</td><td></td></tr>
<tr><td>3</td><td>Scoring element 3</td><td>X of x</td><td>X of x</td><td>X of x</td><td></td></tr>
<tr><td>4</td><td>Scoring element 4</td><td>X of x</td><td>X of x</td><td>X of x</td><td></td></tr>
<tr><td colspan="2" rowspan="2">Draft scoring range</td><td colspan="3">Applicable SGs/elements <u>likely</u> met</td><td rowspan="2"><u>Likely</u> overall PI score</td></tr>
<tr><td>SG60</td><td>SG80</td><td>SG100</td></tr>
</table>

PI 1.1.2	**Where the stock is reduced, there is evidence of stock rebuilding within a specified timeframe**			
	X of x	X of x	X of x	<60/60 – 79/≥80
Information gap indicator	More information sought/Information sufficient to score PI			
Overall Performance Indicator scores added from Client and Peer Review Draft Report				
Individual scoring elements (add rows as required; delete if not scoring by elements)	Applicable SGs met per individual scoring element			Scoring element scores
	SG60	SG80	SG100	
1 Scoring element 1	X of x	X of x	X of x	
2 Scoring element 2	X of x	X of x	X of x	
3 Scoring element 3	X of x	X of x	X of x	
4 Scoring element 4	X of x	X of x	X of x	
Overall Performance Indicator score	Applicable SGs/elements met			Overall score
	SG60	SG80	SG100	
	X of x	X of x	X of x	
Condition number (if relevant)				

PI 1.2.1 – Harvest strategy (All MUs 1–4 / UoAs 1-7)

PI 1.2.1		**There is a robust and precautionary harvest strategy in place**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Harvest strategy design**			
	Guide post	The harvest strategy is **expected** to achieve stock management objectives reflected in PI 1.1.1 SG80.	The harvest strategy is responsive to the state of the stock and the elements of the harvest strategy **work together** towards achieving stock management objectives reflected in PI 1.1.1 SG80.	The harvest strategy is responsive to the state of the stock and is **designed** to achieve stock management objectives reflected in PI 1.1.1 SG80.
	Met?	**Yes All MUs**	**Yes All MUs**	**Yes All MUs**

Rationale

The harvest strategy consists of objectives, an HCR, over the years both implicit and explicit reference points, a suite of tools, and annual assessments by the YPTG. MSC default reference points were used up to 2019.
In February 2019, the LEC and LEPMAG announced new harvest control rules for yellow perch (Appendix 2).
The harvest control rules are composed of:

- Target fishing mortality as a per cent of the fishing mortality at maximum sustainable yield (F_{msy}). F_{msy} that will remain constant for the duration of the YPMP, a 5-year period
- Biomass limit reference point of the biomass at maximum sustainable yield (B_{msy}). The biomass limit reference points were as follows: MU1 = 29%SSB_0; MU2 = 28%SSB_0; MU3 = 28%SSB_0; MU4 = 27%SSB_0
- All MUs would be at a risk tolerance level of P-star, P* = 0.05
- All MUs would be at a limit on maximum change in TAC of ±20%
- Target fishing rates F would be MU1 = 0.77, MU2 = 0.70, MU3 = 0.79, and MU4 = 0.40

This announcement by LEC indicated that these exploitation policies and HCRs would start in the current year and that the policies would form the core for the next 5 years of yellow perch management through the newly drafted and upcoming YPMP (LEC 2019a).
Based on annual assessments since 2005, TACs have been set according to scientific advice. Reported catch has not exceeded TACs, and in most cases is below these (Intertek 2015). Also see recent years, 2014–2019 (Table 11). The 2019 TAC setting process indicated that the strategy is responsive to the stock through the P* rule to ensure that the stock does not fall below the LRP (Table 8) where for MU2, the fishing rate F_{target} of 0.721 was reduced to F_{actual} 0.353 because P* was estimated to exceed the 5% level. Quite specifically, in 2019 the YPTG responded with the following: "In MU2 fishing at F_{target} exceeds a 5% probability (P*) that the projected spawning stock biomass will be equal to or less than the limit reference point; therefore, the fishing rate was reduced until the probability was less than 5%." The harvest strategy is responsive to the state of the stock and is designed to achieve stock management objectives through an explicit 50%F_{msy} harvest rate.

The harvest strategy is responsive to the state of the stock and is designed to achieve stock management objectives reflected in PI 1.1.1 SG80. SG 80 and 100 could be met. This applies to all MUs.

b	**Harvest strategy evaluation**

PI 1.2.1		**There is a robust and precautionary harvest strategy in place**		
	Guide post	The harvest strategy is **likely** to work based on prior experience or plausible argument.	The harvest strategy may not have been fully **tested** but evidence exists that it is achieving its objectives.	The performance of the harvest strategy has been **fully evaluated** and evidence exists to show that it is achieving its objectives including being clearly able to maintain stocks at target levels.
	Met?	**Yes All MUs**	**Yes All MUs**	**No All MUs**

Rationale

Fishing mortality has been below the 50%F_{msy} in all MUs since at least the mid-2000s and, in some cases, well before that (e.g., MUs 2–4) (Intertek 2015). The target reference point changed in 2010 and it is likely that harvest strategy can control exploitation. The new harvest strategy is based on extensive examination in an MSE, and annual assessment provides the necessary monitoring. There is evidence that the harvest strategy has achieved and will achieve its objectives. No scientific review has been conducted to indicate that it is clearly able to maintain the stock at the TRP. However, all evidence is that it will do so. Recently there has been strong incoming recruitment (Figure 5, Appendix 1). It is evident that the harvest strategy is capable of maintaining fishing mortality at or below its target. The harvest strategy has undergone some testing, and an MSE process has been conducted. More testing is needed to ensure that once it has been fully implemented, it is achieving its objectives.

The harvest strategy may not have been fully tested but evidence exists that it is achieving its objectives. SG 80 could be met.

This applies to all MUs.

c	**Harvest strategy monitoring**			
	Guide post	Monitoring is in place that is expected to determine whether the harvest strategy is working.		
	Met?	**Yes All MUs**		

Rationale

The annual assessment meetings conducted by the YPTG review a suite of datasets used to monitor yellow perch status.

Monitoring is in place that is expected to determine whether the harvest strategy is working. SG 60 would be met.

This applies to all MUs.

d	**Harvest strategy review**			
	Guide post			The harvest strategy is periodically reviewed and improved as necessary.
	Met?			**Yes All MUs**

Rationale

PI 1.2.1	There is a robust and precautionary harvest strategy in place

The harvest strategy was reviewed in 2001 and substantially updated in 2010. The harvest strategy was specifically updated in the draft yellow perch management plan of 2007 (WTG 2007). During the intervening years and on an ongoing basis, the YPTG considered updates to the strategy, and a new strategy was announced in 2019 (LEC 2019a), with quite specific exploitation policies (see above). These, along with newly developed models, are detailed in a newly revised yellow perch management plan, which is currently in review with LEPMAG acceptance pending. The development of the new exploitation strategy recently completed with QFC and LEPMAG working together resulted in the development of a new statistical catch-at-age model, the Peterson-Reilly model or PR model. The development of this model has been under various stages since 2014. In 2016, the QFC added, among other alterations and adjustments, age 1 and 2 recruitment survey data. The RP model uses three steps. The first three are similar to those used in the previous YPTG model. However, in the third step, the age 0 and age 1 recruitment data are added to the ADMB model along with the MMI coefficients from step two. This allows the model to estimate age 2 recruitment for each year class available in the recruitment data and adds this as a dataset in the objective function. This model is then run iteratively until the maximum effective sample size for the multinomial age composition stabilizes. The YPTG used the original YPTG model to make recommendations up to 2018, and the PR model was used in 2019.

The harvest strategy is periodically reviewed and improved as necessary. SG 100 would be met.

This applies to all MUs.

e	**Shark finning**			
	Guide post	It is **likely** that shark finning is not taking place.	It is **highly likely** that shark finning is not taking place.	There is a **high degree of certainty** that shark finning is not taking place.
	Met?	**NA**	**NA**	**NA**

Rationale

Sharks are not present; therefore SIe is not scored.

f	**Review of alternative measures**			
	Guide post	There has been a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock.	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock and they are implemented as appropriate.	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock, and they are implemented, as appropriate.
	Met?	**Yes All MUs**	**Yes All MUs**	**No All MUs**

Rationale

There is a regular review of potential effectiveness and practicalities of measures minimising related mortality of unwanted catch of the target stock. All evidence is that they are implemented in an appropriate way. However, reviews are not biennial.

There is a regular review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock and they are implemented as appropriate. SG 80 could be met.

PI 1.2.1	There is a robust and precautionary harvest strategy in place

This applies to all MUs.

References

Lake Erie Committee (LEC). 2019a. Lake Erie yellow perch exploitation policies. Lake Erie Committee of the Great Lakes Fishery Commission. Announcement including Q&A, February 12, 2019. 4 pages.

Yellow Perch Task Group (YPTG). 2007. Lake Erie Yellow Perch Management Plan (draft), December 2007. Prepared by the Yellow Perch Task Group Standing Technical Committee. 57 pages.

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Yellow Perch Task Group (YPTG). 2018. Report of the Lake Erie Yellow Perch Task Group, March 28, 2018. Presented to the Standing Technical Committee, Lake Erie Committee, Great Lakes Fishery Commission. 49 pages.

Yellow Perch Task Group (YPTG). 2019. Report of the Lake Erie Yellow Perch Task Group, March 29, 2019. Presented to the Standing Technical Committee, Lake Erie Committee, Great Lakes Fishery Commission. 39 pages.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range		Applicable SGs/elements likely met			Likely overall PI score
		SG60	SG80	SG100	
UoA 1 and 5	MU 1	4 of 4	3 of 3	2 of 4	≥ 80
UoA 2 and 6	MU 2	4 of 4	3 of 3	2 of 4	≥ 80
UoA 3 and 7	MU 3	4 of 4	3 of 3	2 of 4	≥ 80
UoA 4	MU 4	4 of 4	3 of 3	2 of 4	≥ 80
Information gap indicator		Information sufficient to score PI			

Overall Performance Indicator scores added from Client and Peer Review Draft Report

PI 1.2.1	**There is a robust and precautionary harvest strategy in place**				
Individual scoring elements (add rows as required; delete if not scoring by elements)		Applicable SGs met per individual scoring element			Scoring element scores
		SG60	SG80	SG100	
1	MU 1	X of x	X of x	X of x	
2	MU 2	X of x	X of x	X of x	
3	MU 3	X of x	X of x	X of x	
4	MU 4	X of x	X of x	X of x	
Overall Performance Indicator score		Applicable SGs/elements met			Overall score
		SG60	SG80	SG100	
		X of x	X of x	X of x	
Condition number (if relevant)					

PI 1.2.2 – Harvest control rules and tools (All MUs 1–4 / UoAs 1-7)

PI 1.2.2		**There are well defined and effective harvest control rules (HCRs) in place**		
Scoring Issue		SG 60	SG 80	SG 100
a	**HCRs design and application**			
	Guide post	**Generally understood** HCRs are in place **or available** that are **expected** to reduce the exploitation rate as the point of recruitment impairment (PRI) is approached.	**Well defined** HCRs are **in place** that **ensure** that the exploitation rate is reduced as the PRI is approached, are expected to keep the stock **fluctuating around** a target level consistent with (or above) MSY, or for key LTL species a level consistent with ecosystem needs.	The HCRs are expected to keep the stock **fluctuating at or above** a target level consistent with MSY, or another more appropriate level taking into account the ecological role of the stock, **most** of the time.
	Met?	**Yes All MUs**	**Yes All MUs**	**Yes All MUs**

Rationale

The suite of management techniques in the various management plans, i.e., YPTG 2007 plan and the explicit harvest control rule of 50% F_{msy} target harvest rate, are evidence of the general requirement to reduce exploitation as abundance declines to a low level. Prior to 2019, the HCRs did not make explicit reference to an LRP but in the new exploitation strategy announced in 2019 (LEC 2019a), specific LRPs are detailed and these were implemented in 2019 (Table 8), so well-defined HCRs are in place that are consistent with a harvest strategy that ensures that exploitation is reduced as LRPs are approached. Quite specifically, this was detailed in a 2019 announcement by the LEC and is included in the newly revised and currently being reviewed yellow perch management plan. Concerning these specific control rules, in February 2019, the LEC and LEPMAG announced new harvest control rules for yellow perch (Appendix 2).
The harvest control rules are composed of:

- Target fishing mortality as a per cent of the fishing mortality at maximum sustainable yield (F_{msy}). F_{msy} that will remain constant for the duration of the YPMP, a 5-year period
- Biomass limit reference point of the biomass at maximum sustainable yield (B_{msy}). The biomass limit reference points were as follows: MU1 = 29%SSB_0; MU2 = 28%SSB_0; MU3 = 28%SSB_0; MU4 = 27%SSB_0
- All MUs would be at a risk tolerance level of P-star, P* = 0.05
- All MUs would be at a limit on maximum change in TAC of ±20%
- Target fishing rates F would be MU1 = 0.77, MU2 = 0.70, MU3 = 0.79, and MU4 = 0.40

This announcement by LEC indicated that these exploitation policies and HCRs would start in the current year and that the policies would form the core for the next 5 years of yellow perch management through the newly drafted and upcoming YPMP (LEC 2019a).

The HCRs are expected to keep the stock fluctuating at or above a target level consistent with MSY, or another more appropriate level taking into account the ecological role of the stock, most of the time. SG 80 and 100 could be met.

This applies to all MUs.

b	**HCRs robustness to uncertainty**			
	Guide post		The HCRs are likely to be robust to the main uncertainties.	The HCRs take account of a **wide** range of uncertainties including the ecological role of the stock, and there is **evidence** that the

PI 1.2.2	**There are well defined and effective harvest control rules (HCRs) in place**			
				HCRs are robust to the main uncertainties.
	Met?		**Yes All MUs**	**No All MUs**

Rationale

By design, the HCRs account for the main uncertainties identified in the annual stock assessment. They do this through the provision of scientific advice associated with the minimum, mean, and maximum RAHs. As uncertainty in the current stock status changes, so do these RAHs. It is clear that the HCR takes into account the uncertainties recognized in the stock assessments. However, processes such as movement among MUs are not considered in the HCR. However, given the species and what is known about its seasonal activity and migration patterns, this seems unlikely but remains to be examined.

The HCRs are likely to be robust to the main uncertainties. SG 80 would be met.

c	**HCRs evaluation**			
	Guide post	There is **some evidence** that tools used **or available** to implement HCRs are appropriate and effective in controlling exploitation.	**Available evidence indicates** that the tools in use are appropriate and effective in achieving the exploitation levels required under the HCRs.	**Evidence clearly shows** that the tools in use are effective in achieving the exploitation levels required under the HCRs.
	Met?	**Yes All MUs**	**Yes All MUs**	**Yes All MUs**

Rationale

The primary tool to control harvest is the TAC. It is based on annual scientific advice. The catch has not exceeded the TAC since 2005 (Intertek 2015). Since 2005, reported catch has been below TAC and the TAC has been set consistently with scientific advice. In recent years, since 2014, although the TAC in most years has been greater than the RAAH (Table 11), the actual harvest has been appreciably lower, ranging from 65 to 79% of the TAC and since 2015–2015, somewhat lower, particularly in recent years (Table 11). The primary regulatory tool, TAC, is used successfully in many fisheries to control exploitation. The use of quotas to control exploitation in the fishery clearly identifies that these are effective in achieving the objectives of the harvest strategy. Long-term trends in fishing mortality under quota management clearly indicate that this tool is effective in controlling F.

Evidence clearly shows that the tools in use are effective in achieving the exploitation levels required under the HCRs. SG 100 could be met.

This applies to all MUs.

References

Lake Erie Committee (LEC). 2019a. Lake Erie yellow perch exploitation policies. Lake Erie Committee of the Great Lakes Fishery Commission. Announcement including Q&A, February 12, 2019. 4 pages.

Yellow Perch Task Group (YPTG). 2007. Lake Erie Yellow Perch Management Plan (draft), December 2007. Prepared by the Yellow Perch Task Group Standing Technical Committee. 57 pages.

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PI 1.2.2	**There are well defined and effective harvest control rules (HCRs) in place**
Yellow Perch Task Group (YPTG). 2014. Report of the Lake Erie Yellow Perch Task Group, March 27, 2014. Presented to the Standing Technical Committee, Lake Erie Committee, Great Lakes Fishery Commission. 43 pages. Yellow Perch Task Group (YPTG). 2015. Report of the Lake Erie Yellow Perch Task Group, March 23, 2015. Presented to the Standing Technical Committee, Lake Erie Committee, Great Lakes Fishery Commission. 42 pages. Yellow Perch Task Group (YPTG). 2016. Report of the Lake Erie Yellow Perch Task Group, March 30, 2016. Presented to the Standing Technical Committee, Lake Erie Committee, Great Lakes Fishery Commission. 42 pages. Yellow Perch Task Group (YPTG). 2017. Report of the Lake Erie Yellow Perch Task Group, March 23, 2017. Presented to the Standing Technical Committee, Lake Erie Committee, Great Lakes Fishery Commission. 51 pages. Yellow Perch Task Group (YPTG). 2018. Report of the Lake Erie Yellow Perch Task Group, March 28, 2018. Presented to the Standing Technical Committee, Lake Erie Committee, Great Lakes Fishery Commission. 49 pages. Yellow Perch Task Group (YPTG). 2019. Report of the Lake Erie Yellow Perch Task Group, March 29, 2019. Presented to the Standing Technical Committee, Lake Erie Committee, Great Lakes Fishery Commission. 39 pages.	

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range		Applicable SGs/elements likely met			Likely overall PI score
		SG60	SG80	SG100	
UoA 1 and 5	MU 1	2 of 2	3 of 3	2 of 3	≥ 80
UoA 2 and 6	MU 2	2 of 2	3 of 3	2 of 3	≥ 80
UoA 3 and 7	MU 3	2 of 2	3 of 3	2 of 3	≥ 80
UoA 4	MU 4	2 of 2	3 of 3	2 of 3	≥ 80
Information gap indicator		Information sufficient to score PI			

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Individual scoring elements (add rows as required; delete if not scoring by elements)		Applicable SGs met per individual scoring element			Scoring element scores
		SG60	SG80	SG100	
1	MU 1	X of x	X of x	X of x	
2	MU 2	X of x	X of x	X of x	
3	MU 3	X of x	X of x	X of x	
4	MU 4	X of x	X of x	X of x	
Overall Performance Indicator score		Applicable SGs/elements met			Overall score
		SG60	SG80	SG100	
		X of x	X of x	X of x	

PI 1.2.2	There are well defined and effective harvest control rules (HCRs) in place
Condition number (if relevant)	

PI 1.2.3 – Information and monitoring (All MUs 1–4 / UoAs 1-7)

PI 1.2.3		**Relevant information is collected to support the harvest strategy**		
Scoring Issue		SG 60	SG 80	SG 100
a	Range of information			
	Guide post	**Some** relevant information related to stock structure, stock productivity and fleet composition is available to support the harvest strategy.	**Sufficient** relevant information related to stock structure, stock productivity, fleet composition and other data are available to support the harvest strategy.	A **comprehensive range** of information (on stock structure, stock productivity, fleet composition, stock abundance, UoA removals and other information such as environmental information), including some that may not be directly related to the current harvest strategy, is available.
	Met?	**Yes All MUs**	**Yes All MUs**	**No All MUs**
Rationale				

Genetic and morphological studies exist that would support the basis of stock units, however there is no doubt that there is some movement between MUs. Maturity and fecundity data come from a wide variety of sources. Natural mortality (0.40) is based upon a 1997 review (Intertek 2015). Information is available on fleet composition in both Ontario and Ohio. Information on the licensing systems catalogues vessel and gear characteristics of each participant, and through the vessel monitoring system, good information is provided on fishing location, which is supplemented by logbook data. Other data include ongoing monitoring of environmental conditions in Lake Erie, which include yellow perch productivity. Quite generally, there is sufficient information on stock structure, stock productivity, and fleet composition. In addition, other data on environmental conditions are sufficient to monitor potential abiotic changes in yellow perch productivity. Although there is a broad range of information on yellow perch and this could be considered comprehensive, there is a lack of verification on discard data. Discards could be relatively low, but this probably needs more verification.

Sufficient relevant information related to stock structure, stock productivity, fleet composition and other data are available to support the harvest strategy. SG 80 could be met. This applies to all MUs.

b	Monitoring			
	Guide post	Stock abundance and UoA removals are monitored and **at least one indicator** is available and monitored with sufficient frequency to support the harvest control rule.	Stock abundance and UoA removals are **regularly monitored at a level of accuracy and coverage consistent with the harvest control rule**, and **one or more indicators** are available and monitored with sufficient frequency to support the harvest control rule.	**All information** required by the harvest control rule is monitored with high frequency and a high degree of certainty, and there is a good understanding of inherent **uncertainties** in the information [data] and the robustness of assessment and management to this uncertainty.
	Met?	**Yes All MUs**	**Yes All MUs**	**No All MUs**
Rationale				

A number of fisheries-dependent and - independent stock abundance indices are used in the yellow perch assessment. The primary fisheries-dependent indices, providing fishing effort since the late 1970s, come from the Ontario gill-net, Ohio trap-net fisheries, and Ohio sports fisheries. The primary fisheries-independent indices have

PI 1.2.3	Relevant information is collected to support the harvest strategy

been provided by the Ontario partnership gill-net survey since 1989 and the Ontario and U.S. western basin inter-agency trawling survey since 1987. These indices provide more than three decades of stock monitoring (e.g., recruitment indices, Appendix 1), which is more than five generation times for yellow perch. Fishery removals have been recorded in daily catch records since 1997, and discards have been reported since 2011. Although post-capture mortality from gill nets appears to be high (80%), given the reported magnitude of released fish compared with total catch, post-capture mortality does not appear to be a significant problem. The relative uncertainty of indices is incorporated into the assessment. Dock-side landings are monitored but not on-the-lake verifications of discards, although they are reported to be low. All information required by the harvest control rule is monitored with high frequency relative to generation time. There is a reasonable understanding of the uncertainties in fish removals and stock indices; however, there is concern about discard data because of the lack of verification. The robustness of assessment and management to these uncertainties has not been fully examined.

Stock abundance and UoA removals are regularly monitored at a level of accuracy and coverage consistent with the harvest control rule, and one or more indicators are available and monitored with sufficient frequency to support the harvest control rule. SG 80 could be met. This applies to all MUs.

c	Comprehensiveness of information			
	Guide post		There is good information on all other fishery removals from the stock.	
	Met?		**Yes All MUs**	

Rationale

A large recreational fishery exists in Ohio and a smaller one in Ontario. The individual compositional and operational characteristics of these fisheries are well described. There is a comprehensive database of catch and effort, quite comparable to those associated with the commercial fisheries. There are small hoop-net, seine, and bait fisheries; however, there is no estimate of the catch of these. The Ohio sport fishery, which is the primary other one, is well monitored.

There is good information on all other fishery removals from the stock. SG 80 would be met. This applies to all MUs.

References

Lake Erie Management Unit. 2018. 2017 Draft Annual Report of the Lake Erie Management Unit. Ontario Ministry of Natural Resources and Forestry, Blenheim, Ontario. 65 pages.

Lester, N., Bingham, A., Clark, B., Pollock, K., and Sullivan, P. 2005. Report of the Blue Ribbon
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Ontario Ministry of Natural Resources (OMNR). 2008. Status of major stocks 2007. Lake Erie Management Unit. 4271, ISSN 1718-4924, ISBN 978-1-4249-4065-3 (2008 ed.). 66 pages.

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PI 1.2.3	**Relevant information is collected to support the harvest strategy**
Ontario Ministry of Natural Resources and Forestry. 2019. PowerPoint presentation, OCFA Annual Convention, Niagara Falls, Ontario, January 2019. 28 pages. Tavel. 2009. MSC pre-assessment evaluation of the Lake Erie yellow perch (Perca flavescens) commercial gillnet fishery. Pre-assessment report. 76 pages. Tyson, J.T., Johnson, T.B., Knight, C.T., and Bur, M.T. 2006. Intercalibration of research survey vessels on Lake Erie. North American Journal of Fisheries Management 26:559-570. Yellow Perch Task Group (YPTG). 2007. Lake Erie Yellow Perch Management Plan (draft), December 2007. Prepared by the Yellow Perch Task Group Standing Technical Committee. 57 pages. 69:1292–1301.	

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range		Applicable SGs/elements likely met			Likely overall PI score
		SG60	SG80	SG100	
UoA 1 and 5	MU 1	2 of 2	3 of 3	0 of 2	≥ 80
UoA 2 and 6	MU 2	2 of 2	3 of 3	0 of 2	≥ 80
UoA 3 and 7	MU 3	2 of 2	3 of 3	0 of 2	≥ 80
UoA 4	MU 4	2 of 2	3 of 3	0 of 2	≥ 80
Information gap indicator		Information sufficient to score PI			

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Individual scoring elements (add rows as required; delete if not scoring by elements)		Applicable SGs met per individual scoring element			Scoring element scores
		SG60	SG80	SG100	
1	MU 1	X of x	X of x	X of x	
2	MU 2	X of x	X of x	X of x	
3	MU 3	X of x	X of x	X of x	
4	MU 4	X of x	X of x	X of x	
Overall Performance Indicator score		Applicable SGs/elements met			Overall score
		SG60	SG80	SG100	
		X of x	X of x	X of x	
Condition number (if relevant)					

PI 1.2.4 – Assessment of stock status (All MUs 1–4 / UoAs 1-7)

PI 1.2.4		**There is an adequate assessment of the stock status**		
Scoring Issue		SG 60	SG 80	SG 100
a	Appropriateness of assessment to stock under consideration			
	Guide post		The assessment is appropriate for the stock and for the harvest control rule.	The assessment takes into account the major features relevant to the biology of the species and the nature of the UoA.
	Met?		**Yes All MUs**	**No All MUs**
Rationale				

Estimates of abundance, biomass, and fishing mortality are provided by the SCAA model, along with estimates of uncertainty, which are used by the HCR. The model, which incorporates error in both fishery removals and the indices, is appropriate, given the nature of the fishery. The assessment has been reviewed extensively and determined to be appropriate for the stock and the ACR. It describes the major biological processes associated with Lake Erie yellow perch and the fisheries that exploit them. The SCAA, however, does not capture any possible impact of mixing among the MUs. Over the years, the YPTG has noted that this could be an issue. Although many aspects of the biology of yellow perch are considered, mixing could be important to the assessment and the decision-making.

The assessment is appropriate for the stock and for the harvest control rule. SG 80 would be met. This applies to all MUs.

b	Assessment approach			
	Guide post	The assessment estimates stock status relative to generic reference points appropriate to the species category.	The assessment estimates stock status relative to reference points that are appropriate to the stock and can be estimated.	
	Met?	**Yes All MUs**	**Yes All MUs**	
Rationale				

Assessment of each MU estimates the spawning stock biomass in relation to an analytically calculated LRP and fishing mortality relative to the $50\%F_{msy}$.

The assessment estimates stock status relative to reference points that are appropriate to the stock and can be estimated. SG 80 could be met. This applies to all MUs.

c	Uncertainty in the assessment			
	Guide post	The assessment **identifies major sources** of uncertainty.	The assessment **takes uncertainty into account**.	The assessment takes into account uncertainty and is evaluating stock status relative to reference points in a **probabilistic** way.
	Met?	**Yes All MUs**	**Yes All MUs**	**Yes All MUs**
Rationale				

PI 1.2.4	**There is an adequate assessment of the stock status**

Fishery removal and index datasets both have associated estimates of relative variance (lambda). Based on the findings of analysis resulting in the draft Yellow Perch Management Plans (YPTG 2007, updated plan in final review, as indicated by the exploitation policies provided by the LEC 2019a) and subsequent examination of the relative error in each input dataset, the models, through the use of estimates of relative variance associated with each fishery removal and index dataset, take uncertainty into account. These lambda terms are based on discussions that led to the development of the management plans and subsequent examination of the relative error in each input dataset. The minimum, mean, and maximum recommended allowable harvest are provided for each projected year. As well, the stock biomass at the end of the projected year is evaluated in a probabilistic way relative to LRP (20%SSB_0).

The assessment takes into account uncertainty and is evaluating stock status relative to reference points in a probabilistic way. SG 100 could be met. This applies to all MUs.

d	Evaluation of assessment			
	Guide post			The assessment has been tested and shown to be robust. Alternative hypotheses and assessment approaches have been rigorously explored.
	Met?			**Yes All MUs**

Rationale

Management strategy evaluations provided extensive tests of the assessment model in which alternative hypothesis and model sensitivities were examined and are part of the new yellow perch exploitation strategy and are incorporated in the newly revised Yellow Perch Management Plan. (In January 2019, a slide deck of the MSE scenario survey was circulated, see review and details in MSC 3rd Surveillance Audit, Hough et al. 2019.)

The assessment has been tested and shown to be robust. Alternative hypotheses and assessment approaches have been rigorously explored. SG 100 would be met. This applies to all MUs.

e	Peer review of assessment			
	Guide post		The assessment of stock status is subject to peer review.	The assessment has been **internally and externally** peer reviewed.
	Met?		**Yes All MUs**	**Yes All MUs**

Rationale

The LEPMAG, QFC, and others, including commissioned highly qualified scientists, e.g., Myers and Bence (2001), have interacted over the years to provide both internal and external peer review. Most recently, for example, the LEGMAG provided the YPTG with detailed and well-vetted recommendations about how to move forward with future management of yellow perch in Lake Erie. The outcome had resulted from the guidance and analytical facilitation of the QFC. The QFC had provided detailed updates of the assessment model and had carried out the appropriate management strategy evaluations. All stakeholder members of the LEPMAG had been actively involved, resulting in a new yellow perch assessment model as well as advice on fishery-based performance metrics and recommendations for new harvest policies. Discussions were leading to a subsequent revision of the Lake Erie Yellow Perch Management Plan, and drafts were developed. This plan would supersede the previous draft management plan (YPTG 2007). Considerable progress had been made on the management strategy evaluation, as indicated by

PI 1.2.4	There is an adequate assessment of the stock status

detailed minutes of LEPMAG meetings conducted April 2016, May 2017, January 2018, and May 2018. This led to the announcement by the LEC of the new yellow perch exploitation policies in February 2019. These new policies resulted in analytically based limit reference points to help ensure sustainability of the recreational and commercial fisheries. The reference points and exploitation rates developed and recommended would shape the forthcoming Lake Erie Yellow Perch Management Plan. This plan currently is in draft and under final review and is fundamental to an explanation of the development and use of the updated yellow perch catch-at-age models and analytically based new harvest control rules and reference points. These resulted from consensus by the LEPMAG during the MSE process.

The assessment has been internally and externally peer reviewed. SG 80 and 100 could be met. This applies to all MUs.

References

Lake Erie Committee (LEC). 2019a. Lake Erie yellow perch exploitation policies. Lake Erie Committee of the Great Lakes Fishery Commission. Announcement including Q&A, February 12, 2019. 4 pages.

Myers, R.A., and Bence, J.R. 2001. The 2001 assessment of perch in Lake Erie: a review. TC Report, 26 pages.

Yellow Perch Task Group (YPTG). 2007. Lake Erie Yellow Perch Management Plan (draft), December 2007. Prepared by the Yellow Perch Task Group Standing Technical Committee. 57 pages.

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Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range		Applicable SGs/elements likely met			Likely overall PI score
		SG60	SG80	SG100	
UoA 1 and 5	MU 1	2 of 2	4 of 4	3 of 4	≥ 80

PI 1.2.4	**There is an adequate assessment of the stock status**				
UoA 2 and 6	MU 2	2 of 2	4 of 4	3 of 4	≥ 80
UoA 3 and 7	MU 3	2 of 2	4 of 4	3 of 4	≥ 80
UoA 4	MU 4	2 of 2	4 of 4	3 of 4	≥ 80
Information gap indicator		Information sufficient to score PI			
Overall Performance Indicator scores added from Client and Peer Review Draft Report					
Individual scoring elements (add rows as required; delete if not scoring by elements)		Applicable SGs met per individual scoring element			Scoring element scores
		SG60	SG80	SG100	
1	MU 1	X of x	X of x	X of x	
2	MU 2	X of x	X of x	X of x	
3	MU 3	X of x	X of x	X of x	
4	MU 4	X of x	X of x	X of x	
Overall Performance Indicator score		Applicable SGs/elements met			Overall score
		SG60	SG80	SG100	
		X of x	X of x	X of x	
Condition number (if relevant)					

PI 1.1.1 – Stock status – Walleye (UoA 8)

PI 1.1.1		**The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Stock status relative to recruitment impairment**			
	Guide post	It is **likely** that the stock is above the point where recruitment would be impaired (PRI).	It is **highly likely** that the stock is above the PRI.	There is a **high degree of certainty** that the stock is above the PRI.
	Met?	**Yes**	**Yes**	**Yes**
Rationale				

Biomass has been well above the LRP of 20%SSB$_0$ since the early 1980s (Intertek 2015). During the most recent 6-yr period (2014–2019), encompassing the time after the initial MSC certification of the walleye fishery, the SSB$_0$ of walleye in Lake Erie has increased substantially, from approximately 50 million kg to 60 million kg (Table 15). The SSB has shown a progressive increase over the period of time, ranging from approximately 29 million kg in 2014 to 50 million kg in 2019. The LRP, using the 20%SS$_0$, has increased from 10 to approximately 12 million kg. On a relative scale, the LRP ratio has increased considerably, from approximately 2.5 to 4.0, and is well above 1. The probability that the 2020 spawning stock biomass would be lower than the LRP (20%SSB$_0$) was 0.000% (Table 14).

There is a **high degree of certainty** that the stock is above the PRI. SG 80 and 100 could be met.

b	**Stock status in relation to achievement of Maximum Sustainable Yield (MSY)**			
	Guide post		The stock is at or fluctuating around a level consistent with MSY.	There is **a high degree of certainty** that the stock has been fluctuating around a level consistent with MSY or has been above this level over recent years.
	Met?		**Yes**	**Yes**
Rationale				

Biomass has been well above the TRP of 40%SSB$_0$ since the early 1980s. Also the TRP has increased over the past 6-yr period (2014–2019), and the TRP ratios have been relatively stable, greater than 1, and show an increasing trend from approximately 1.3 to 2.0 over this period of time (Table 15).

There is **a high degree of certainty** that the stock has been fluctuating around a level consistent with MSY or has been above this level over recent years. SG 80 and 100 could be met.

References

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PI 1.1.1	**The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing**

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Stock status relative to reference points

	Type of reference point	**Value of reference point**	**Current stock status relative to reference point**
Reference point used in scoring stock relative to PRI (SIa)	20%SSB_0	LRP 6-yr period 2014–2019 (mean ± 95% CI). = 11.763 ± 1.060 million kg. For annual values for the period, see Table 15.	LRP ratio 6-yr period 2014–2019 (mean ± 95% CI) = 3.14 ± 0.66
Reference point used in scoring	40%SSB_0	TRP 6-yr period 2014–2019 (mean ± 95% CI). = 23.525 ± 2.119 million	TRP ratio 6-yr period 2014–2019 (mean ± 95% CI) = 1.57 ± 0.33

PI 1.1.1	**The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing**		
stock relative to MSY (SIb)		kg. For annual values for the period, see Table 15.	

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	Applicable SGs/elements likely met			Likely overall PI score
	SG60	SG80	SG100	
	1 of 1	2 of 2	2 of 2	≥80
Information gap indicator	Information sufficient to score PI			

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Individual scoring elements (add rows as required; delete if not scoring by elements)	Applicable SGs met per individual scoring element			Scoring element scores
	SG60	SG80	SG100	
	X of x	X of x	X of x	
Overall Performance Indicator score	Applicable SGs/elements met			Overall score
	SG60	SG80	SG100	
	X of x	X of x	X of x	
Condition number (if relevant)				

PI 1.1.2 – Stock rebuilding

PI 1.1.2		**Where the stock is reduced, there is evidence of stock rebuilding within a specified timeframe**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Rebuilding timeframes**			
	Guide post	A rebuilding timeframe is specified for the stock that is the **shorter of 20 years or 2 times its generation time**. For cases where 2 generations is less than 5 years, the rebuilding timeframe is up to 5 years.		The shortest practicable rebuilding timeframe is specified which does not exceed **one generation time** for the stock.
	Met?	**NA**		**NA**
Rationale				
At present, stock score 80 or above on PI 1.1.1 (SA2.3.2) The walleye stock is currently well above the upper stock reference points and PI 1.1.2 is not evaluated.				
b	**Rebuilding evaluation**			
	Guide post	Monitoring is in place to determine whether the rebuilding strategies are effective in rebuilding the stock within the specified timeframe.	There is **evidence** that the rebuilding strategies are rebuilding stocks, **or it is likely** based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the stock within the **specified timeframe**.	There is **strong evidence** that the rebuilding strategies are rebuilding stocks, **or it is highly likely** based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the stock within the **specified timeframe**.
	Met?	**NA**	**NA**	**NA**
Rationale				
At present, stock score 80 or above on PI 1.1.1 (SA2.3.2). The walleye stock is currently well above the upper stock reference points and PI 1.1.2 is not evaluated.				
References				
Ontario Ministry of Natural Resources and Forestry. 2019. PowerPoint presentation, OCFA Annual Convention, Niagara Falls, Ontario, January 2019. 28 pages. Walleye Task Group (WTG). 2013. Report for 2012 by the Lake Erie Walleye Task Group, March 2013. Presented to the Standing Technical Committee, Lake Erie Committee, Great Lakes Fishery Commission. Ypsilanti, Michigan, USA. Presented at Niagara Falls, New York, March 2013. 26 pages. Walleye Task Group (WTG). 2014. Report for 2013 by the Lake Erie Walleye Task Group, March 2014. Presented to the Standing Technical Committee, Lake Erie Committee, Great Lakes Fishery Commission. Ypsilanti, Michigan, USA. Presented at Windsor, Ontario, March 2014. 26 pages.				

PI 1.1.2	Where the stock is reduced, there is evidence of stock rebuilding within a specified timeframe
Walleye Task Group (WTG). 2015. Report for 2014 by the Lake Erie Walleye Task Group, March 2015. Presented to the Standing Technical Committee, Lake Erie Committee, Great Lakes Fishery Commission. Ypsilanti, Michigan, USA. Presented at Ypsilanti, Michigan, March 2015. 27 pages. Walleye Task Group (WTG). 2016. Report for 2015 by the Lake Erie Walleye Task Group, March 2016. Presented to the Standing Technical Committee, Lake Erie Committee, Great Lakes Fishery Commission. Ypsilanti, Michigan, USA. Presented at Niagara Falls, Ontario, March 2016. 26 pages. Walleye Task Group (WTG). 2017. Report for 2016 by the Lake Erie Walleye Task Group, March 2017. Presented to the Standing Technical Committee, Lake Erie Committee, Great Lakes Fishery Commission. Ypsilanti, Michigan, USA. Presented at Ypsilanti, Michigan, March 2017. 25 pages. Walleye Task Group (WTG). 2018. Report for 2017 by the Lake Erie Walleye Task Group, March 2018. Presented to the Standing Technical Committee, Lake Erie Committee, Great Lakes Fishery Commission. Ann Arbor, Michigan, USA. Presented at Toronto, Ontario, March 2018. 26 pages. Walleye Task Group (WTG). 2019. Report for 2018 by the Lake Erie Walleye Task Group, March 2019. Presented to the Standing Technical Committee, Lake Erie Committee, Great Lakes Fishery Commission. Ann Arbor, Michigan, USA. Presented at Ypsilanti, Michigan. March 2018. 24 pages.	

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	Applicable SGs/elements likely met			Likely overall PI score
	SG60	SG80	SG100	
	NA	NA	NA	NA
Information gap indicator	Information sufficient to score PI			

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Individual scoring elements (add rows as required; delete if not scoring by elements)	Applicable SGs met per individual scoring element			Scoring element scores
	SG60	SG80	SG100	
	X of x	X of x	X of x	
Overall Performance Indicator score	Applicable SGs/elements met			Overall score
	SG60	SG80	SG100	
	X of x	X of x	X of x	
Condition number (if relevant)				

PI 1.2.1 – Harvest strategy

PI 1.2.1		**There is a robust and precautionary harvest strategy in place**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Harvest strategy design**			
	Guide post	The harvest strategy is **expected** to achieve stock management objectives reflected in PI 1.1.1 SG80.	The harvest strategy is responsive to the state of the stock and the elements of the harvest strategy **work together** towards achieving stock management objectives reflected in PI 1.1.1 SG80.	The harvest strategy is responsive to the state of the stock and is **designed** to achieve stock management objectives reflected in PI 1.1.1 SG80.
	Met?	**Yes**	**Yes**	**Yes**
Rationale				

The harvest strategy consists of objectives, a HCR, explicit limit and target reference points, a suite of tools, and annual assessment by the WTG. The strategy consists of components observed to be required in other fisheries. Since 2005, TACs have been set according to scientific advice, which is in turn based on the annual assessments. Reported catch has not exceeded TACs and in most cases is below these (Intertek 2015). Also see recent years, 1999–2018 (Table 17). The 2019 TAC setting process indicated that the strategy is responsive to the stock and, through the P* Rule, is designed to ensure that the stock does not fall below the LRP (WTG 2019).

The harvest strategy is responsive to the state of the stock and is **designed** to achieve stock management objectives reflected in PI 1.1.1 SG80. SG 80 and 100 could be met.

b	**Harvest strategy evaluation**			
	Guide post	The harvest strategy is **likely** to work based on prior experience or plausible argument.	The harvest strategy may not have been fully **tested** but evidence exists that it is achieving its objectives.	The performance of the harvest strategy has been **fully evaluated** and evidence exists to show that it is achieving its objectives including being clearly able to maintain stocks at target levels.
	Met?	**Yes**	**Yes**	**No**
Rationale				

The harvest strategy is based upon extensive examination in an MSE. It consists of a relatively conservative 60%F_{msy} target, a 20%SSB_0 LRP and a P* rule which would reduce exploitation as the LRP is approached. The strategy has been tested through an MSE, and the annual assessments provide the necessary monitoring. It was first implemented in 2013 and was implemented as planned. It was determined that biomass has not fallen below the LRP. The harvest strategy has been fully evaluated in a thorough MSE. While there is evidence that it is achieving its objectives, no scientific review has been conducted to indicate that it is clearly able to maintain the stock at the TRP. However, all evidence indicates that it will do so.

The harvest strategy may not have been fully **tested** but evidence exists that it is achieving its objectives. SG 80 could be met.

PI 1.2.1		**There is a robust and precautionary harvest strategy in place**		
c		**Harvest strategy monitoring**		
	Guide post	Monitoring is in place that is expected to determine whether the harvest strategy is working.		
	Met?	**Yes**		
Rationale				
The annual assessment meetings conducted by the WTG review a suite of datasets used to monitor walleye status. Monitoring is in place that is expected to determine whether the harvest strategy is working. SG 60 could be met.				
d		**Harvest strategy review**		
	Guide post			The harvest strategy is periodically reviewed and improved as necessary.
	Met?			**Yes**
Rationale				
There is a long history review of harvest strategies in the fishery. The recent MSE is the most extensive to date but highlights the capacity of the management system to update the strategy where and when necessary and indicate the appropriate adjustments. The harvest strategy is periodically reviewed and improved as necessary. SG 100 would be met.				
e		**Shark finning**		
	Guide post	It is **likely** that shark finning is not taking place.	It is **highly likely** that shark finning is not taking place.	There is a **high degree of certainty** that shark finning is not taking place.
	Met?	**NA**	**NA**	**NA**
Rationale				
Sharks are not present, and shark-finning is not involved, SIe is not scored.				
f		**Review of alternative measures**		
	Guide post	There has been a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock.	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock and they are implemented as appropriate.	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock, and they are implemented, as appropriate.
	Met?	**Yes**	**Yes**	**No**

PI 1.2.1	There is a robust and precautionary harvest strategy in place

Rationale

There is a regular review of the potential effectiveness and practicality of measures minimising related mortality of unwanted catch of the target stock, and they are implemented appropriately. However, this review is not biennial.

There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock and they are implemented as appropriate. SG 80 could be met.

References

Kayle, K., Oldenburg, K., Murray, C., Francis, J., and Markham, J. 2015. Lake Erie Walleye Management Plan 2015-2019. Lake Erie Committee, Great Lakes Fishery Commission. 42 pages.

Lake Erie Management Unit. 2018. 2017 Draft Annual Report of the Lake Erie Management Unit. Ontario Ministry of Natural Resources and Forestry, Blenheim, Ontario. 65 pages.

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PI 1.2.1	**There is a robust and precautionary harvest strategy in place**

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	Applicable SGs/elements likely met			Likely overall PI score
	SG60	SG80	SG100	
	4 of 4	3 of 3	2 of 4	≥80
Information gap indicator	Information sufficient to score PI			

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Individual scoring elements (add rows as required; delete if not scoring by elements)	Applicable SGs met per individual scoring element			Scoring element scores
	SG60	SG80	SG100	
	X of x	X of x	X of x	
Overall Performance Indicator score	Applicable SGs/elements met			Overall score
	SG60	SG80	SG100	
	X of x	X of x	X of x	
Condition number (if relevant)				

PI 1.2.2 – Harvest control rules and tools

PI 1.2.2		**There are well defined and effective harvest control rules (HCRs) in place**		
Scoring Issue		SG 60	SG 80	SG 100
a	**HCRs design and application**			
	Guide post	**Generally understood** HCRs are in place **or available** that are **expected** to reduce the exploitation rate as the point of recruitment impairment (PRI) is approached.	**Well defined** HCRs are **in place** that **ensure** that the exploitation rate is reduced as the PRI is approached, are expected to keep the stock **fluctuating around** a target level consistent with (or above) MSY, or for key LTL species a level consistent with ecosystem needs.	The HCRs are expected to keep the stock **fluctuating at or above** a target level consistent with MSY, or another more appropriate level taking into account the ecological role of the stock, **most** of the time.
	Met?	***Yes***	***Yes***	***Yes***

Rationale

With the assistance of the QFC and based upon a detailed MSE, the LEPMAG in 2014 recommended an HCR that included:

- Target fishing mortality at 60% of the Maximum Sustainable Yield (60%F_{msy})
- Threshold limit reference point of 20% of the unfished spawning stock biomass (20%SSB_0)
- Would be at a risk tolerance level of P-star, P* = 0.05
- Probabilistic control rule, risk tolerance level of P star, P* = 0.05
- A limitation on the annual change in TAC of ±20%

The LEC adopted the recommended HCR advanced by LEPMAG in March 2014. These were included in the 2014–2019 Walleye Management Plan (Kayle et al. 2015).

The explicit HCR with a 60%F_{msy} target harvest rate, 20%SSB0 LRP and a 5% P* rule are evidence of the general requirement to reduce exploitation as abundance declines to a critically low level. A well-defined HCR is in place consistent with the strategy which, through an explicit LRP and a 5% P* rule, will reduce exploitation as biomass declines.

The HCRs are expected to keep the stock **fluctuating at or above** a target level consistent with MSY, or another more appropriate level taking into account the ecological role of the stock, **most** of the time. SG 80 and 100 could be met.

b	**HCRs robustness to uncertainty**			
	Guide post		The HCRs are likely to be robust to the main uncertainties.	The HCRs take account of a **wide** range of uncertainties including the ecological role of the stock, and there is **evidence** that the HCRs are robust to the main uncertainties.
	Met?		**Yes**	**No**

Rationale

The HCR accounts for the main uncertainties identified in the annual stock assessment. It does this through provision in the scientific advice both in stating whether projected biomass will fall below the LRP and in providing minimum, mean, and maximum RAHs. As uncertainty in current stock size changes, so do these RAHs. It is clear that the HCR takes into account the uncertainties recognized in the stock assessment. The WTG acknowledges that movement between the east and west basins are an issue in the lake-wide assessment of walleye. There are also movements

PI 1.2.2	There are well defined and effective harvest control rules (HCRs) in place		
to and from Lake Huron that are a source of uncertainty. The impact of this movement on the MU 1 – 3 walleye assessment is unclear. The HCRs are likely to be robust to the main uncertainties. SG 80 would be met.			
c	**HCRs evaluation**		
Guide post	There is **some evidence** that tools used **or available** to implement HCRs are appropriate and effective in controlling exploitation.	**Available evidence indicates** that the tools in use are appropriate and effective in achieving the exploitation levels required under the HCRs.	**Evidence clearly shows** that the tools in use are effective in achieving the exploitation levels required under the HCRs.
Met?	***Yes***	***Yes***	***Yes***

Rationale

The primary tool to control harvesting is the TAC. This is based on annual scientific advice. The reported catch has not exceeded the TAC since 2005 (Tables 17 and 18). Since 2005, reported catch has been below the TAC and the latter has been set consistent with scientific advice. The primary regulatory tool, TAC, is used successfully in many fisheries to control exploitation. The use of quotas to control exploitation in the fishery clearly indicates that these are effective in achieving the objectives of the harvest strategy.

Evidence clearly shows that the tools in use are effective in achieving the exploitation levels required under the HCRs. SG 80 and 100 could be met.

References

Kayle, K., Oldenburg, K., Murray, C., Francis, J., and Markham, J. 2015. Lake Erie Walleye Management Plan 2015-2019. Lake Erie Committee, Great Lakes Fishery Commission. 42 pages.

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PI 1.2.2	There are well defined and effective harvest control rules (HCRs) in place

Walleye Task Group (WTG). 2017. Report for 2016 by the Lake Erie Walleye Task Group, March 2017. Presented to the Standing Technical Committee, Lake Erie Committee, Great Lakes Fishery Commission. Ypsilanti, Michigan, USA. Presented at Ypsilanti, Michigan, March 2017. 25 pages.

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Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	Applicable SGs/elements likely met			Likely overall PI score
	SG60	SG80	SG100	
	2 of 2	3 of 3	2 of 3	≥80
Information gap indicator	Information sufficient to score PI			

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Individual scoring elements (add rows as required; delete if not scoring by elements)	Applicable SGs met per individual scoring element			Scoring element scores
	SG60	SG80	SG100	
	X of x	X of x	X of x	
Overall Performance Indicator score	Applicable SGs/elements met			Overall score
	SG60	SG80	SG100	
	X of x	X of x	X of x	
Condition number (if relevant)				

PI 1.2.3 – Information and monitoring

PI 1.2.3		**Relevant information is collected to support the harvest strategy**		
Scoring Issue		SG 60	SG 80	SG 100
a	Range of information			
	Guide post	**Some** relevant information related to stock structure, stock productivity and fleet composition is available to support the harvest strategy.	**Sufficient** relevant information related to stock structure, stock productivity, fleet composition and other data are available to support the harvest strategy.	A **comprehensive range** of information (on stock structure, stock productivity, fleet composition, stock abundance, UoA removals and other information such as environmental information), including some that may not be directly related to the current harvest strategy, is available.
	Met?	**Yes**	**Yes**	**No**

Rationale

Studies indicate that walleye in western Lake Erie are genetically distinct from those in eastern Lake Erie. There is substantial migration of walleye from west to east. There is uncertainty associated with the annual age and size structure of these migrants. There may also be migration to and from Lake Huron. Maturity and fecundity data come from various sources. Natural mortality is assumed to be equal to 0.32, based on tagging studies. There is a good understanding of stock productivity, using stock recruitment relationships, with environmental covariates permitting estimation of stock production. Information is available on fleet composition. The licensing system catalogues vessel and gear characteristics of each participant. The vessel monitoring system provides good information on fishing location, which is supplemented by logbook data. Various genetic and morphological studies support the basis of the stock unit. Other data include ongoing monitoring of environmental conditions in Lake Erie, which influence walleye productivity. Quite generally, there is sufficient information on stock structure, stock productivity, and fleet composition. In addition, other data on environmental conditions are sufficient to monitor potential abiotic changes in walleye productivity. Although there is a broad range of information on walleye and this could be considered comprehensive, there is a lack of verification on discard data. Discards could be relatively low, but this probably needs more verification. There are no estimates of walleye post-capture mortality. Furthermore, the uncertainties in the associated migration between and within the lake need to be addresses to ensure that objectives of the harvest strategy are met.

Sufficient relevant information related to stock structure, stock productivity, fleet composition and other data are available to support the harvest strategy. SG 80 could be met.

b	Monitoring			
	Guide post	Stock abundance and UoA removals are monitored and **at least one indicator** is available and monitored with sufficient frequency to support the harvest control rule.	Stock abundance and UoA removals are **regularly monitored at a level of accuracy and coverage consistent with the harvest control rule**, and **one or more indicators** are available and monitored with sufficient frequency to support the harvest control rule.	**All information** required by the harvest control rule is monitored with high frequency and a high degree of certainty, and there is a good understanding of inherent **uncertainties** in the information [data] and the robustness of assessment and management to this uncertainty.

PI 1.2.3		Relevant information is collected to support the harvest strategy		
	Met?	**Yes**	**Yes**	**No**

Rationale

A number of fisheries-dependent and -independent stock abundance indices are used in the walleye assessment. The primary fisheries-dependent indices, providing fishing effort since the late 1970s, come from the Ontario gill-net and Ohio sports fisheries. The primary fisheries-independent indices are provided by the Ontario partnership gill-net survey since 1989, the Ontario and U.S. western basin inter-agency trawling survey since 1988, and the Ohio-Michigan gill-net survey since 1978. These indices provide more than three decades of stock monitoring (e.g., recruitment indices, Appendix 1), which is more than five generation times for walleye. Fishery removals have been recorded in daily catch records since the mid-1990s, and discards have been reported since 2011. Given the reported magnitude of released fish compared with total catch, post-capture mortality does not appear to be a major issue. The relative uncertainty of indices is incorporated into the assessment. There is monitoring of dock-side landings, but these are not on the lake verifications of discard although these are reported to be low. All information required by the harvest control rule is monitored with high frequency relative to generation time. There is a reasonable understanding of the uncertainties in fish removals and stock indices; however, there is concern about discard data because of the lack of verification. The robustness of assessment and management to these uncertainties has not been fully examined. All information required by the HCR is monitored with a high degree of frequency and annually.

Stock abundance and UoA removals are **regularly monitored at a level of accuracy and coverage consistent with the harvest control rule**, and **one or more indicators** are available and monitored with sufficient frequency to support the harvest control rule. SG 80 could be met.

c	Comprehensiveness of information			
	Guide post		There is good information on all other fishery removals from the stock.	
	Met?		**Yes**	

Rationale

There is a small recreational fishery in Ontario and a much larger one in Ohio. The individual compositional and operational characteristics of these fisheries are well described. There is a comprehensive database of catch and effort, quite comparable to those associated with the commercial fisheries. There are small hoop-net, seine, and bait fisheries; however, there is no estimate of the catch of these. Nevertheless, the primary other fishery (Ohio sport) is well monitored.

There is good information on all other fishery removals from the stock. SG 80 would be met.

References

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PI 1.2.3	**Relevant information is collected to support the harvest strategy**

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Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	Applicable SGs/elements likely met			Likely overall PI score
	SG60	SG80	SG100	
	2 of 2	3 of 3	0 of 2	≥80
Information gap indicator	Information sufficient to score PI			

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Individual scoring elements	Applicable SGs met per individual scoring element	

PI 1.2.3	**Relevant information is collected to support the harvest strategy**			
(add rows as required; delete if not scoring by elements)	SG60	SG80	SG100	Scoring element scores
	X of x	X of x	X of x	
Overall Performance Indicator score	Applicable SGs/elements met			Overall score
	SG60	SG80	SG100	
	X of x	X of x	X of x	
Condition number (if relevant)				

PI 1.2.4 – Assessment of stock status

PI 1.2.4		There is an adequate assessment of the stock status		
Scoring Issue		SG 60	SG 80	SG 100
a	Appropriateness of assessment to stock under consideration			
	Guide post		The assessment is appropriate for the stock and for the harvest control rule.	The assessment takes into account the major features relevant to the biology of the species and the nature of the UoA.
	Met?		**Yes**	**No**

Rationale

Estimates of abundance, biomass, and fishing mortality are provided by the SCAA model, along with estimates of uncertainty, which are used by the HCR. The model, which incorporates error in both the fisheries removals and the indices, is appropriate, given the nature of the fishery. The assessment has been reviewed extensively and determined to be appropriate for the stock and the HCR. It describes the major biological processes associated with Lake Erie walleye and the fisheries that exploit them. However, known movements among MUs 1–3 and eastern Lake Erie MU4 have not yet been included.

The assessment is appropriate for the stock and for the harvest control rule. SG 80 would be met.

b	Assessment approach			
	Guide post	The assessment estimates stock status relative to generic reference points appropriate to the species category.	The assessment estimates stock status relative to reference points that are appropriate to the stock and can be estimated.	
	Met?	**Yes**	**Yes**	

Rationale

Assessment estimates spawning biomass relative to 20%SSB$_0$ (LRP) and 60%F$_{msy}$ (target fishing mortality).

The assessment estimates stock status relative to reference points that are appropriate to the stock and can be estimated. SG 60 and 80 could be met.

c	Uncertainty in the assessment			
	Guide post	The assessment **identifies major sources** of uncertainty.	The assessment **takes uncertainty into account**.	The assessment takes into account uncertainty and is evaluating stock status relative to reference points in a **probabilistic** way.
	Met?	**Yes**	**Yes**	**Yes**

Rationale

Fishery removal and index datasets both have associated estimates of relative variance (lambda). Based on the findings of analysis resulting in the Walleye Management Plans (Locke et al. 2005, Kayle et al. 2015) and subsequent examination of the relative error in each input dataset. Error associated with the Ricker stock recruitment

PI 1.2.4	**There is an adequate assessment of the stock status**

relationship is documented and used in the reference point determination. The model, through the use of estimates of relative variance associated with each fishery removal and index dataset, takes uncertainty into account. These lambda terms are based on discussions that led to the development of the management plans and subsequent examination of the relative error in each input dataset. The minimum, mean, and maximum recommended allowable harvest are provided for each projected year. As well, the stock biomass at the end of the projected year is evaluated in a probabilistic way relative to 20%SSB_0.

The assessment takes into account uncertainty and is evaluating stock status relative to reference points in a **probabilistic** way. SG 100 could be met.

d	Evaluation of assessment			
	Guide post			The assessment has been tested and shown to be robust. Alternative hypotheses and assessment approaches have been rigorously explored.
	Met?			**Yes**

Rationale

Management strategy evaluations provided extensive tests of the assessment model in which alternative hypothesis and model sensitivities were examined.

The assessment has been tested and shown to be robust. Alternative hypotheses and assessment approaches have been rigorously explored. SG 100 would be met.

e	Peer review of assessment			
	Guide post		The assessment of stock status is subject to peer review.	The assessment has been **internally and externally** peer reviewed.
	Met?		**Yes**	**Yes**

Rationale

The Lake Erie Percid Management Advisory Group is involved, and the QFC provides analyses and insights. The WTG provides an internal peer-review form, the results of which are provided in annual reports provided by the WTG. The WTG provides internal peer review, but from time to time, external peer review has been conducted by commissioned, highly qualified scientists (e.g., Myers and Bence 2002) and ongoing interaction with the QFC of Michigan State University.

The assessment has been **internally and externally** peer reviewed. SG 100 could be met.

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Draft scoring range and information gap indicator added at Announcement Comment Draft Report

PI 1.2.4	**There is an adequate assessment of the stock status**			
Draft scoring range	Applicable SGs/elements likely met			Likely overall PI score
	SG60	SG80	SG100	
	2 of 2	4 of 4	3 of 4	≥80
Information gap indicator	Information sufficient to score PI			
Overall Performance Indicator scores added from Client and Peer Review Draft Report				
Individual scoring elements (add rows as required; delete if not scoring by elements)	Applicable SGs met per individual scoring element			Scoring element scores
	SG60	SG80	SG100	
	X of x	X of x	X of x	
Overall Performance Indicator score	Applicable SGs/elements met			Overall score
	SG60	SG80	SG100	
	X of x	X of x	X of x	
Condition number (if relevant)				

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7.3 Principle 2

7.3.1 Principle 2 background

Principle 2 of the MSC standard sets requirements for fishing operations that allow for the maintenance of the structure, productivity, function and diversity of the ecosystem (including habitat and associated dependent and ecologically related species) on which the fishery depends. Principle 2 is designed to specifically assess the outcome, management and information aspects relating to all the key ecosystem components: primary and secondary species (i.e. unwanted catch that may be managed or unmanged), Endangered, Threatened, or Protected (ETP) species, habitats and ecosystems. Each P2 species is considered within only one of the primary species, secondary species or ETP species components.

Analysis in this section covers the aquatic ecosystem, its status and any particularly sensitive areas, habitats or ecosystem features influencing or affected by the fishery; the status and relevant management history of the primary, secondary and ETP species including specific constraints; and details of any critical environments or sources of concern and actions required to address them.

No cumulative impacts have been consideration for any Principle 2 Performance Indicator since there are no other fisheries in assessment or certified in Lake Erie.

The Lake Erie Ecosystem

"The State of Lake Erie in 2009" report published in 2017[1] highlights that Lake Erie is the shallowest and southernmost Laurentian Great Lake, with three distinct basins (western, central, and eastern) that differ in shape, depth, hydrology, and biological productivity. Although Lake Erie overall is considered mesotrophic (moderate biological productivity), some areas in the shallow western basin are "eutrophic" (high productivity), and much of the deep eastern basin is "oligotrophic" (low productivity). Productivity of central-basin waters generally follows a gradient between the western and eastern basins declining from west to east. Productivity also decreases from shallow inshore areas to deep offshore areas in all basins (Figure 20).

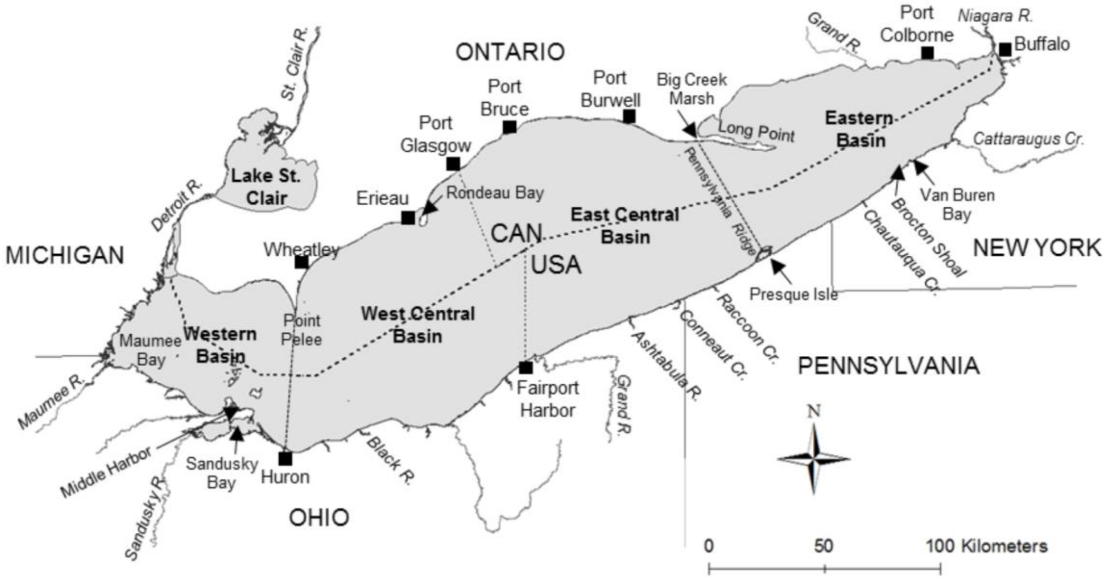

Figure 18. Map of Lake Erie showing the eastern and western basins, two sub-basins of the central basin, international boundary line, various municipalities and landmarks, and selected tributaries (italics), as referenced in the text.

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[1] Kayle, K.A., and Murray, C. 2017. Lake Erie's central basin. In The state of Lake Erie in 2009. Edited by J.L. Markham and R.L. Knight [online]. Available from: http://www.glfc.org/pubs/SpecialPubs/Sp17_01.pdf

Variation in physical features and biological productivity within and among the basins of Lake Erie affects fish ecology and community diversity, stock structure, behavior (movements), and ultimately how fisheries are managed (Ryan et al. 2003; Tyson et al. 2009). Generally, mesotrophic areas of Lake Erie support cool-water fish communities of walleye, yellow perch, smallmouth bass, northern pike, and muskellunge, with a soft-rayed shiner forage base (see Table 19). Hexagenia mayfly populations are sentinels of mesotrophic conditions in Lake Erie (Edwards and Ryder 1990).

Eutrophic-area fish communities are characterized by black basses, white perch, white bass, channel catfish, freshwater drum, and a prey base dominated by gizzard shad and age-0 spiny-rayed fishes (yellow perch, white perch, white bass, and freshwater drum).

Oligotrophic areas sustain cold-water salmonids (lake trout, lake whitefish, steelhead, cisco) and burbot with a forage-fish community dominated by naturalized rainbow smelt, soft-rayed shiners, and, historically, cisco. Deep-water amphipods Diporeia spp., an indicator of healthy oligotrophic food webs, are no longer found in Lake Erie (Barbiero et al. 2011).

Lake sturgeon occupy nearshore areas across the lake but remain rare. Nearshore fish communities tend to organize around dynamic coastal habitats, such as wetlands, bays, rivers, and estuaries, whereas offshore fish communities are strongly influenced by thermal stratification, dissolved oxygen levels, bottom structure (reefs), and circulation patterns (gyres). Repeatability and persistence of key spawning and nursery habitats over time have supported stock formation for several high-value species (walleye, yellow perch, and lake whitefish) whose movements within and among basins provide fisheries benefits to multiple jurisdictions through coordinated management.

7.4 Primary and Secondary Species

Ontario

In Ontario, the industry is governed by a series of 'Conditions of License' which vary from quota zone to quota zone and lake to lake. All fish landed in the Province of Ontario by a non-aboriginal commercial fishery are subject to inspection prior to offloading the day's catch. This is accomplished by two methods. On Lake Erie, the bulk of the catches are scrutinized by a government appointed dock-side monitor and sample weights are taken which must correlate to the Daily-Catch-Report (DCR) filed by the Captain of the fishing vessel[2]. Where a dock-side monitor is not available, the Captain must file the DCR report at a lock-box station prior to off-loading his catch. When utilizing this method, the Captain and the DCR's are subject to random audits by Conservation Officers.

OMNR requires fishers to declare all fishes caught on a DCR (including retained catch, and discarded, released and surrendered catch). Appendix C of the Conditions of Ontario Commercial Fishing Licence (see Appendix 4) specifies allowances for the four quota species (Walleye, Yellow perch, Lake whitefish, and smelt), and lists 11 species with unlimited catch (Channel catfish, White bass, Longnose gar, Bowfin, Alewife, Gizzard shad, Burbot, White perch, Rock bass, Freshwater drum, and crappie) as well as four unlimited catch species groups (suckers excluding black and Bigmouth buffalo, Mooneye/Goldeye, carp >56 cm and smaller bullheads, sunfish excluding Warmouth). All other species are defined as "No harvest permitted". All fish named on Appendix C must be reported and landed or reported and released if alive. Any fish or wildlife species not listed in Appendix C or fish larger than the length restrictions listed on Appendix C are 'no harvest permitted' species. This includes invasive species and species listed on the Species At Risk in Ontario (SARO) list. Any no harvest permitted or SARO species that are caught and are still alive must be released in a manner which causes the least harm to the fish or wildlife. Fish must be returned to the water immediately in accordance with the

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[2] http://www.ocfa.ca/fisheries-industry/regulatory-environment

Ontario Fishery Regulations. Each released species must be recorded on the DCR in numbers of individuals released. When no harvest permitted species including invasive species and SARO species, are caught and are no longer alive, they must be separated from the catch and recorded on the DCR in number of individuals caught and turned over to a Port Observer or Conservation Officer at the time of inspection. In essence, all catch is to be reported.

Nevertheless, fishers declare catch on their DCR which includes data entries for landed catch, as well as for weight of discarded and released fish by targeted effort. The target species entered in the DCR is defined at the moment of setting the gear (i.e. by intentionality) and the gill net mesh size should be appropriate for the target. Data from up to three lifts may be entered in a single DCR.

Ohio

Key compliance requirements of the Division's MCS program in respect of Ohio's 2019 commercial Yellow Perch small mesh trap net fishery are reported here as far as they relate to the management of primary and secondary species (as described in the MSC standard).

- Monitoring and catch reporting: (i) all vessels engaged in trapnetting must have an operating vessel monitoring system aboard approved by the chief of the Division of Wildlife, (ii) trap net licensees shall keep an accurate daily record of their catch on an electronic catch reporting system as established by the chief of the Division of Wildlife; (iii) an accurate daily record of their catch (quota and non-quota species) of fish taken by trap net shall be entered into an electronic catch reporting system immediately after each net is lifted, (iv) all of the estimated weights entered into the electronic catch reporting system shall be electronically transmitted after lifting the last net, or at least one half hour prior to landing at the dock listed on the license;
- All undersized fish and species that cannot be taken commercially must be released immediately with as little injury as possible while the fishing device is lifted, pulled, or hauled;
- It is unlawful for any person to sell, buy, offer for sale, possess, or transport for sale fish which have a length or weight limit in any form other than round, headed and gutted, or filleted;
- Commercial fish minimum sizes: 8 1/2 in (in the round); 5 5/8 in (fillet); 6 7/8 in (headless); and
- All fish taken or caught from Ohio waters shall be brought into an Ohio port for inspection. No person shall ship, carry, transport, or cause to be transported any fish taken or caught from Ohio waters directly to a point outside the state (ORC Chapter 1533.63).

The table below shown some of the most common species in Lake Erie, many of which are caught as bycatch in the fishery under assessment.

Table 19. Scientific and common names of lake Erie fishes.

Scientific name	**Common name**	**Scientific name**	**Common name**
Acipenser fulvescens	Lake Sturgeon	*Micropterus dolomieu*	Smallmouth Bass
Alosapseudoharengus	Alewife	*Micropterus salmoides*	Largemouth Bass
Ambloplites rupestris	Rock Bass	*Morone americana*	White Perch
Ameiurus nebulosus	Brown Bullhead	*Morone chrysops*	White Bass
Aplodinotus grunniens	Freshwater Drum	*Moxostoma erythrurum*	Golden Redhorse
Carassius auratus	Goldfish	*Moxostoma macrolepidotum*	Shorthead Redhorse
Carpiodes cyprinus	Quillback	*Neogobius melanostomus*	Round Goby
Catostomus commersonii	White Sucker	*Notropis atherinoides*	Emerald Shiner

Coregonus clupeaformis	Lake Whitefish	*Notropis hudsonius*	Spottail Shiner
Cyprinus carpio	Common Carp	*Notropis volucellus*	Mimic Shiner
Dorosoma cepedianum	Gizzard Shad	*Osmerus mordax*	Rainbow Smelt
Esox masquinongy	Muskellunge	*Perca flavescens*	Yellow Perch
Ichthyomyzon unicuspis	Silver Lamprey	*Percina caprodes*	Logperch
Ictalurus punctatus	Channel Catfish	*Percopsis omiscomaycus*	Trout-perch
Labidesthes sicculus	Brook Silverside	*Salvelinus namaycush*	Lake Trout
Macrhybopsis storeriana	Silver Chub	*Sander vitreus*	Walleye
Petromyzon marinus	Sea Lamprey		

The Lake Erie Yellow Perch and Walleye fishery has an established data collection system that allows the categorization of primary and secondary main/minor species. Accordingly, tables are provided below showing the 5 year average used to categorise species for P2 assessment.

Table 20. Yellow perch fishery catch profile (in pounds) in QZ1 with 5 year averages from 2014-2018.

QZ	Species	2018 Total	2018 UoA%	2017 Total	2017 UoA%	2016 Total	2016 UoA%	2015 Total	2015 UoA%	2014 Total	2014 UoA%	5 Year Average % of UoA total catch
1	Brown Bullhead	-	0.00%	-	0.00%	-	0.00%	-	0.00%	7.7	0.00%	0.00%
1	Burbot	38.7	0.00%	-	0.00%	-	0.00%	-	0.00%	-	0.00%	0.00%
1	Channel Catfish	6,454.4	0.45%	4,058.7	0.24%	6,936.5	0.46%	5,899.2	0.67%	2,971.4	0.35%	0.44%
1	Common Carp	-	0.00%	1.9	0.00%	34.8	0.00%	42.5	0.00%	75.3	0.01%	0.00%
1	Freshwater Drum	11,775.2	0.82%	16,954.7	1.01%	12,438.0	0.82%	3,491.8	0.40%	8,174.4	0.98%	0.81%
1	Gizzard Shad	8,442.8	0.59%	26,233.9	1.57%	54,423.6	3.59%	8,186.5	0.93%	1,700.9	0.20%	1.38%
1	Muskellunge	-	0.00%	-	0.00%	-	0.00%	9.7	0.00%	-	0.00%	0.00%
1	Lake Sturgeon	60.0	0.00%	56.4	0.00%	70.3	0.00%	175.2	0.02%	43.9	0.01%	0.01%
1	Lake Whitefish	14.6	0.00%	42.2	0.00%	73.7	0.00%	51.6	0.01%	47.9	0.01%	0.00%
1	Longnose Gar	-	0.00%	-	0.00%	-	0.00%	1.0	0.00%	-	0.00%	0.00%
1	MIXED SCRAP FISH	-	0.00%	-	0.00%	-	0.00%	-	0.00%	116.0	0.01%	0.00%
1	Mooneye	-	0.00%	12.5	0.00%	-	0.00%	-	0.00%	-	0.00%	0.00%
1	Northern Pike	-	0.00%	-	0.00%	-	0.00%	3.9	0.00%	1.0	0.00%	0.00%

1	Pomoxis	4.9	0.00%	-	0.00%	1.0	0.00%	5.9	0.00%	-	0.00%	0.00%
1	Quillback	6.8	0.00%	5.8	0.00%	3.9	0.00%	-	0.00%	-	0.00%	0.00%
1	Rainbow Smelt	4.9	0.00%	20.3	0.00%	56.2	0.00%	50.3	0.01%	19.3	0.00%	0.00%
1	Rainbow Trout	-	0.00%	-	0.00%	-	0.00%	13.5	0.00%	-	0.00%	0.00%
1	Rock Bass	5.0	0.00%	10.4	0.00%	15.9	0.00%	11.7	0.00%	5.5	0.00%	0.00%
1	Round Goby	-	0.00%	-	0.00%	-	0.00%	6.8	0.00%	-	0.00%	0.00%
1	Sea Lamprey	-	0.00%	-	0.00%	-	0.00%	1.0	0.00%	-	0.00%	0.00%
1	Smallmouth Bass	1.0	0.00%	-	0.00%	-	0.00%	41.6	0.00%	-	0.00%	0.00%
1	Suckers	18,800.8	1.31%	21,062.0	1.26%	19,717.9	1.30%	14,081.3	1.61%	6,855.3	0.82%	1.26%
1	Walleye	74,292.5	5.19%	164,890.4	9.84%	185,189.3	12.22%	101,557.3	11.58%	21,146.3	2.52%	8.27%
1	White Bass	3,144.1	0.22%	1,763.1	0.11%	5,065.7	0.33%	7,665.0	0.87%	10,853.4	1.29%	0.57%
1	White Perch	198,022.8	13.84%	308,916.3	18.44%	325,377.4	21.47%	219,137.2	24.98%	213,837.2	25.51%	20.85%
1	White Sucker	947.4	0.07%	1,843.9	0.11%	-	0.00%		0.00%		0.00%	0.04%
1	Yellow Perch	1,108,795.4	77.49%	1,129,504.7	67.42%	906,230.8	59.79%	516,789.9	58.91%	572,270.7	68.28%	66.38%
	TOTAL catch	**1,430,811.3**	100%	**1,675,377.2**	100%	**1,515,635.0**	100%	**877,222.9**	100%	**838,126.2**	100%	100%

Primary/Secondary species summary table

QZ1	
Main Primary species (subject to management)	**Main Secondary species (Not subject to management)**
Walleye (*Sander Vitreus*)	White perch (*Morone Americana*) – not assessed: invasive species

Lake Sturgeon and Lake Trout are considered vulnerable species. None of this species has catches in the UoA above the 2% threshold. Lake trout was not recorded in this UoA.

Table 21. Yellow perch fishery catch profile (in pounds) in QZ2 with 5 year averages from 2014-2018.

QZ	Species	2018 Total	2018 UoA%	2017 Total	2017 UoA%	2016 Total	2016 UoA%	2015 Total	2015 UoA%	2014 Total	2014 UoA%	5 Year Average % of UoA total catch
2	Bigmouth Buffalo	-	0.00%	-	0.00%	-	0.00%	-	0.00%	-	0.00%	0.00%
2	Burbot	2.9	0.00%	-	0.00%	1.0	0.00%	10.6	0.00%	-	0.00%	0.00%
2	Channel Catfish	3,038.8	0.17%	1,281.9	0.07%	1,741.4	0.10%	3,157.7	0.15%	1,563.2	0.08%	0.11%
2	Cisco	-	0.00%	-	0.00%	-	0.00%	-	0.00%	2.0	0.00%	0.00%
2	Common Carp	80.3	0.00%	24.2	0.00%	11.6	0.00%	30.9	0.00%	3.9	0.00%	0.00%
2	Common Shiner	-	0.00%	-	0.00%	1.0	0.00%	-	0.00%	-	0.00%	0.00%
2	Freshwater Drum	32,034.8	1.79%	13,239.5	0.70%	11,183.4	0.63%	21,704.9	1.00%	16,298.8	0.84%	0.99%
2	Gizzard Shad	10,502.1	0.59%	33,728.0	1.79%	43,912.5	2.46%	3,787.4	0.17%	1,893.2	0.10%	1.02%
2	Lake Sturgeon	3.9	0.00%	4.9	0.00%	1.0	0.00%	2.0	0.00%	15.5	0.00%	0.00%
2	Lake Trout	-	0.00%	-	0.00%	-	0.00%	1.0	0.00%	15.5	0.00%	0.00%
2	Lake Whitefish	9.4	0.00%	13.3	0.00%	34.1	0.00%	8.5	0.00%	49.4	0.00%	0.00%
2	Lepomis	1.0	0.00%	-	0.00%	-	0.00%	-	0.00%	-	0.00%	0.00%
2	Longnose Gar	1.0	0.00%	-	0.00%	-	0.00%	-	0.00%	-	0.00%	0.00%
2	Mooneye	-	0.00%	44.9	0.00%	10.2	0.00%	-	0.00%	-	0.00%	0.00%

2	Oncorhynchus	-	0.00%	-	0.00%	1.0	0.00%	4.8	0.00%	-	0.00%	0.00%
2	Pomoxis	5.0	0.00%	-	0.00%	1.0	0.00%	6.7	0.00%	1.9	0.00%	0.00%
2	Quillback	94.8	0.01%	4.8	0.00%	2.9	0.00%	-	0.00%	-	0.00%	0.00%
2	Rainbow Smelt	343.7	0.02%	539.0	0.03%	1,525.9	0.09%	1,721.7	0.08%	453.9	0.02%	0.05%
2	Rainbow Trout	-	0.00%	-	0.00%	1.0	0.00%	2.0	0.00%	1.0	0.00%	0.00%
2	Rock Bass	-	0.00%	1.0	0.00%	-	0.00%	4.9	0.00%	1.0	0.00%	0.00%
2	Round Goby	-	0.00%	-	0.00%	16.5	0.00%	3.9	0.00%	-	0.00%	0.00%
2	Sea Lamprey	-	0.00%	-	0.00%	2.0	0.00%	3.0	0.00%	1.0	0.00%	0.00%
2	Smallmouth Bass	-	0.00%	-	0.00%	-	0.00%	-	0.00%	1.0	0.00%	0.00%
2	Suckers	6,003.8	0.34%	3,366.2	0.18%	4,115.0	0.23%	2,999.3	0.14%	1,806.9	0.09%	0.20%
2	Walleye	65,034.1	3.64%	123,458.7	6.54%	80,747.4	4.53%	41,609.9	1.92%	5,466.6	0.28%	3.38%
2	White Bass	2,875.8	0.16%	3,092.0	0.16%	7,323.9	0.41%	9,741.7	0.45%	20,169.8	1.04%	0.45%
2	White Perch	522,499.4	29.21%	361,790.0	19.18%	418,899.1	23.49%	662,142.4	30.58%	457,553.2	23.62%	25.22%
2	White Sucker	111.3	0.01%	176.2	0.01%	-	0.00%		0.00%		0.00%	0.00%
2	Yellow Perch	1,145,866.7	64.07%	1,345,858.9	71.34%	1,213,694.1	68.06%	1,418,538.5	65.51%	1,431,847.8	73.92%	68.58%
	TOTAL catch	**1,788,508.8**	100.00%	**1,886,623.5**	100%	**1,783,226**	100.00%	**2,165,481.8**	100.00%	**1,937,145.6**	100%	100.00%

Primary/Secondary species summary table

QZ2	
Main Primary species (subject to management)	**Main Secondary species (Not subject to management)**
None	White perch (*Morone Americana*) – not assessed: invasive species

Lake Sturgeon and Lake Trout are considered vulnerable species. None of this species has catches in the UoA above the 2% threshold.

Walleye is above the 2% threshold but is not considered a less resilient species. Walley stock status is highly likely to be above the PRI.

Table 22. Yellow perch fishery catch profile (in pounds) in QZ3W with 5 year averages from 2014-2018.

QZ	Species	2018 Total	2018 UoA%	2017 Total	2017 UoA%	2016 Total	2016 UoA%	2015 Total	2015 UoA%	2014 Total	2014 UoA%	5 Year Average % of UoA total catch
3	American Eel	4.80	0.00%	-	0.00%	-	0.00%	-	0.00%	-	0.00%	0.00%
3	Burbot	14.60	0.00%	17.40	0.00%	24.20	0.00%	4.90	0.00%	31.10	0.00%	0.00%
3	Channel Catfish	373.10	0.02%	256.90	0.01%	776.90	0.04%	354.00	0.02%	406.20	0.02%	0.02%
3	Cisco	1.00	0.00%	-	0.00%	3.00	0.00%	-	0.00%	-	0.00%	0.00%
3	Common Carp	8.70	0.00%	1.00	0.00%	31.90	0.00%	7.70	0.00%	-	0.00%	0.00%
3	Freshwater Drum	12,794.40	0.62%	9,211.40	0.43%	4,116.00	0.19%	2,497.50	0.12%	7,943.00	0.30%	0.33%
3	Gizzard Shad	4,168.20	0.20%	15,052.40	0.71%	21,874.50	0.99%	974.80	0.05%	1,084.10	0.04%	0.40%
3	Lake Sturgeon		0.00%	4.80	0.00%	7.70	0.00%	-	0.00%	-	0.00%	0.00%
3	Lake Trout	-	0.00%	-	0.00%	2.00	0.00%	10.80	0.00%	1.00	0.00%	0.00%
3	Lake Whitefish	181.00	0.01%	373.40	0.02%	265.20	0.01%	31.80	0.00%	37.50	0.00%	0.01%
3	Mooneye	-	0.00%	1.00	0.00%	-	0.00%	-	0.00%	-	0.00%	0.00%
3	Muskellunge	-	0.00%	-	0.00%	-	0.00%	-	0.00%	2.90	0.00%	0.00%

3	Northern Pike	-	0.00%	-	0.00%	-	0.00%	-	0.00%	1.00	0.00%	0.00%
3	Pomoxis	1.00	0.00%	0.20	0.00%	-	0.00%	1.00	0.00%	2.90	0.00%	0.00%
3	Rainbow Smelt	52.60	0.00%	268.20	0.01%	1,204.50	0.05%	1,640.90	0.08%	266.80	0.01%	0.03%
3	Rainbow Trout	3.90	0.00%	-	0.00%	3.90	0.00%	1.00	0.00%	1.00	0.00%	0.00%
3	Rock Bass	-	0.00%	-	0.00%	-	0.00%	-	0.00%	1.00	0.00%	0.00%
3	Round Goby	-	0.00%	0.20	0.00%	2.90	0.00%	27.00	0.00%	175.00	0.01%	0.00%
3	Sea Lamprey	-	0.00%	-	0.00%	1.00	0.00%	-	0.00%	2.00	0.00%	0.00%
3	Smallmouth Bass	-	0.00%	-	0.00%	-	0.00%	-	0.00%	1.00	0.00%	0.00%
3	Suckers	1,279.20	0.06%	1,562.20	0.07%	2,019.20	0.09%	949.30	0.04%	2,940.60	0.11%	0.08%
3	Walleye	70,222.60	3.39%	126,468.10	5.97%	104,600.70	4.72%	9,768.10	0.45%	4,990.30	0.19%	2.94%
3	White Bass	1,487.70	0.07%	1,502.80	0.07%	3,795.10	0.17%	4,187.60	0.19%	25,404.60	0.95%	0.29%
3	White Perch	353,059.50	17.05%	145,558.40	6.87%	137,550.20	6.20%	105,401.60	4.90%	167,949.10	6.25%	8.26%
3	White Sucker	943.30	0.05%	11.60	0.00%	605.00	0.03%	1,048.70	0.05%	1,896.20	0.07%	0.04%
3	Yellow Perch	1,625,726.10	78.53%	1,819,246.80	85.83%	1,940,319.90	87.51%	2,024,876.30	94.10%	2,472,175.90	92.06%	87.61%
	TOTAL catch	**2,070,321.70**	**100%**	**2,119,536.80**	**100%**	**2,217,203.80**	**100%**	**2,151,783.00**	**100%**	**2,685,313.20**	**100%**	**100%**

Primary/Secondary species summary table

QZ3W	
Main Primary species (subject to management)	**Main Secondary species (Not subject to management)**
None	White perch (*Morone Americana*) – not assessed: invasive species

Lake Sturgeon and Lake Trout are considered vulnerable species. None of this species has catches in the UoA above the 2% threshold.

Walleye is above the 2% threshold but is not considered a less resilient species. Walley stock status is highly likely to be above the PRI.

Table 23. Yellow perch fishery catch profile (in pounds) in QZ3E with 5 year averages from 2014-2018.

QZ	Species	2018 Total	2018 UoA%	2017 Total	2017 UoA%	2016 Total	2016 UoA%	2015 Total	2015 UoA%	2014 Total	2014 UoA%	5 Year Average % of UoA total catch
3	American Eel	-	0.00%	-	0.00%	1.0	0.00%	1.0	0.00%	-	0.00%	0.00%
3	Brown Bullhead	6.8	0.00%	-	0.00%	-	0.00%	-	0.00%	-	0.00%	0.00%
3	Burbot	19.3	0.01%	7.7	0.00%	13.5	0.01%	24.2	0.01%	61.8	0.01%	0.01%
3	Channel Catfish	26.2	0.01%	26.1	0.01%	24.1	0.01%	10.7	0.00%	108.2	0.02%	0.01%
3	Cisco	-	0.00%	-	0.00%	-	0.00%	-	0.00%	1.0	0.00%	0.00%
3	Freshwater Drum	474.7	0.17%	77.4	0.04%	179.2	0.08%	294.8	0.10%	767.7	0.15%	0.11%
3	Gizzard Shad	1,100.8	0.39%	1,067.0	0.58%	741.6	0.31%	42.6	0.01%	-	0.00%	0.26%
3	Goldfish	-	0.00%	-	0.00%	-	0.00%	-	0.00%	1.0	0.00%	0.00%
3	Lake Sturgeon	-	0.00%	-	0.00%	-	0.00%	9.7	0.00%		0.00%	0.00%
3	Lake Trout	40.5	0.01%	21.4	0.01%	64.9	0.03%	37.5	0.01%	11.7	0.00%	0.01%
3	Lake Whitefish	225.4	0.08%	192.1	0.10%	216.9	0.09%	81.2	0.03%	33.6	0.01%	0.06%
3	Moxostoma	-	0.00%	135.3	0.07%	-	0.00%	-	0.00%	-	0.00%	0.01%
3	Rainbow Smelt	-	0.00%	-	0.00%	25.1	0.01%	292.9	0.10%	174.0	0.03%	0.03%

3	Rock Bass	9.7	0.00%	-	0.00%	4.8	0.00%	61.8	0.02%	-	0.00%	0.01%
3	Round Goby	-	0.00%	1.9	0.00%	7.7	0.00%	-	0.00%	7.7	0.00%	0.00%
3	Suckers	1,955.5	0.70%	243.5	0.13%	653.8	0.27%	2,063.5	0.69%	858.4	0.17%	0.39%
3	Walleye	17,667.9	6.29%	15,514.7	8.43%	6,343.2	2.67%	5,331.9	1.77%	8,780.2	1.71%	4.17%
3	White Bass	509.9	0.18%	163.4	0.09%	1,526.9	0.64%	5,970.7	1.99%	23,707.1	4.61%	1.50%
3	White Perch	6,804.4	2.42%	2,726.6	1.48%	6,940.4	2.92%	2,768.6	0.92%	17,197.1	3.34%	2.22%
3	White Sucker	30.9	0.01%	9.7	0.01%	-	0.00%		0.00%		0.00%	0.00%
3	Yellow Perch	252,103.7	89.72%	163,950.6	89.04%	221,008.2	92.96%	283,514.0	94.35%	462,894.5	89.95%	91.20%
	TOTAL catch	**280,975.7**	100%	**184,137.4**	100%	**237,751.3**	100%	**300,505.1**	100%	**514,604.0**	100%	100.00%

Primary/Secondary species summary table

QZ3E	
Main Primary species (subject to management)	**Main Secondary species (Not subject to management)**
None	None
Lake Sturgeon and Lake Trout are considered vulnerable species. None of this species has catches in the UoA above the 2% threshold. Walleye is above the 2% threshold but is not considered a less resilient species. Walleye stock status is highly likely to be above the PRI.	

Table 24. Walleye large mesh fishery catch profile (in pounds) with 5 year averages from 2014-2018.

Walleye large mesh fishery species	2018 Total catch	2018 % UoA	2017 total catch	2017 % UoA	2016 total catch	2016 % UoA	2015 total catch	2015 % UoA	2014 Total catch	2014 % UoA	5 Year Average % of UoA

											total catch
Bigmouth Buffalo	7.0	0.00%	26.0	0.00%	37.0	0.00%	0	0.00%		0.00%	0.00%
Bowfin	0.0	0.00%	5.0	0.00%	0.0	0.00%	0	0.00%		0.00%	0.00%
Brown Bullhead	0.0	0.00%	0.0	0.00%	0.0	0.00%	4.0	0.00%		0.00%	0.00%
Brown Trout	0.0	0.00%	0.0	0.00%	0.0	0.00%	0	0.00%		0.00%	0.00%
Burbot	59.0	0.00%	84.0	0.00%	6.0	0.00%	88.0	0.00%		0.00%	0.00%
Channel Catfish	13,933.0	0.13%	26,767.0	0.26%	28,883.0	0.30%	35,908.0	0.51%	16,256.0	0.27%	0.29%
Chinook Salmon	0.0	0.00%	0.0	0.00%	1.0	0.00%	0	0.00%		0.00%	0.00%
Cisco	1.0	0.00%		0.00%		0.00%	0	0.00%		0.00%	0.00%
Coho Salmon	1.0	0.00%	2.0	0.00%	0.0	0.00%	1.0	0.00%	3.0	0.00%	0.00%
Common Carp	905.0	0.01%	1,538.0	0.01%	6,656.0	0.07%	5,075.2	0.07%	10,945.8	0.18%	0.07%
Freshwater Drum	108,517.0	1.02%	212,494.0	2.03%	251,719.0	2.63%	452,619.7	6.45%	296,047.4	4.97%	3.42%
Gizzard Shad	943.0	0.01%	715.0	0.01%	0.0	0.00%	199,043.0	2.83%	166,070.0	2.79%	1.13%
Goldfish	1.0	0.00%	1.0	0.00%		0.00%	-	0.00%	1.0	0.00%	0.00%
Lake Sturgeon	0.0	0.00%	2.0	0.00%	0.0	0.00%	494.0	0.01%	457.0	0.01%	0.00%
Lake Trout	0.0	0.00%	1.0	0.00%	1.0	0.00%	316.0	0.00%	246.0	0.00%	0.00%
Lake Whitefish	42,818.0	0.40%	27,346.0	0.26%	29,809.0	0.31%	58,374.8	0.83%	96,809.5	1.62%	0.69%
Longnose Gar	36.0	0.00%	0.0	0.00%	0.0	0.00%	5.0	0.00%	15.0	0.00%	0.00%
Mooneyes	1.0	0.00%		0.00%		0.00%	0	0.00%		0.00%	0.00%
Muskellunge	0.0	0.00%	3.0	0.00%	8.0	0.00%	15.0	0.00%	41.0	0.00%	0.00%
Northern Pike	0.0	0.00%	1.0	0.00%	0.0	0.00%	6.0	0.00%	14.0	0.00%	0.00%
Oncorhynchus	0.0	0.00%	0.0	0.00%	0.0	0.00%	55.0	0.00%	83.0	0.00%	0.00%
Pink Salmon	0.0	0.00%	0.0	0.00%	0.0	0.00%	9.0	0.00%		0.00%	0.00%
Pomoxis	11.0	0.00%	5.0	0.00%	2.0	0.00%	11.8	0.00%	2.0	0.00%	0.00%
Quillback	947.0	0.01%	1,887.0	0.02%	601.0	0.01%	284.0	0.00%	578.0	0.01%	0.01%
Rainbow Smelt	2.0	0.00%	0.0	0.00%	300.0	0.00%	2,013.0	0.03%	291.0	0.00%	0.01%
Rainbow Trout	24.0	0.00%	13.0	0.00%	3.0	0.00%	169.0	0.00%	120.0	0.00%	0.00%
Rock Bass	21.0	0.00%	21.0	0.00%	14.0	0.00%	5.0	0.00%	13.0	0.00%	0.00%
Round Goby	0.0	0.00%	0.0	0.00%	0.0	0.00%	0	0.00%		0.00%	0.00%

Sea Lamprey	0.0	0.00%	0.0	0.00%	0.0	0.00%	26.0	0.00%	2.0	0.00%	0.00%
Smallmouth Bass	0.0	0.00%	10.0	0.00%	1.0	0.00%	76.0	0.00%	54.0	0.00%	0.00%
Splake	0.0	0.00%	0.0	0.00%	0.0	0.00%	0	0.00%		0.00%	0.00%
Suckers	15,481.0	0.14%	29,405.0	0.28%	14,248.0	0.15%	55,027.4	0.78%	47,090.0	0.79%	0.43%
Walleye	6,105,737.0	57.15%	4,824,492.0	46.18%	3,998,487.0	41.78%	3,915,456.7	55.76%	3,703,224.2	62.15%	52.60%
White Bass	1,791,735.0	16.77%	2,352,332.0	22.52%	3,963,684.0	41.41%	1,851,146.7	26.36%	1,413,277.1	23.72%	26.16%
White Perch	2,501,958.0	23.42%	2,916,251.0	27.92%	1,251,312.0	13.07%	428,752.9	6.11%	201,279.5	3.38%	14.78%
White Sucker	71.0	0.00%	0.0	0.00%	0.0	0.00%	65.0	0.00%	972.0	0.02%	0.00%
Yellow Perch	101,367.0	0.95%	52,706.0	0.50%	25,407.0	0.27%	16,944.8	0.24%	5,002.3	0.08%	0.41%
	Total		**Total**		**Total**		**Total**		**Total**		
	10,684,576.0	100.00%	**10,446,107.0**	100.00%	**9,571,179.0**	100.00%	**7,021,992.0**	100%	**5,958,893.8**	100%	100.00%

Primary/Secondary species summary table

<table>
<tr><th colspan="2">Walleye - Lake Erie</th></tr>
<tr><td>Main Primary species (subject to management)</td><td>Main Secondary species (Not subject to management)</td></tr>
<tr><td>None</td><td>White perch (<i>Morone Americana</i>) – not assessed: invasive species</td></tr>
<tr><td></td><td>White bass (<i>Morone chrysops</i>) – (has a stock assessment with no advice on management, it is an open access fishery not subject to quota management or harvest control rule)</td></tr>
<tr><td colspan="2">Lake Sturgeon and Lake Trout are considered vulnerable species. None of this species has catches in the UoA above the 2% threshold.
Freshwater drum is above the 2% threshold but is not considered a less resilient species based on PSA results.</td></tr>
</table>

Table 25. MU1 Yellow perch fishery catch profile (in pounds) with 2 year averages from 2017-2018.

Species catch	MU 1 Y perch 2017 harvest	Estimated Release	Total 2017	2017 UoA %	MU 1 Y perch 2018 harvest	Estimated Release	Total 2018	2018 UoA %	2017-2018 Average
Yellow Perch	446,389	0	446,389	74.12%	434,452	31936	466,388	68.43%	71.28%
Common Carp	964	25	989	0.16%	0	24	24	0.00%	0.08%

Burbot	9	16	25	0.00%	0	0	0	0.00%	0.00%
White Bass	3,606	532	4,138	0.69%	2,329	233	2,562	0.38%	0.53%
Channel Catfish	24,849	1,077	25,926	4.30%	48,248	28958	77,206	11.33%	7.82%
Freshwater Drum	29,766	2,026	31,792	5.28%	30,680	4574	35,254	5.17%	5.23%
Buffalo	1,913	2	1,915	0.32%	380	5	385	0.06%	0.19%
Goldfish	15	0	15	0.00%	12	0	12	0.00%	0.00%
Suckers	202	1,171	1,373	0.23%	2,757	4099	6,856	1.01%	0.62%
Quillback	1,632	12	1,644	0.27%	1,662	10	1,672	0.25%	0.26%
Gizzard Shad	34	110	144	0.02%	19	2	21	0.00%	0.01%
White Perch	71,602	16,107	87,709	14.56%	81,624	9092	90,716	13.31%	13.94%
Whitefish	48	121	169	0.03%	301	125	426	0.06%	0.05%
Bullhead	29	0	29	0.00%	4	2	6	0.00%	0.00%
Total	581,058	21,199	602,257	100.00%	602,468	79,060	681,528	100.00%	100.00%

Primary/Secondary species summary table

Yellow perch MU1	
Main Primary species (subject to management)	**Main Secondary species (Not subject to management)**
None	White perch (*Morone Americana*) – not assessed: invasive species
	Freshwater drum (*Aplodinotus grunniens*)
	Channel catfish (*Ictalurus punctatus*)
Lake Sturgeon and Lake Trout are considered vulnerable species. No catches have been recorded in this UoA. The 2% threshold has not been reached.	

Table 26. MU2 Yellow perch fishery catch profile with 2 year averages from 2017-2018.

Species catch	**MU 2 Y perch 2017 harvest**	**Estimated Release**	**Total 2017**	**2017 UoA %**	**MU 2 Y perch 2018**	**Estimated Release**	**Total 2018**	**2018 UoA %**	**2017-2018 Average**
Yellow Perch	590,427	0	590,427	93.16%	528,234	11173	539,407	93.34%	93.25%
Common Carp	13	0	13	0.00%		0	0	0.00%	0.00%
Burbot	7	0	7	0.00%		0	0	0.00%	0.00%
White Bass	2	5	7	0.00%	67	8	75	0.01%	0.01%

Channel Catfish	196	77	273	0.04%	122	54	176	0.03%	0.04%
Freshwater Drum	0	10	10	0.00%	0	45	45	0.01%	0.00%
Buffalo	0	0	0	0.00%	0	0	0	0.00%	0.00%
Goldfish	0	0	0	0.00%	0	0	0	0.00%	0.00%
Suckers	0	288	288	0.05%	56	334	390	0.07%	0.06%
Quillback	0	0	0	0.00%	0	2	2	0.00%	0.00%
Gizzard Shad	0	0	0	0.00%	0	0	0	0.00%	0.00%
White Perch	29,418	12,976	42,394	6.69%	31,704	4,087	35,791	6.19%	6.44%
Whitefish	218	144	362	0.06%	1,351	635	1,986	0.34%	0.20%
Bullhead	0	0	0	0.00%	0	1	1	0.00%	0.00%
Total	620,281	13,500	633,781	100.00%	561,534	16,339	577,873	100.00%	100.00%

Primary/Secondary species summary table

Yellow perch MU2	
Main Primary species (subject to management)	**Main Secondary species (Not subject to management)**
None	White perch (*Morone Americana*) – not assessed: invasive species
Lake Sturgeon and Lake Trout are considered vulnerable species. No catches have been recorded in this UoA. The 2% threshold has not been reached.	

Table 27. MU3 Yellow perch fishery catch profile with 2 year averages from 2017-2018.

Species catch	MU 3 Y perch 2017 harvest	Estimated Release	Total 2017	2017 UoA %	MU 3 Y perch 2018	Estimated Release	Total 2018	2018 UoA %	2017-2018 Average
Yellow Perch	449,979	0	449,979	98.49%	439,233	3427	442,660	97.53%	98.01%
Common Carp	0	89	89	0.02%	0	17	17	0.00%	0.01%
Burbot	153	71	224	0.05%	0	98	98	0.02%	0.04%
White Bass	55	9	64	0.01%	16	21	37	0.01%	0.01%
Channel Catfish	38	397	435	0.10%	0	3264	3,264	0.72%	0.41%
Freshwater Drum	0	278	278	0.06%	0	3170	3,170	0.70%	0.38%
Buffalo	0	0	0	0.00%	0	0	0	0.00%	0.00%
Goldfish	0	0	0	0.00%	0	0	0	0.00%	0.00%

Suckers	408	574	982	0.21%	331	1807	2,138	0.47%	0.34%
Quillback	46	119	165	0.04%	0	9	9	0.00%	0.02%
Gizzard Shad	0	14	14	0.00%	0	3	3	0.00%	0.00%
White Perch	3,768	621	4,389	0.96%	398	704	1,102	0.24%	0.60%
Whitefish	186	75	261	0.06%	1238	152	1,390	0.31%	0.18%
Bullhead	0	5	5	0.00%	0	0	0	0.00%	0.00%
Total	454,633	2,252	456,885	100.00%	441,216	12,672	453,888	100.00%	100.00%

Primary/Secondary species summary table

Yellow perch MU3	
Main Primary species (subject to management)	**Main Secondary species (Not subject to management)**
None	None
Lake Sturgeon and Lake Trout are considered vulnerable species. No catches have been recorded in this UoA. The 2% threshold has not been reached.	

Based on available data, the Audit Team also looked at previous years in Ohio to determine if the latest 2-year average was representative of the main primary/secondary species categorised above. To do this we first looked at the Ohio's harvest in the past 10 years, by species to see if the longer dataset was aligned with the most recent 2017-2018 dataset. We note that release information for MU1, MU2 and MU3 was only available since 2017, hence we used this more complete dataset for determining primary/secondary species for assessment with more confidence.

Table 28. Ohio mean annual catch 2009-2018 by species (in pounds). Source: Ohio Lake Erie Fisheries Status Report 2018.

Species	Ohio mean annual catch 2009-2018	Percentage of total
Yellow Perch	1,442,858.00	32.74%
Common Carp	140,345.00	3.18%
Burbot	101.00	0.00%
White Bass	517,604.00	11.74%
Channel Catfish	413,657.00	9.39%
Freshwater Drum	546,777.00	12.41%
Buffalo	254,715.00	5.78%
Goldfish	44,885.00	1.02%
Suckers	16,906.00	0.38%

Quillback	139,975.00	3.18%
Gizzard Shad	75,749.00	1.72%
White Perch	712,425.00	16.16%
Whitefish	75,292.00	1.71%
Bullhead	26,159.00	0.59%
Total	4,407,448.00	100%

The associated catches summarised in the table above are largely consistent with the 2017-2018 thresholds where the main species are channel catfish and freshwater drum. In addition to these, however, it is possible to see also white bass and buffalo. As can be seen in the table below, white bass is a standalone target fishery, and buffalo is mostly caught as bycatch in the white bass target fishery.

Table 29. 2017 and 2018 disaggregated harvest of species by target fishery for MU1, MU2 and MU3 in Ohio waters of Lake Erie.

MU	Management Unit 1				Management Unit 2			Management Unit 3		
	Target Species				Target Species			Target Species		
2018 Harvest (pounds)	**White Bass**	**White Perch**	**Yellow Perch**	**Total**	**White Perch**	**Yellow Perch**	**Total**	**Yellow Perch**	**Total**	**Grand Total**
Yellow Perch	4,365	903	434,452	439,720	0	528,234	528,234	439,233	439,233	1,407,187
White Bass	**171,595**	25,449	2,329	199,373	1,417	67	1,484	16	16	200,873
Channel Catfish	90,482	28,149	48,248	166,879	1,744	122	1,866	0	0	168,745
Freshwater Drum	126,350	47,785	30,680	204,815	5,863	0	5,863	0	0	210,678
Bullhead	48	0	4	52	0	0	0	0	0	52
Buffalo	**35,840**	3,251	380	39,471	0	0	0	0	0	39,471
Goldfish	66	2	12	80	0	0	0	0	0	80
Suckers	3,541	1,385	2,757	7,683	0	56	56	331	331	8,070
Quillback	54,485	6,353	1,662	62,500	0	0	0	0	0	62,500
Gizzard Shad	151	0	19	170	0	0	0	0	0	170
White Perch	455,048	185,990	81,624	722,662	23,044	31,704	54,748	398	398	777,808
Whitefish	830	284	301	1,415	16	1,351	1,367	1,238	1,238	4,020
2017 harvest (pounds)	**White Bass**	**White Perch**	**Yellow Perch**	**Total**	**White Perch**	**Yellow Perch**	**Total**	**Yellow Perch**	**Total**	**Grand Total**
Yellow Perch	834	40	446,389	447,263	20	590,427	590,447	449,979	449,979	1,487,689
Common Carp	20,042	719	964	21,725	0	13	13	0	0	21,738
Burbot	4	0	9	13	0	7	7	153	153	173
White Bass	**282,959**	9,079	3,606	295,644	4,206	2	4,208	55	55	299,907

Channel Catfish	127,738	23,795	24,849	176,382	3,340	196	3,536	38	38	179,956
Freshwater Drum	134,494	34,997	29,766	199,257	6,107	0	6,107	0	0	205,364
Buffalo	**59,543**	4,153	1,913	65,609	0	0	0	0	0	65,609
Goldfish	81	0	15	96	0	0	0	0	0	96
Suckers	5,119	1,037	202	6,358	0	0	0	408	408	6,766
Quillback	75,927	4,819	1,632	82,378	0	0	0	46	46	82,424
Gizzard Shad	1,338	0	34	1,372	0	0	0	0	0	1,372
White Perch	612,189	169,946	71,602	853,737	23,872	29,418	53,290	3,768	3,768	910,795
Whitefish	222	1	48	271	26	218	244	186	186	701
Bullhead	30	0	29	59	0	0	0	0	0	59

Main Species Background

White Perch (Invasive species, not scored)

Biology

Morone americana is a demersal and semi-anadromous species, usually reaching a length of 12.7-17.8 cm and weighing from an average of 250 g up to 650 g (Riede, 2004). However, a maximum length of 49.5 cm has been recorded (IGFA, 2001), and a maximum weight of 2200 g (Robins and Ray, 1986). The recorded maximum age is 16 years (Froese and Pauly, 2008)[3].

In its native estuarine environment, *M. americana* is semi-anadromous and spawns in the spring when water temperatures are between 10 and 16°C (Mansueti, 1961; Jenkins and Burkhead, 1994). It migrates from the saltier bays and coastal areas into tidal, but more freshwater portions of streams and rivers to spawn in spring. In landlocked waters, it spawns in both rivers and reservoirs, and migrates from deep to shallow waters to spawn when temperatures are between 15 and 20°C, but may show no preference for habitat types during spawning and egg deposition (Zuerlein, 1981).

M. americana maturation is size-specific with males maturing at smaller sizes than females (Mansueti, 1961). Males may spawn for the first time at 2 years, and females usually by 3 years, usually in late spring in brackish to nearly fresh water rivers over sandy bottoms. Spawning occurs over a period of 10 to 21 days with individual females expelling eggs on more than one occasion (Mansueti, 1961). Female *M. americana* are oviparous, broadcasting demersal, adhesive eggs to be fertilized externally (Mansueti, 1961). The eggs sink to the bottom and stick (Thomson et al., 1978). Its fecundity ranges between 20,000 and 150,000 eggs per individual female (Jenkins and Burkhead, 1994). Hatching takes place from 1 to 6 days following fertilization; 4 days at the usual spawning temperature of 15°C (Natureserve, 2008).

Diet

Larval *M. americana* feed on zooplankton such as rotifers, copepods and cladocerns (Setzler-Hamilton et al., 1982). One-year-old *M. americana* first feed on zooplankton early in life, but then changes their diet to benthic invertebrates (Gopalan et al., 1998), and as they grow larger, aquatic insect larvae (chironomids, trichopterans, and ephemeropterans) become an important part of the diet. Large individuals consume a high percentage of fishes (Scott and Crossman, 1973). Fish eggs are an important component of the *M. americana* diet especially in spring months. It may consume its own eggs (McGovern and Olney, 1988), or *Stizostedion vitreum* (walleye) or *Morone chrysops* (white bass) eggs can make up to 100% of the *M. Americana* diet depending on which fish is spawning. *M. americana* also feed heavily on minnows of Notropis spp. and zooplankton.

Ecology

White perch is an invasive species in Lake Erie. The ability of white perch to compete for food with other species can cause negative effects on biodiversity[4]. The competition between *M. americana* and native yellow perch (*Perca flavescens*) for zooplankton (Parrish and Margraf, 1990) and diet overlap (Fuller et al., 2008) may be the reason for the decline in growth rates of yellow perch since the invasion of *M. americana* in Lake Erie, especially in the western basin. Parrish and Margraf (1994) speculated that competition between juvenile *M. americana* and forage fishes, such as emerald shiner (*Notropis atherinoides*) and spottail shiner (*Notropis hudsonius*), may be responsible for the declines of the latter species.

There can be a secondary effect of this competition as decline of these species could also affect walleye - the top predator in Lake Erie (Schaeffer and Margraf, 1987; Parrish and Margraf, 1994, in Fuller et al., 2008). The collapse of the walleye fishery in the Bay of Quinte on the north shore of Lake Ontario coincided with an

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[3] https://www.cabi.org/isc/datasheet/74160

[4] https://www.cabi.org/isc/datasheet/74160

increase in the *M. americana* population and may have been a result of egg predation and the resulting lack of recruitment (Fuller et al., 2008). *M. americana* are also thought to cause declines in white bass [(*Morone chrysops*)] (Todd, 1986) populations in the Great Lakes region. *M. americana* completely replaced the previously dominant black bullhead (*Ameiurus melas*) 3 years after being introduced into a Nebraska reservoir, from 74% black bullhead to 70% white perch (Fuller et al., 2008).

The tendency of *M. americana* to hybridize with native fish poses a threat to biodiversity by diluting and polluting the gene pool. Hybridization and competition may represent another threat to the already dwindling yellow bass of the Great Lakes region. *M. americana* is known to form hybrids with white bass in Lake Erie in Ohio and Michigan, and the Detroit River and the St. Clair River in Michigan (Todd, 1986), and with yellow bass *Morone mississippiensis* in the Illinois River (Irons et al., 2002).

Information

White perch catch information is collected during commercial fisheries operation through the Daily Catch Report (DCR). The landed, released, and surrendered catch information submitted in the Daily Catch Report is considered to be reliable (pers. comm. Brian Locke, Manager, Lake Erie Management Unit - Ontario Ministry of Natural Resources and Forestry; off-site conference call meeting, October 10th 2019).

This is an unlimited catch species in both Ohio and Ontario waters of Lake Erie. Additional indices of abundance are monitored in yearly surveys conducted in collaboration between US and Canadian authorities.

Catch per unit effort

White perch catch per unit effort can be summarised below based on data from the Ohio commercial fisheries since 2009. Note that seine fishing in 2018 was responsible for about 3% of the catches while trapnet was responsible for the other 97%.

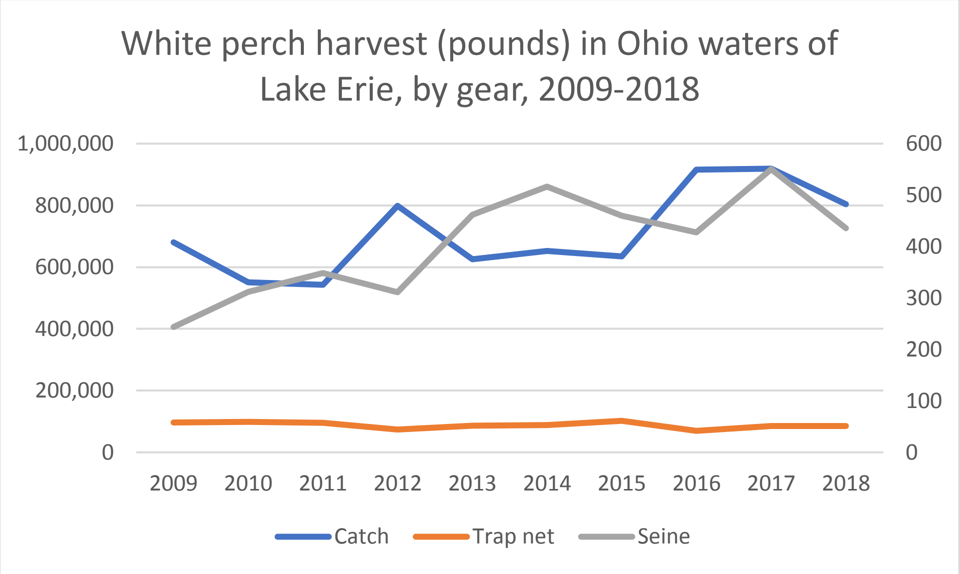

Figure 19. White perch harvest (pounds) in Ohio waters of Lake Erie, by gear, 2009-2018. Units of measure: Pounds per trap net lift, pounds per 1,000 feet of seine haul.

The catch of white perch in Ontario waters in the past 5 years is been presented below.

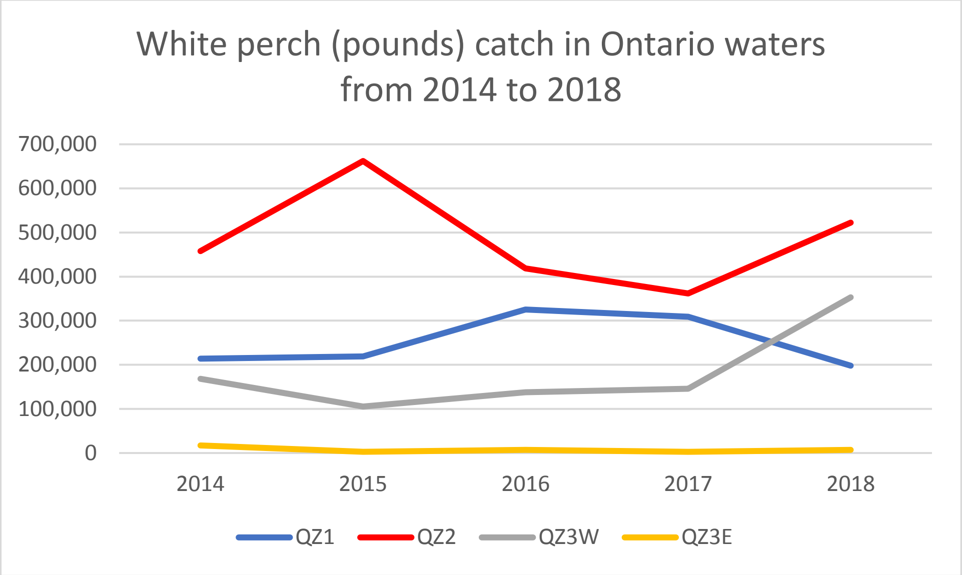

Figure 20. White perch (pounds) catch in Ontario waters from 2014 to 2018.

Recent survey data indicating white perch abundance

White perch is monitored in Lake Erie from a series of trawl survey indices in the Western basin of both Ohio and Ontario waters, as well as hydroacoustic surveys, and partnership index gillnet surveys.

The U.S. Geological Survey (USGS) trawl program sampling design complemented the time series of combined trawling efforts between the Ohio Department of Natural Resources (ODNR) and the Ontario Ministry of Natural Resources and Forestry (OMNRF) in August. Results showed that total biomass in survey trawl catches declined by approximately 90 percent from 310 kg/ha in 2013 to 27 kg/ha in 2017. This decline was not attributed to any single taxon, but was observed across the assemblage and functional groups, including predators (percids and moronids), forage fishes (Emerald Shiners, Gizzard Shad, and Rainbow Smelt), and large benthic species (Freshwater Drum, Quillback, Common Carp, and Channel Catfish).

Forage biomass averaged 0.19 and 1.32 kg/ha during 2017 spring and autumn sampling, respectively. Catches of Emerald Shiner peaked at 51.49 kg/ha in spring 2013 and were <0.01 kg/ha in autumn 2017. Rainbow Smelt catches were low and varied from <0.01 kg/ha to 4.99 kg/ha. Similarly, Gizzard Shad were also low and variable, but typically higher in autumn than spring, reflecting the occurrence of young-of-year fish[5] (Figure 23).

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[5] http://www.glfc.org/pubs/lake_committees/common_docs/CompiledReportsfromUSGS2018.pdf

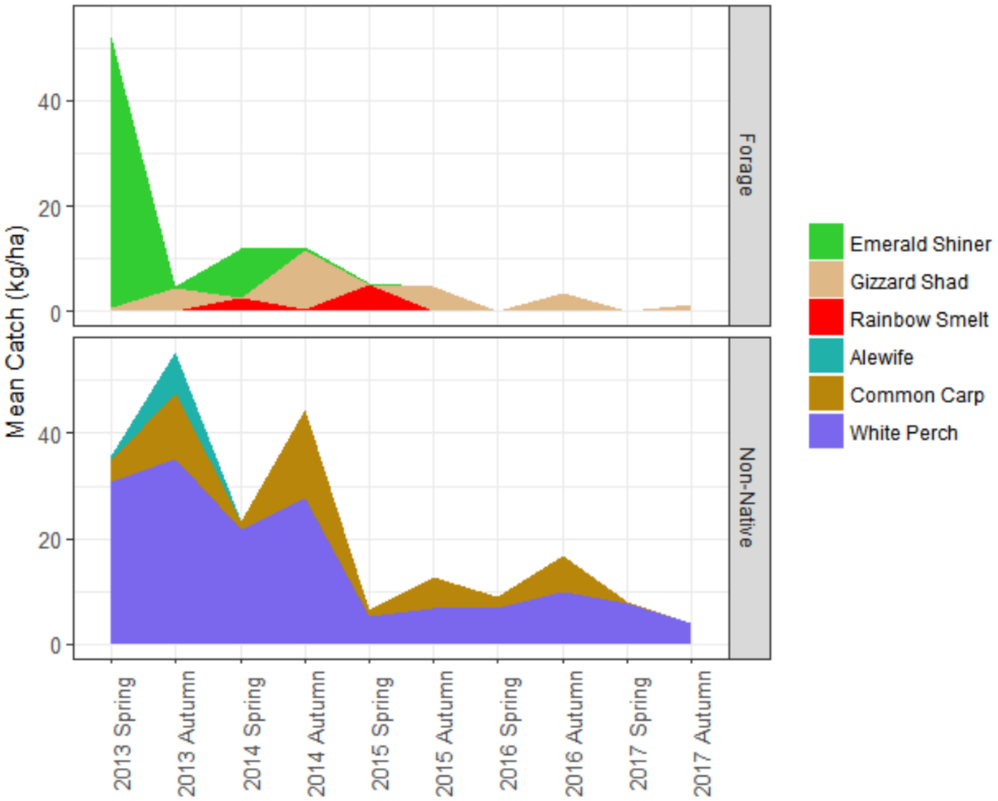

Figure 21. Stacked area plots of catch of primary forage (upper panel) and non-native (lower panel) fishes from trawls in western Lake Erie. Note, Rainbow Smelt belong to both categories but are only plotted in the upper panel. Also, note that Round Goby, Sea Lamprey, and Goldfish are non-native species that were not plotted due to very low abundances in trawls.

The biomass proportion of catch of non-native species was generally less than 25%, averaging 0.16 (s.d. = 0.06) over the five years. The dominant non-native species either declined or showed little evidence of trends. White Perch averaged 15.69 kg/ha (s.d. = 32.36) across the series, with catch rates of 7.74 kg/ha and 2.20 kg/ha respectively in spring and autumn caught of 2017.

Ohio Survey

The Ohio's Lake Erie Fisheries 2018 Annual Report highlights that the OMNR, ODNR, and the USGS have collaborated to conduct joint hydroacoustic and midwater trawl surveys in central Lake Erie since 2004.

Routine bottom trawl surveys in the central basin began in Pennsylvania in 1982 and in Ohio in 1990 to assess age-0 percid and forage fish abundance and distributions[6]. Western basin sites in the Ohio waters of Lake Erie are sampled with a flat-bottom otter trawl and central basin sites are sampled with a two-seam Yankee trawl with a roller sweep.

Most recently, population assessment surveys were conducted in the western basin from May 23, 2018 through September 20, 2018 and in the central basin from June 20, 2018, through October 30, 2018[7]. Results for yearlings of white perch as well as white perch and walleye (for comparison) are shown below.

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[6] http://www.glfc.org/pubs/lake_committees/erie/FTG_docs/annual_reports/FTG_report_2019.pdf

[7] https://wildlife.ohiodnr.gov/portals/wildlife/pdfs/fishing/LakeErieStatus.pdf

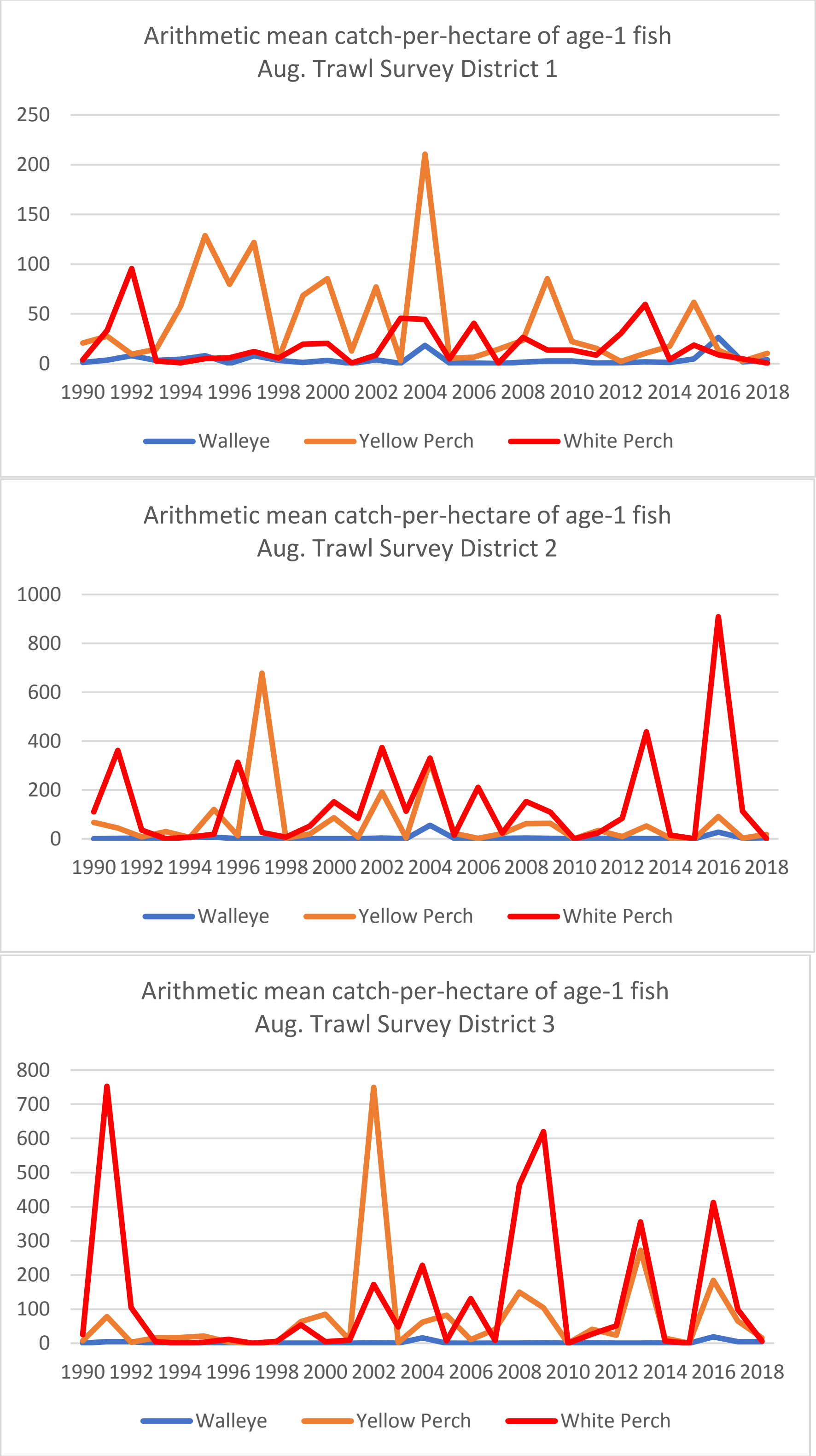

Figure 22. Arithmetic mean catch-per-hectare of age-1 fish (i.e. yearlings) for walleye, yellow perch and white perch during August trawls in the Ohio waters of Lake Erie District 1 (Western Basin), District 2 (West-central) and District 3 (East-central), 1990-2018. Extracted from 2018 Ohio Lake Erie Status Report, 2018.

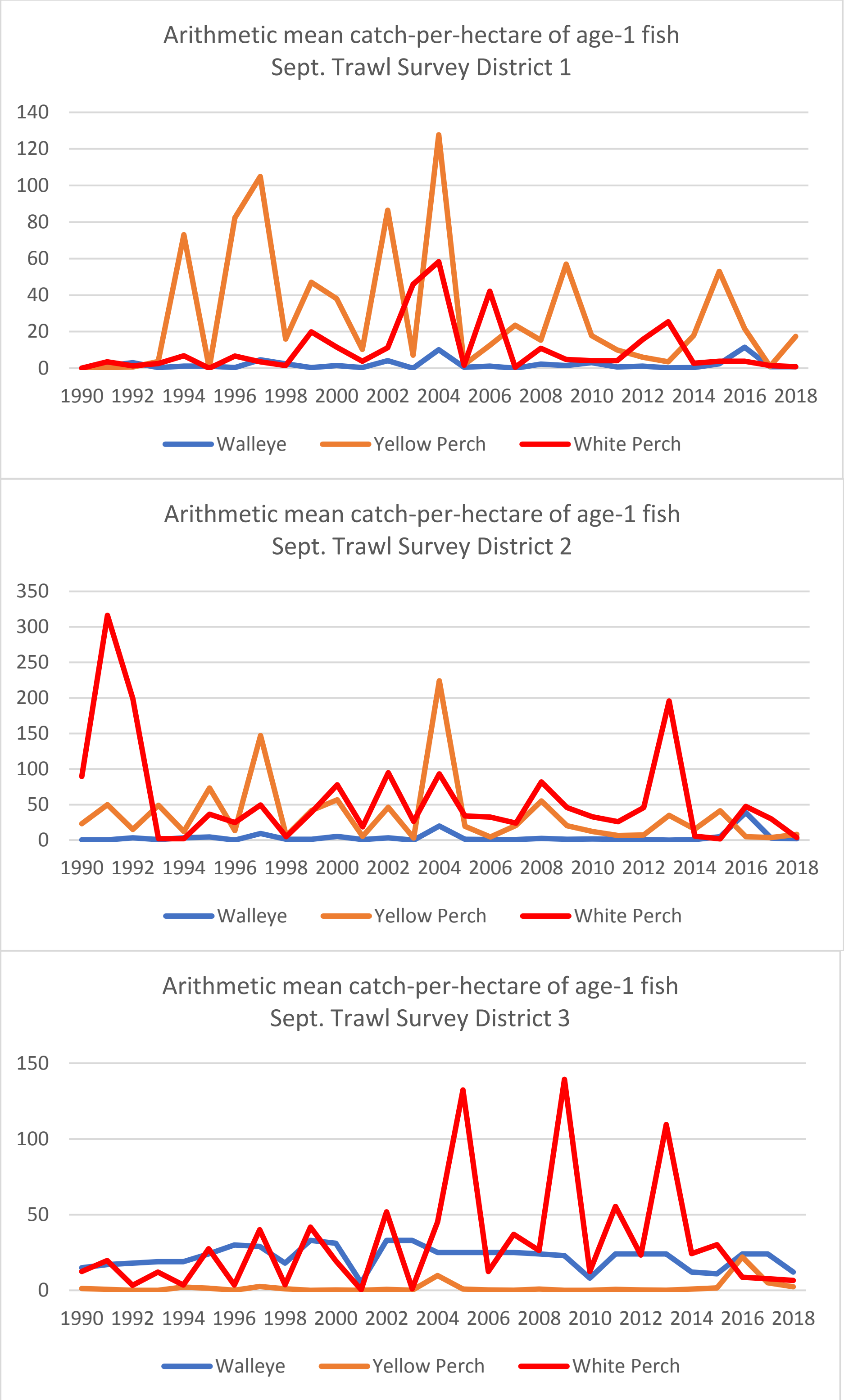

Figure 23. Arithmetic mean catch-per-hectare of age-1 fish (i.e. yearlings) for walleye, yellow perch and white perch during September trawls in the Ohio waters of Lake Erie District 1 (Western Basin), District 2 (West-central) and District 3 (East-central), 1990-2018. Extracted from 2018 Ohio Lake Erie Status Report, 2018.

Eastern Basin

A fisheries hydroacoustic survey has been conducted in the East Basin since 1993[8] to provide estimates of the distribution and abundance of Rainbow Smelt. Companion mid-water trawls have been completed by NYDEC in the past but due to vessel issues, those data have not been collected since 2007. Only Ontario waters were sampled in 2018 due to cross-border travel restrictions. The R/V Keenosay conducted up to nine 20-minute trawls on transects in Ontario waters concurrent with and on the same transect as the R/V Grandon acoustic data collection. Whenever possible, trawl effort was distributed above and below the thermocline to adequately assess species composition throughout the water column. The catch was sorted by species and age group, and relative proportions of each species and age group were calculated for each trawl.

Two cross-lake transects were sampled between 16 July and 20 July 2018 with hydroacoustics. The two remaining transects were not completed due to electrical problems with the R/V Grandon. All four transects were sampled with midwater trawls by the R/V Keenosay. Thirty-six midwater trawls were completed during the survey. Young-of-the-year Yellow Perch composed sizable portions of midwater trawl catches on all transects. Young-of-the-year Gizzard Shad, White Bass and White Perch also contributed to large proportions of trawl catch, primarily on the west transects 57600 and 57350.

Management

White perch is one of the most abundant invasive species in Lake Erie. As in the previous Certification Report in 2015 (Adlerstein et al. 2015), and although above the 5% catch profile threshold in a number of UoAs, **white perch is not considered for scoring in this assessment as it is an invasive species in Lake Erie[9] (as per MSC SD3.1.1.1 b)**. The client group confirmed that white perch is still classified as an invasive species. Within Lake Erie, including both the Ontario and Ohio jurisdictions, white perch does not have a quota, discards requirements or a management strategy. In their entirety, these elements are considered by managers to be aligned and consistent to an informal eradication strategy for white perch (pers. comm. Brian Locke, Manager, Lake Erie Management Unit - Ontario Ministry of Natural Resources and Forestry; Travis Hartman, Lake Erie Program Administrator, Ohio Department of Natural Resources, off-site conference call meeting, October 10th 2019).

Walleye

Biology and Ecology

Please refer back to the P1 background for biological information on walleye. Walleye (Percidae, *Sander vitreus*) are native to Lake Erie and the Ohio River and are stocked in some of Ohio's inland reservoirs. Walleye usually have silvery or yellowish sides with a black back and white underside. They have sharp spines in their first dorsal fin and have a mouth full of short, blunt teeth. The walleye looks similar to sauger (*Stizostedion canadense*) and saugeye (a walleye-sauger hybrid), and distinction between the three species can sometimes be difficult[10].

Walleye are an important commercial and recreational species as well as an important ecological species as an apex predator throughout their native and introduced range in North America. Walleye play a key role in the ecosystem as predators and facilitate the migration of other species like mussels, which ride in their gills during their larval stage. In Lake Erie, walleye diets in 1994–2002 demonstrated less of a shift towards round goby consumption than other piscivores and walleye still mainly consumed pelagic prey[11] (Johnson et al., 2005). This species, like other migratory fish, utilizes different parts of the lake at different life stages; as young

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[8] http://www.glfc.org/pubs/lake_committees/erie/FTG_docs/annual_reports/FTG_report_2019.pdf

[9] CABI, Invasive Species Compendium: https://www.cabi.org/isc/datasheet/74160

[10] https://www.lakescientist.com/lake-facts/fish/walleye/

[11] https://www.glerl.noaa.gov/pubs/fulltext/2016/20160045.pdf

fry walleye live in coastal wetlands or shallow, rocky reefs, but as adults they move to deeper parts of the lake[12]. Walleye prefer clear lakes and rivers in the upper Midwest and Canada that contain good habitat (gravel reefs, vegetation beds, and open water) and abundant prey such as yellow perch, shiners, or shad.

A recent threat to walleye populations is genetic contamination from stocking of hybrid saugeye or non-native walleye strains. Saugeye are fertile, and backcrossing with parental walleye could lead to dilution of genetic strains. Saugeye are stocked around the Midwest because of their popularity with anglers. Saugeye tend to grow and survive better in turbid reservoir environments and are usually easier to catch than walleye. Migrating saugeye sometimes encounter native walleye populations in connected waters. Walleye will occasionally hybridize with sauger if the two species occur in the same water bodies, but stocking of saugeye leads to much higher rates of hybridization. A combination of degraded habitats and increased stocking of hybrids poses a serious threat to naturally sustained walleye populations.[13]

Assessment and Status

The WTG uses a SCAA model to estimate the abundance of Walleye in Lake Erie from 1978 to 2018. The stock assessment model estimates population abundance of age 2 and older Walleye using fishery-dependent and fishery-independent data sources. The model includes fishery-dependent data from the Ontario commercial fishery (MU 1-3) and sport fisheries in Ohio (MU 1-3) and Michigan (MU 1). Since 2002, the WTG model has included data collected from three fishery-independent gill net assessment surveys (i.e., Ontario Partnership, Michigan, and Ohio).

The Lake Erie Percid Management Advisory Group (LEPMAG) developed an updated Walleye model, which the WTG began using in 2013. This model includes: 1) estimated selectivity for all ages within the model without the assumptions of known selectivity at age; 2) integrated age-0 trawl survey data into the model; 3) a multinomial distribution for the age composition data; and 4) time-varying catchability using a random walk for fishery and survey data including the age-0 trawl survey. Instantaneous natural mortality (M) is assumed to be constant (0.32) among years (1978-2018) and ages (ages 2 through 7 and older). The abundances-at-age were derived from the estimated parameters using an exponential survival equation. Based on the 2019 integrated SCAA model, the 2018 west-central population (MU1-3) was estimated at 49.849 million age 2 and older Walleye. An estimated 30.625 million age 3 (2015 year class) fish comprised 61% of the age 2 and older Walleye population. Age 4 (2014 year class) represented the second largest (15%) and age 2 (2016 year class) the third largest (12%) components of the population. Based on the integrated model, the number of age 2 recruits entering the population in 2019 (2017 year class) and 2020 (2018 year class) are estimated to be 13.514 and 94.071 million Walleye, respectively. The 2019 projected abundance of age 2 and older Walleye in the west-central population is estimated to be 45.338 million fish.

The target fishing rate, (60%FMSY = 0.334) in the harvest policy was applied since the probability of the projected spawner biomass in 2020 (56.410. million kg) falling below the limit reference point (SSB20% = 12.184 million kg) after fishing at 60%FMSY in 2019 was less than 5% ($p< 0.05$). Thus, the probabilistic control rule (P*) to reduce target fishing rate and conserve spawner biomass was not invoked during the 2019 determination of the Recommended Allowable Harvest (RAH).

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[12] https://conservationgateway.org/ConservationByGeography/NorthAmerica/wholesystems/greatlakes/coasts/wle/Documents/Walleye%20Lake%20Habitat.pdf

[13] https://www.lakescientist.com/lake-facts/fish/walleye/

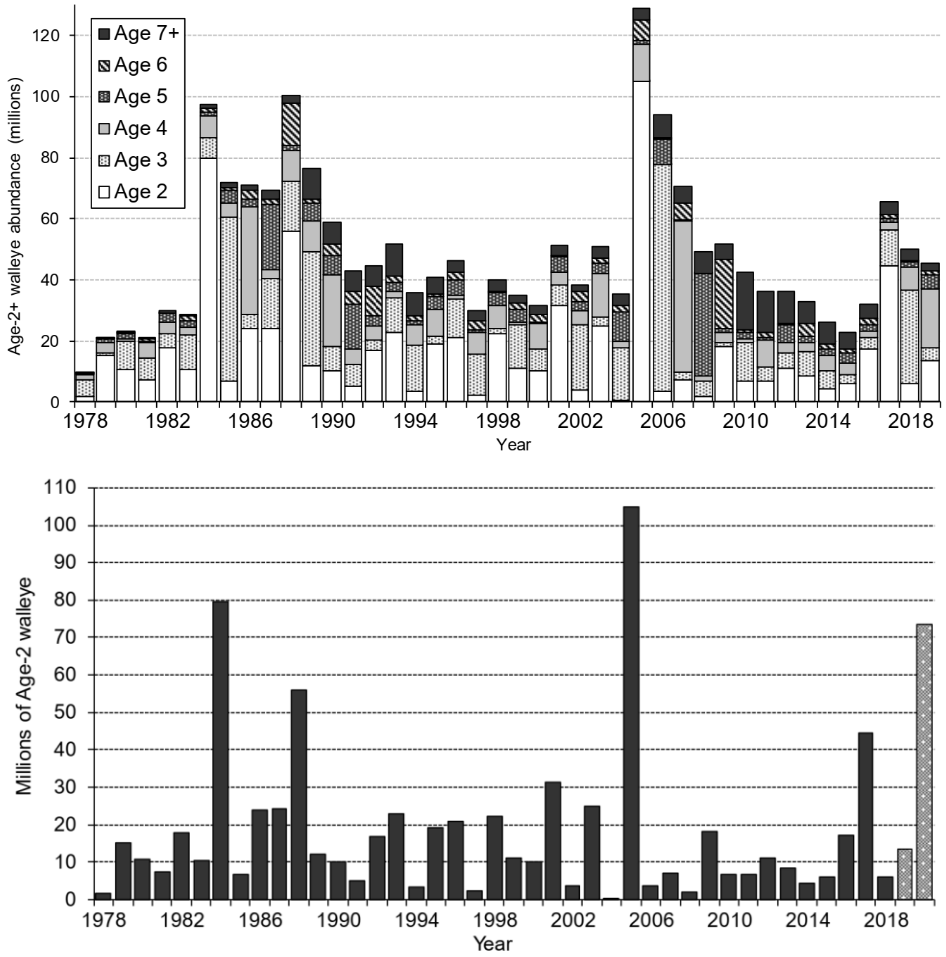

Figure 24. Left: Estimated (1978 – 2018) and projected (2019 and 2020) number of age-2 Walleye in the west central Lake Erie Walleye population from the latest ADMB integrated model run. Right: Estimated (1978 – 2018) and projected (2019 and 2020) number of age-2 Walleye in the west central Lake Erie Walleye population from the latest ADMB integrated model run. Source: WTG Report, 2019[14].

Management

In March 2019, the WTG applied the following Harvest Control Rules as identified in the Walleye Management Plan (WMP; 2015-2024):

- Target Fishing Mortality of 60% of the Maximum Sustainable Yield (60%FMSY);
- Threshold Limit Reference Point of 20% of the Unfished Spawning Stock Biomass (20%SSB0);
- Probabilistic Control Rule, P-star, P*= 0.05 ;
- A limitation on the annual change in TAC of ± 20%.

According to the above, the LEC set a 2019 walleye TAC of 8.531 million fish, a 20% increase over the 2018 TAC of 7.109 million fish (note, walleye are allocated by number of fish)[15]. In addition to the RAH, the Harvest Control Rule adopted by LEPMAG limits the annual change in TAC to ± 20% of the previous year's TAC. According to this rule, the maximum change in TAC would be (+) or (-) 20% of the 2018 TAC (7.109) million fish), and the range in 2019 TAC for LEC consideration would be from 6.504 million fish to 8.531 million fish.
Walleye populations are managed as a single stock and are increasing throughout Lake Erie due to average or better hatches in four of the past five years. TAC decisions are reflective of the status of Lake Erie's fish

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[14] http://www.glfc.org/pubs/lake_committees/erie/WTG_docs/annual_reports/WTG_report_2019.pdf

[15] http://www.glfc.org/pubs/pressrel/LEC%20news%20release%202019_FINAL.pdf

populations and take into account the goal of consistent and sustainable harvest each year. The Walleye Task Group, whose membership consists of scientists and field biologists from all Lake Erie jurisdictions, meet regularly to share data and reach consensus on biological conditions and population abundance estimates. The allocations are determined by the LEC after extensive, lake wide biological assessments, analyses, discussions, and consultations with stakeholders. Walleye, like yellow perch is managed then through ITQs.

The Province of Ontario and the states of Ohio and Michigan share the TAC based on a formula of walleye habitat within each jurisdiction in the western and central basins of the lake. Under a 2019 TAC of 8.531 million fish, Ohio will be entitled to 4.360 million fish, Ontario 3.673 million fish, and Michigan 0.497 million fish. Jurisdictions in the eastern end of the lake are outside of the TAC area and harvest limits there are set consistent with lake wide objectives.

Information

In 2018, the latest year of available data, fishery effort and Walleye harvest data were combined for all fisheries, jurisdictions and Management Units (MUs) to produce lake-wide summaries. The 2018 total estimated lake-wide harvest was 6.271 million Walleye, of which 5.627 million were harvested in the total allowable catch (TAC) area. This TAC-area harvest represents 79% of the 2018 TAC (7.109 million Walleye) and includes Walleye harvested in commercial and sport fisheries in MU 1, 2, and 3. An additional 0.644 million Walleye (10% of the lake-wide total) were harvested outside of the TAC area in MU 4&5. The 2018 Ontario commercial harvest was 3.657 million Walleye lake-wide, with 3.407 million caught in the TAC area. In 2018, the Ontario commercial fishery did not exceed their allocated quota in weight of fish. Ontario Ministry of Natural Resources and Forestry converts the TAC in numbers of walleye to an allocation in weight. It is the allocation in weight that is provided to the Ontario commercial fishing industry. If the weight conversion factor is not identical to the average weight of harvested walleye, this can lead to either an over-harvest or an under-harvest. In 2018, the Ontario commercial fishery did not exceed their allocated quota in weight of fish. However, more age-3 Walleye were harvested than predicted. Therefore, the actual mean harvest weight in the commercial fishery was lower than the weight conversion factor used to allocate quota to the Ontario commercial fishery, and the commercial fishery harvested a higher number of fish than TAC. In 2018, the lake-wide Ontario commercial harvest was 12% higher than in 2017, and 80% above the long-term average (1976-2017).

In the commercial fishery, the 2015 year class (age 3) comprised 74% of the harvest followed by the 2014 year class (age 4) with 13% of the harvest. Age 7 and older fish, which included the 2003 year class, comprise 3% of the lake-wide commercial harvest. Lake-wide, the mean age continued to decline in the sport fishery (3.9 yrs. old) but increased in the commercial fishery (3.3 yrs. old) and combined sport and commercial fishery (3.5 yrs. old).

White Bass

Biology and ecology

Hayden *et. al.* (2011)[16] described white bass (*Morone chrysops*) as being an economically important sport and commercial fish that migrates in spring from offshore aggregations to nearshore reef complexes and tributaries in western Lake Erie to spawn (Goodyear et al., 1982). Major spawning tributaries include the Sandusky and Maumee rivers (Goodyear et al., 1982). The white bass mating system is polyandrous with spawning triggered by increasing water temperatures and photoperiod (Salek et al., 2001). In Lake Erie, spawning occurs in April and May when water temperatures reach approximately 13°–16 °C (Goodyear et al., 1982; Etnier and Starnes, 2001). Fertilized eggs incubate for approximately 51 h at water temperatures of 20°–

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[16] https://www.sciencedirect.com/science/article/pii/S0380133011002048

22 °C and receive no parental care. Following egg fertilization, the majority of adult fish return to the deeper offshore waters of Lake Erie (Walden, 1964; Etnier and Starnes, 2001).

White Bass migrate up most of the Western Basin tributaries from Lake Erie each year to spawn. The Sandusky, Maumee, and Portage rivers typically have the most White Bass moving up in the spring[17]. They prefer to lay their eggs in moving streams but will also spawn in nearshore lake currents that get swept up by winds. Female White Bass can lay as many as a half million eggs.

White Bass are known to grow to a length between 10 and 12 inches and weigh an average of 1 pound. Both of those figures are what is typical, but record-sized members of the fish species have been found to reach 17 inches and weigh more than 6 pounds.

An investigation published in 2011 in the Journal of Great Lakes Research found that Lake Erie White Bass populations are not likely to be genetically distinct. Scientists used naturally occurring differences in otolith bones to make the find and also noticed a pattern showing decreased natal homing behavior by White Bass as their ages went up.

As for White Bass behavior, the fish tend to avoid eating aquatic plants. Popular prey creatures include zooplankton, small crustaceans, minnows, bait fish and water fleas[18].

Assessment and Status
Information

The Audit Team was provided by an updated stock assessment for white bass. Lake White Bass stock assessments used a statistical catch-at-age (SCA) model built in Auto Differentiation Model Builder (ADMB Project, 2015) that was modified from the Walleye Task Group (WTG) SCA model used between 2001 and 2014 (Walleye Task Group, 2001). The data required to fit this model include catch number at age, age and year specific survey catch per unit effort, age and year specific weight at age, annual fishing effort and specified natural mortality. The SCA for white bass uses fisheries independent and dependent data from Ontario and Ohio. West and central basin data, and not east basin data, are included in the model because this is where the vast majority of white bass harvest takes place.

Fisheries independent data:

- Ontario Partnership Gill Net Survey (catch rate, age composition)
- Ohio Gill Net Survey (catch rate, weight-at-age, and age composition)

Fisheries dependent data:

- Ontario Commercial Gill Net (catch, effort, age composition)
- Ohio Trap Net (catch, effort)
- Ohio Open-Water Creel (catch, effort, age composition)

The Lake Erie White Bass stock assessment used a statistical catch-at-age (SCA) model built in Auto Differentiation Model Builder (ADMB Project, 2015) was modified from the Walleye Task Group (WTG) SCA model used between 2001 and 2014 (Walleye Task Group, 2001). White bass has been assessed in 2017 with projections for 2018. The abundance and biomass of White Bass in recent years (2011-2017) has been high relative to the early 1990's. The resulting biomass of this stock in 2017 is shown below.

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[17] http://wildlife.ohiodnr.gov/fishing/fishing-tips-by-species/white-bass#tabr5

[18] https://www.fishbase.se/summary/Morone-chrysops.html

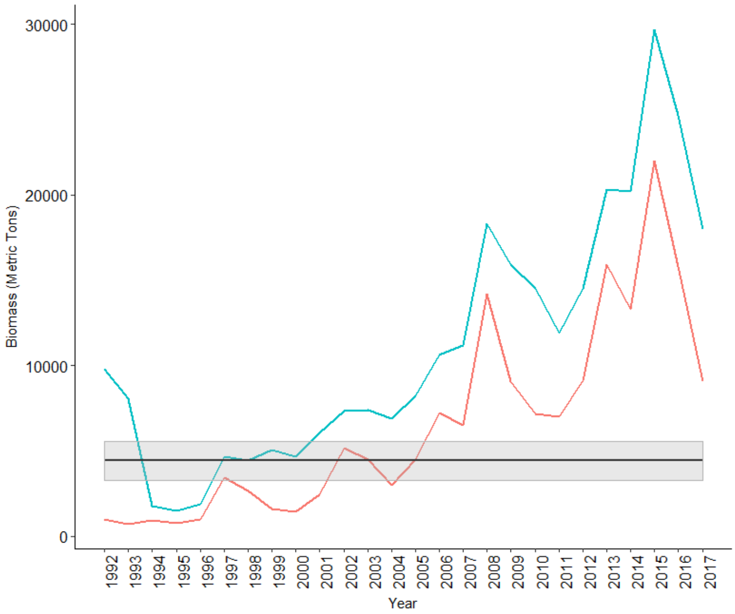

Figure 25. White bass unfished spawning stock biomass (blue) and fished spawning stock biomass (red) estimated using the Lake Eire White Bass SCA model. The mean and 95% CI for 40% of the unfished spawning stock biomass over the time-series is represented by the solid black line and grey shaded area, respectively. The lower reference points were left off of the graph for display purposes (Source: 2017 Stock Assessment provided by OCFA).

The whitebass stock assessment was updated in 2018. White Bass biomass in Lake Erie was estimated to be 7.3 million kg in 2018 (Figure 28), with most of the biomass produced by the 2016 (age 2) and 2012 cohorts.

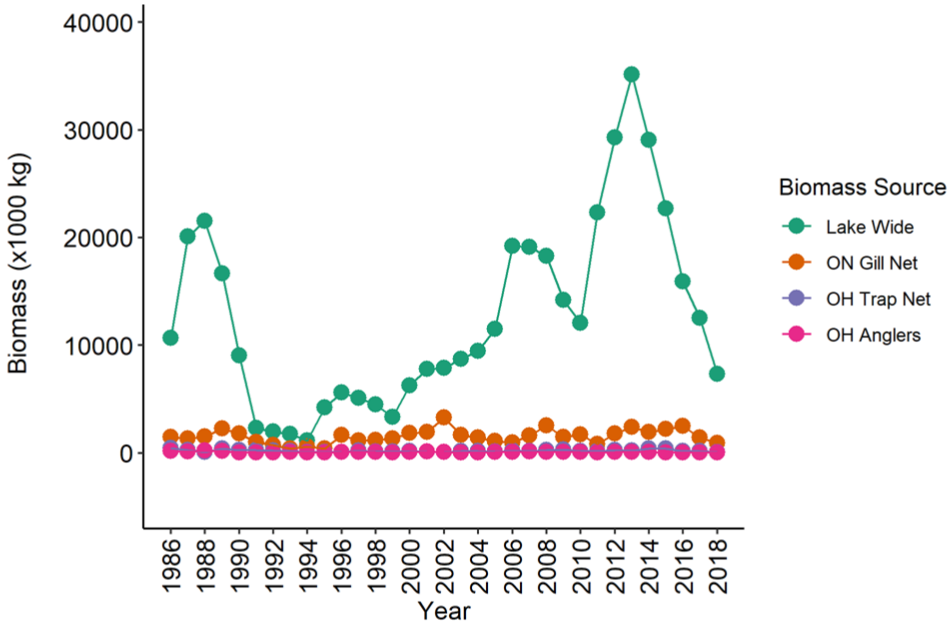

Figure 26. Biomass of White Bass in Lake Erie, the Ontario commercial gill net catch, the Ohio commercial trap net catch, and the Ohio open-water recreational harvest. The lake wide biomass was estimated using a statistical catch-at-age model. Ontario and Ohio catches were observed using catch reporting programs. Ohio open-water recreational harvest was estimated from annual creel surveys conducted in the Ohio waters of Lake Erie (Source: 2018 Stock Assessment provided by OCFA).

Population biomass has shown a steady decline since a population high in 2013 of 35.2 million kg. The large biomass of White Bass in 2013 was supported by two strong recruitment events that occurred in 2010 and 2012. The 2012 cohort was large enough that age 6 individuals are still a dominant source of biomass in the system. The total harvest of White Bass has been rather stable from 1986-2018 (mean = 1.8 million kg, min = 0.5 million kg, max = 3.4 million kg), while the total and gill net fishing mortality rates have shown a consistent decline over the time series. At peak White Bass biomass (2011-2015), the total harvest of White Bass did not show any appreciable increase and remained at relatively low levels (min = 1 million kg, max = 2.7 million kg), which suggests that commercial fishing was not a major contributor to the recent decline in White Bass biomass. Recruitment of White Bass in 2018 was moderate in the west basin (33rd percentile for series). Data from 2019 surveys are still being processed and validated. However, preliminary analyses indicate the recruitment in 2019 was similar to 2018.

If the same reference point proposed in the 2017 stock assessment is still appropriate, the 2018 stock appears to be still above the 40% unfished spawning stock biomass threshold.

Management

White bass are not managed via total allowable catch, quota allocations, or ITQs (i.e., fisheries for these species are largely open access), although minimum size limits are applied in Ohio waters[19]. Based on Appendix C of the Conditions of Ontario Commercial Fishing License, white bass is currently managed as an unlimited catch species. The commercial Lake Erie Walleye gill net fishery is part of a multi-species fishery that also targets Lake whitefish and White bass: regulations require the use of large mesh gill nets > 89 mm. Landing reports are available for the commercial large mesh gill net fishery since 2004. While conditions of licence for the Ontario fisheries require recording of all fish caught on the DCR, reporting of discards was only enforced since 2011 (Adlerstein et al. 2015).

Freshwater Drum and Channel Catfish

Freshwater Drum

Biology and Ecology

The freshwater drum (*Aplodinotus grunniens*) is found in Lake Erie and the Ohio River. They can also be found in most of the larger tributary rivers to both of these bodies of water.[20] Freshwater drums have large eyes, a very high back, with a long dorsal fin with 24 - 32 rays and a rounded caudal fin. Skeletal features of freshwater drums are reinforced skull and unique otoliths. These are large and round with an "L" on one of the flattened sides[21]. Freshwater drums are native to Lake Erie and prefer habitats of deeper pools of rivers and in Lake Erie with clear water and clean bottoms. Spawning occurs in open water during May and June when water temperatures reach 18-26°C (Fremling 1980, Swedberg and Walburg 1970, Wrenn 1969). Large females are capable of laying up to 600,000 positively buoyant eggs (Fremling 1980, Wrenn 1969), which float at the surface until they hatch roughly 24 hours later in warmer waters (Swedberg and Walburg 1970). Sexual maturity is reached after 4 to 6 years, with individuals measuring at least about 200 mm in length (Diaber 1953, Priegel 1969, Wrenn 1969). The maximum reported age of this species is 13 years (Altman and Dittmer 1962), but on average, it lives for 6-8 years (Etnier and Starnes 1993, Ross and Brenneman 2001). Adult freshwater drums reach an average body length of twelve to thirty inches. In Lake Erie they will rarely get over twenty pounds. They may be larger in rivers.

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[19] https://www.nrcresearchpress.com/doi/10.1139/cjfas-2017-0217#.Xag_rehKg2w

[20] http://wildlife.ohiodnr.gov/species-and-habitats/species-guide-index/fish/freshwater-drum

[21] https://ohiohistorycentral.org/w/Freshwater_Drum

Aplodinotus grunniens is tolerant of both clear and turbid conditions (Fremling 1980). Individuals have been observed to become stressed when water temperature exceed 25.6°C[22] and when dissolved oxygen concentrations remain low over an extended period (Priegel 1976). An analysis of freshwater drum digestive tracts and macrobenthic samples collected from western Lake Erie by Bur (1982)[23] indicated that drum were selective feeders. Planktonic cladocerans and larval midges (Chironomidae) were the primary prey organisms eaten by drum. Young-of-the-year fed mostly on cladocerans, while yearling and older drum ate both cladocerans and midge larvae. Decapods, pelecypods, and fish were found only in the digestive tracts of drum longer than 250 mm. The adult diet consists mainly of immature insects, crayfish, minnows, amphipods, and mollusks, while young fish feed on zooplankton (Daiber 1952, Etnier and Starnes 1993, Fremling 1980).[24] The Freshwater Drum often roots around in the substrate or move rocks on the bottom to dislodge its prey and will feed throughout all hours of the night (Priegel 1967).

Freshwater drums are harvested commercially in Lake Erie. An extensive die off occurred in Lake Erie during Spring 2006. It was determined that viral hemorrhagic septicemia (VHS) was the cause. VHS is a viral infection that affects fresh and saltwater fishes when water temperatures get too high.[25]

Information

The U.S. Geological Survey (USGS) trawl program sampling design complemented the time series of combined trawling efforts between the ODNR and the OMNRF in August. Results showed that total biomass in survey trawl catches declined by approximately 90 percent from 310 kg/ha in 2013 to 27 kg/ha in 2017. This decline was not attributed to any single taxon, but was observed across the assemblage and functional groups, including predators (percids and moronids), forage fishes (Emerald Shiners, Gizzard Shad, and Rainbow Smelt), and large benthic species (Freshwater Drum, Quillback, Common Carp, and Channel Catfish).

Species biomass composition U.S. Geological Survey (USGS) trawl program varied little across the series. Freshwater Drum dominated the biomass proportion with percentages as high as ~70% in spring 2015 (Figure 29). Although it has remained the dominant single species by biomass (except in autumn 2016), Freshwater Drum biomass fluctuated from 25% to 53% since autumn 2016. By comparison, the proportions of other large benthic species, such as Channel Catfish, Common Carp and Quillback, have remained relatively constant across the series. Other non-forage species that dominated the biomass composition of the catch were percids (Walleye and Yellow Perch) and moronids (White Perch and White Bass). Both moronid species and Yellow Perch biomass proportions were relatively constant across the series, but Walleye (adults and juveniles) increased since 2014 from 10% to 20% of the catch biomass.

Biomass proportion of channel catfish and freshwater drum (and other species) have been reported for the Western basin (corresponding to the MU1 management area) from 2013 to 2017 as follows:

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[22] https://nas.er.usgs.gov/queries/FactSheet.aspx?speciesID=946

[23] https://www.sciencedirect.com/science/article/pii/S0380133082720076

[24] http://wildlife.ohiodnr.gov/species-and-habitats/species-guide-index/fish/freshwater-drum

[25] https://ohiohistorycentral.org/w/Freshwater_Drum

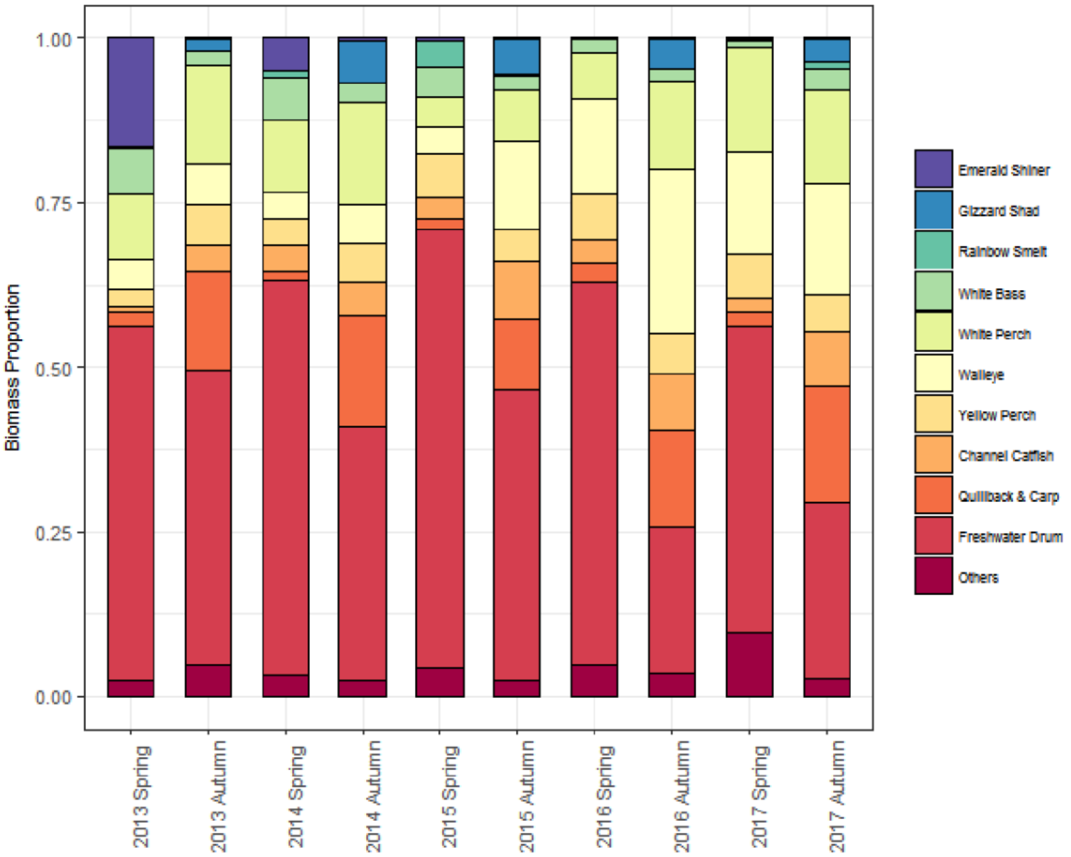


Figure 27. Biomass proportion of fish in bottom trawls in western Lake Erie.

The Ohio 2018 Fisheries Annual Report highlighted that young-of-year freshwater drum and all ages of trout-perch were well above their respective long-term means in 2018 in District 1 (roughly equivalent to MU1). Furthermore, Young-of-the-year freshwater drum in District 2 and yellow perch in district 3 where the only survey indices that were above the long term mean in 2018.

Recent Ohio catch information for freshwater drum is presented below.

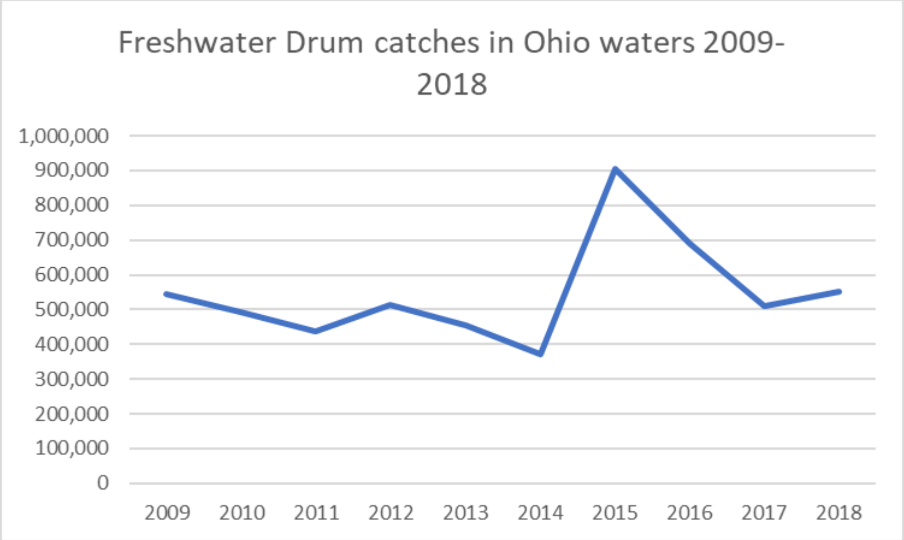


Figure 28. Freshwater drum commercial harvest (pounds) from the Ohio waters of Lake Erie, 2009-2018.

Assessment and Status

During the second surveillance audit in 2017, the LEC Data Deficient Working Group conducted a formal Productivity Susceptibility Analysis (PSA) for freshwater drum due to the lack of more substantive assessment information. The PSA Productivity and Susceptibility Attributes have remained consistent between version 1.3 (2nd Surveillance) and 2.01 (current re-assessment) of the MSC standard.

The results of this are shown below. The productivity information has been verified again on Fishbase in October 2019 as part of the re-assessment and the information was found to be still current, as well as the resulting productivity scores. We note the higher specificity and applicability of data from Lake Erie surveys supersedes the more general information from Fishbase in some instances, as illustrated in the rationales for each of the Productivity attributes below.

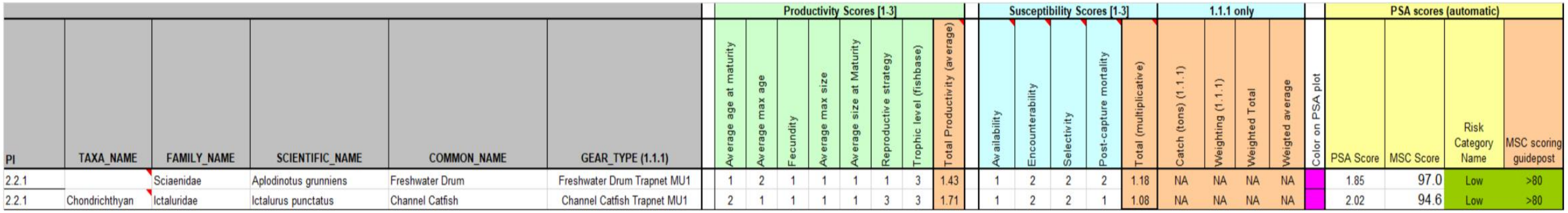
Table 30. Freshwater drum Productivity worksheet (MU1 trapnet) as prepared by the LEC Data Deficient Working Group.

Freshwater Drum				
Productivity determinant	High Productivity (Low risk, score=1)	Medium Productivity (medium risk, score=2)	Low Productivity (high risk, score=3)	
Average age at maturity	<5	5-15 years	>15 years	Sexual maturity is reached 4-6 years (individual measuring 200mm); Female L50 for west basin reached at age 4 (Partnership data - FWD_CH_CAT_LENGTH_CPE_DDWG.xlsx)
Average maximum age	<10 years	10-25 years	>25 years	On average, species lives for 6-8 years (USGS Fact Sheet). Maximum age 6-8 years. Max reported age 13 (Fishbase accessed February 23, 2017). Max age >20years (Partnership data - FWD_CH_CAT_LENGTH_CPE_DDWG)).
Fecundity	>20,000 eggs per year	100, 20,000 eggs per year	<100 eggs per year	Large females are capable of laying up to 600,000 eggs (USGS Fact Sheet); egg numbers 43,000-508,000 (Scott and Crossman)
Average maximum size	<100 cm	100-300 cm	>300 cm	Max length 95.0 cm TL with a common length of 45.0 cm TL/mle/unsexed (Fishbase)
Average size at maturity	<40 cm	40-200 cm	>200 cm	Average size of maturity 20 cm; average size at maturity for females is 29 cm. Lake wide average L_{50} (sexes combined) (1989-2016) is 27cm. (Partnership Data - FWD_CH_CAT_LENGTH_CPE_DDWG.xlsx)
Reproductive strategy	low parental investment	moderate parental investment	High parental investment	Spawning occures in open water. Eggs are buoyant which float to the surface (USGS Fact Sheet and Scott Crossman).NOAA has done PSAs (see attached) on selected US fisheries as follows: Breeding strategy: The breeding strategy of a stock provides an indication of the level of mortality that might be expected for the offspring in the first stages of life. To estimate offspring mortality, NOAA used Winemiller's (1989) index of parental investment. The index ranges in score from 0 to 14 and is composed of: 1) the placement of larvae or zygotes (i.e., in nest or into water column; score ranges from 0 to 2); 2) the length of time of parental protection of zygotes or larvae (score ranges from 0 to 4); and 3) the length of gestation period or nutritional contribution. They suggest (see their Table 1) scores of 0 mean low parental investment, score of 1-3 indicates moderate parental investment and scores >=4 indicate high parental investment. If we adopt something similar to NOAA, then FWD would score as 0+0+0=0 (low parental investment/low risk)
Trophic level	<2.75	2.75-3.25	>3.25	Trophic level = 3.4 based on food items (Fishbase accessed February 23, 2017)

Table 31. Freshwater drum Susceptibility worksheet (MU1 trapnet) as prepared by the LEC Data Deficient Working Group.

Susceptibility Attribute	Low susceptibility (Low risk, score=1)	Medium susceptibility (Medium risk, score=1)	High susceptibility (High risk, score=1)		
Areal Overlap (availability): Overlap of the fishing effort with a species concentration of the stock	<10%	10-30%	>30%		Ohio targeted trap net fishery occurs offhsore in 30-40 ft of water in a single grid near Kelly Island (personal communication Travis Hartman). Ohio records indicate that Yellow Perch trap
Encounterability: The position of the stock/species with the water column relative to the fishing gear, and the position of the stock/species within the habitat relative to the position of the gear	Low overlap with fishing gear (low encounterability)	Medium overlap with fishing gear	High overlap with the fishing gear (high encounterability)		Freshwater Drum are primarily benthic but do spawn pelagically. Ohio Yellow Perch trapnet fishery is set on bottom in offshore waters in 30-40ft of water with net sets 15ft high (personal communication Travis Hartman).
Selectibity of the gear type Potential of the gear to retain species	A. Individual <size at maturity are rarely caught	A. Individual <size at maturity are regularly caught	A. Individual <size at maturity are frequently caught		Ohio Yellow Perch gear configuration selects for species >8 inches or >20cm. On occasion fish <8 inches are caught. 50% of FWD mature at approxiamterly 27 cm would indicate that some individuals <size of maturity may be caught; At hlf the size of maturity (13.5 cm or 5 inches) would expect indviduals could escape
	Individual <size at maturity can escape or avoid gear	Individual < half the size at maturity can escape or avoid gear	Individual < half the size at maturity are retained by gear		
Post-capture mortality (PCM): The chance that, if captured, a species would be released and that it would e in a good condition permitting sbusequent survival	Evidence of majority released postcapture and survival	Evidence of some released postcapture and survival	Retained species or majority dead when released		There is evidence that Ohio Yellow Perch trap nets do catch / harvest small proportion of Frehwater Drum. Retention of Freshwater Drum depends on amount Perch is caught or market conditions at the time. FWD are considered to be a tolerant species (see:

Table 32. PSA scores for freshwater drum (and channel catfish, presented next) caught in the yellow perch trapnet in MU1.



						Productivity Scores [1-3]								Susceptibility Scores [1-3]					1.1.1 only					PSA scores (automatic)			
PI	TAXA_NAME	FAMILY_NAME	SCIENTIFIC_NAME	COMMON_NAME	GEAR_TYPE (1.1.1)	Average age at maturity	Average max age	Fecundity	Average max size	Average size at Maturity	Reproductive strategy	Trophic level (fishbase)	Total Productivity (average)	Availability	Encounterability	Selectivity	Post-capture mortality	Total (multiplicative)	Catch (tons) (1.1.1)	Weighting (1.1.1)	Weighted Total	Weigted average	Color on PSA plot	PSA Score	MSC Score	Risk Category Name	MSC scoring guidepost
2.2.1		Sciaenidae	Aplodinotus grunniens	Freshwater Drum	Freshwater Drum Trapnet MU1	1	2	1	1	1	1	3	1.43	1	2	2	2	1.18	NA	NA	NA	NA	🟪	1.85	97.0	Low	>80
2.2.1	Chondrichthyan	Ictaluridae	Ictalurus punctatus	Channel Catfish	Channel Catfish Trapnet MU1	2	1	1	1	1	3	3	1.71	1	2	2	1	1.08	NA	NA	NA	NA	🟪	2.02	94.6	Low	>80

Management

Commercial species of any size that may be sold and possessed in Ohio are: Alewife, American eel, Bowfin, carp, sheepshead, gar, Gizzard shad, lamprey, Quillback, smelt, goldfish, suckers, buffalo, Burbot and White perch (Fishing Law). Although this list does not include Freshwater drum, no specific regulations were found for the species. General regulations for all retained species such as season and area closures, as well as gear configuration, apply to Freshwater drum. In Ontario, Freshwater drum is an unlimited catch species.

Channel Catfish

Biology and Ecology

The CABI Invasive species compendium describes various aspects of channel catfish (*Ictalurus punctatus*) biology and ecology as follows[26]. Age at maturity appears to vary according to geographic location. In Lake Erie, half the males were mature when they reached 290 mm TL and half the females when they reached 250-255 mm TL (DeRoth, 1965). According to Appelget and Smith (1951), maturity is generally reached only when a total length of 305 mm is reached; in northern regions, channel catfish may only mature when 2-5 years of age or later (DeRoth, 1965).

Spawning occurs in late spring and early summer when water temperatures reach 16-24°C (Appleget and Smith, 1951). Males generally select a suitable spawning site, usually in sheltered areas such as among stones, hollow logs, under banks or other suitable cover. Eggs are then laid in a nest excavated by the female after which males guard and fan the water over the nest for 5-10 days when the eggs hatch. Spawning takes 4-6 hours, with as many as 8000 eggs being laid (Appleget and Smith, 1951). Eggs require 15.5° to 29.5°C for development to occur, being unable to develop below 15.5°C, with optimum development occurring at 27°C (McMahon and Terrell, 1982). Fertilized eggs hatch in 6 days at 25°C and in 10 days at 15.6°C. Toole (1951) reported eggs hatching in 5-10 days in Texas ponds.

Channel catfish generally live 6 to 10 years although longer life spans have been reported with fish more than 14 years of age being reported in several waters. According to Becker (1983), channel catfish may travel upstream or downstream in rivers to spawn. Movement of reservoir populations increases during or soon after periods of increased river flow. Duncan and Myers (1978) and Dames et al. (1989) observed that reservoir and river populations of channel catfish tend to migrate upstream in spring and downstream in the fall.

Diet

The channel catfish is an omnivorous, opportunistic feeder, feeding on both living and dead matter. It feeds by touch, and taste; taste buds located on the barbels help in the detection of prey (Joyce and Chapman, 1978). Channel catfish usually feed at night, and only at water temperatures above 15.6°C (Becker, 1983). Larval stages feed on midge larvae and pupae. Channel catfish smaller than 102 mm total length (TL) feed primarily on insects; while those larger than 102 mm TL continue to feed on aquatic insects, they also begin to feed on large species of mayflies and caddis flies. Larger fish tend to feed on terrestrial insects, seeds (from elm and cottonwood trees), crayfish, aquatic insect nymphs, snakes, birds, spiders and plant matter (Becker, 1983). Other plant food items include wild grapes, wild fruits, weed seeds and other plant matter falling into rivers and streams from overhanging branches. Species of fish consumed by large channel catfish depend on their availability: minnows (Cyprinidae), bluegill (*Lepomis macrochirus*), crappie (Pomoxis spp.), yellow perch (*Perca flavescens*), hickory shad (*Alosa mediocris*), gizzard shad (*Dorosoma cepedianum*), eels (Anguilla spp.), and green sunfish (*Lepomis cyanellus*) (Bailey and Harrison, 1945; Robinette and Knight, 1981).

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[26] https://www.cabi.org/isc/datasheet/79127

Assessment and Status

During the second surveillance audit in 2017, the LEC Data Deficient Working Group conducted a formal Productivity Susceptibility Analysis (PSA) for channel catfish due to the lack of more substantive assessment information. The results of this are represented below. The PSA Productivity and Susceptibility Attributes have remained consistent between version 1.3 (2nd Surveillance) and 2.01 (current re-assessment) of the MSC standard.

The productivity information has been verified again on Fishbase in October 2019 as part of the re-assessment and the information was found to be still current, as well as the resulting productivity scores. We note the higher specificity and applicability of data from Lake Erie surveys supersedes the more general information from Fishbase in some instances, as illustrated in the rationales for each of the Productivity attributes below.

Table 33. Channel catfish Productivity worksheet (MU1 trapnet) as prepared by the LEC Data Deficient Working Group.

Channel Catfish				
Productivity determinant	High Productivity (Low risk, score=1)	Medium Productivity (medium risk, score=2)	Low Productivity (high risk, score=3)	
Average age at maturity	<5	5-15 years	>15 years	Sexual maturity can be reached 2-3 years(Fishbase); Size at sexual maturity is not known in Canada, but in the south they usually mature at 10.5 - 16.0 inches (267-406 mm) at 5-8 years of age (Scott and Crossman). Estimated femaleL50 in west basin 40 cm (Partnership data - FWD_CH_CAT_LENGTH_CPE_DDWG.xlsx). Estimated age for 40 cm Catfish is between 7-8 years of age (Parthership data - FWD_CH_CAT_LENGTH_CPE_DDWG.xlsx))
Average maximum age	<10 years	10-25 years	>25 years	Max length: 132 cm TL with a common length of 57.0 cm SL male /unsexed. Max age reported 24 years (Fishbase); Average maximum age is between 7 - 9, average age of 8. (Partnership data - FWD_CH_CAT_LENGTH_CPE_DDWG.xlsx)
Fecundity	>20,000 eggs per year	100, 20,000 eggs per year	<100 eggs per year	an egg mass can contain up to 20,000 eggs (Fishbase). 450-500 eggs per ounce; 1-4 pound female can produce 400 eggs and/or 26 inch (66.4 cm) female can produce up to 34,000 eggs (Scott andCrossman)
Average maximum size	<100 cm	100-300 cm	>300 cm	Size of age 8 >40 cm, average max. size 60-80 cm (partnership data - FWD_CH_CAT_LENGTH_CPE_DDWG.xlsx)
Average size at maturity	<40 cm	40-200 cm	>200 cm	Maturity Lm = 36 cm (Fishbase); Female L_{50} (lakewide, sexes-combined 1989-2016) is 39 cm (see: FWD_CH_CAT_LENGTH_CPE_DDWG.xlsx)
Reproductive strategy	low parental investment	moderate parental investment	High parental investment	Spawning occurs in nest constructed and guarded by male (USGS Fact Sheet and Scott + Crossman).NOAA has done PSAs (see attached) on selected US fisheries as follows: Breeding strategy: The breeding strategy of a stock provides an indication of the level of mortality that might be expected for the offspring in the first stages of life. To estimate offspring mortality, NOAA used Winemiller's (1989) index of parental investment. The index ranges in score from 0 to 14 and is composed of: 1) the placement of larvae or zygotes (i.e., in nest or into water column; score ranges from 0 to 2); 2) the length of time of parental protection of zygotes or larvae (score ranges from 0 to 4); and 3) the length of gestation period or nutritional contribution. They suggest (see their Table 1) scores of 0 mean low parental investment, score of 1-3 indicates moderate parental investment and scores >=4 indicate high parental investment. If we adopt something similar to NOAA, then CC would score as 2+2+3=6 (high parental investment/high risk)
Trophic level	<2.75	2.75-3.25	>3.25	Trophic level = 4.2 based on diets (Fishbase)

Table 34. Channel catfish Susceptibility worksheet (MU1 trapnet) as prepared by the LEC Data Deficient Working Group.

Channel Catfish - MU1 trap net					
Susceptibility Attribute	Low susceptibility (Low risk, score=1)	Medium susceptibility (Medium risk, score=1)	High susceptibility (High risk, score=1)		
Areal Overlap (availability): Overlap of the fishing effort with a species concentration of the stock	<10%	10-30%	>30%		Ohio targeted trap net fishery occurs offhsore in 30-40 ft of water in a single grid near Kelly Island (personal communication Travis Hartman). Ohio records indicate that Yellow Perch trap
Encounterability: The position of the stock/species with the water column relative to the fishing gear, and the position of the stock/species within the habitat relative to the position of the gear	Low overlap with fishing gear (low encounterability)	Medium overlap with fishing gear	High overlap with the fishing gear (high encounterability)		Ohio Yellow Perch trapnet fishery is set in offshore waters in 30-40ft of water with net sets 15ft high (personal communication Travis Hartman). Channel Catfish ususally inhabit cool, clear, deeper water with sand, gravel, or rubble bottoms (Scott and Crossman)
Selectibity of the gear type Potential of the gear to retain species	A. Individual <size at maturity are rarely caught	A. Individual <size at maturity are regularly caught	A. Individual <size at maturity are frequently caught		Ohio Yellow Perch gear configuration selects for species >8 inches or >20cm. On occasion fish <8 inches are caught. 50% of Channel Catfish mature at approxiamterly 40 cm would indicate that some individuals <size of maturity may be caught; At half the size of maturity (20 cm or 8 inches) would expect to be caught, but the harvest of Channel Catfish in Yellow Perch trapnets are <10%
	Individual <size at maturity can escape or avoid gear	Individual < half the size at maturity can escape or avoid gear	Individual < half the size at maturity are retained by gear		
Post-capture mortality (PCM): The chance that, if captured, a species would be released and that it would e in a good condition permitting sbusequent survival	Evidence of majority released postcapture and survival	Evidence of some released postcapture and survival	Retained species or majority dead when released		There is evidence that Ohio Yellow Perch trap nets do catch / harvest small proportion of Channel Catfish. Harvest of Channel Catfish depends on the amount Perch is caught or market conditions at the time. Channel Catfish tolerate a wide range of environmental conditions (see:

Information

The U.S. Geological Survey (USGS) trawl program sampling design complemented the time series of combined trawling efforts between the ODNR and the OMNRF in August. Biomass proportion of channel catfish and freshwater drum (and other species) have been reported for the Western basin (corresponding to the MU1 management area) from 2013 to 2017. This has been reported under the freshwater drum section and is not repeated here.

Catches of channel catfish in the past 10 years have been summarised below. The authors of the 2015 MSC certification report (Adlerstein et al. 2015) mentioned that harvest rates in trap nets and seine fisheries reported by ODNR that are taken as indicators of abundance show increases in Channel catfish. Nevertheless, the species may have recently experienced increased mortality due to outbreaks of disease (Channel catfish viral disease and type *E botulism*). Just less than 50% of the Ohio channel catfish catch in 2018 was taken by trapnet gear in MU1 while the rest was taken mainly by seine gear in Sandusky bay (an isolated bay area in the western basin, MU1).

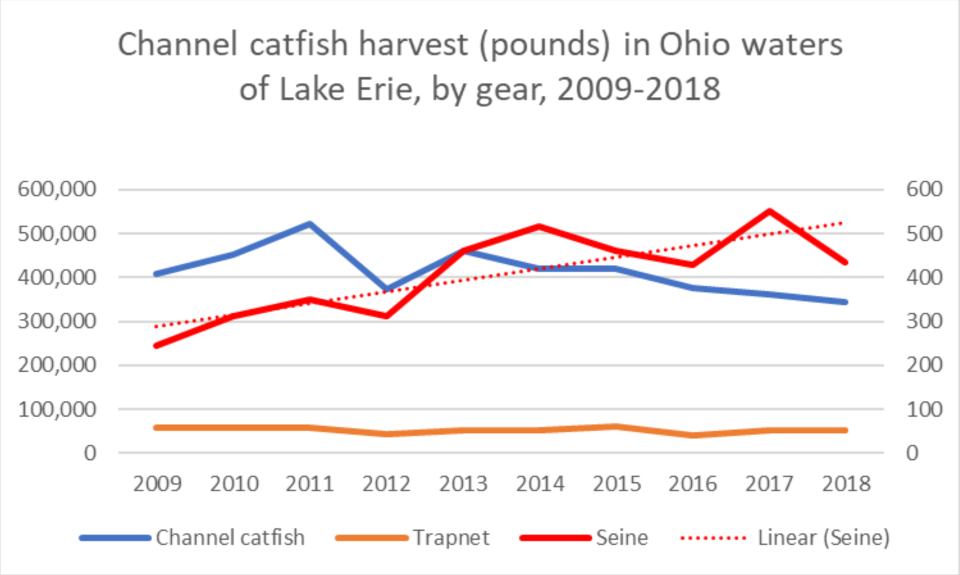

Figure 29. Channel catfish harvest (pounds) in Ohio waters of Lake Erie, by gear, 2009-2018. Units of Measure: Pounds per trap net lift, pounds per 1,000 feet of seine haul.

Management

Freshwater drum and channel catfish are not subject to formal quota management as is the case for yellow perch and walleye fisheries. Channel catfish and freshwater drum are part of a 16 species list with unlimited catch (See Appendix 4 showing Appendix C of the 2019 Conditions of Ontario Commercial Fishing License). There is a minimum landing size of 14½” in the Ohio commercial fishery. There are general regulations for all retained species covering season, area closures and gear configuration. There are no regulations in Ontario except for general mesh size regulations for target fisheries. Channel catfish are harvested by jurisdictions without an interagency management protocol (Alderstein et. al. 2015).

Bait Species

There is no bait utilised in any of the Units of Assessment because that these fisheries are prosecuted with gillnets and trapnets. Hence, no bait species need to be assessed as either primary/secondary P2 species.

7.5 ETP Species

Based on the MSC v2.01 Fisheries Standard, Endangered, Threatened or Protected (ETP) species are those species recognized by national ETP legislation and / or binding international agreements. Examples of these binding agreements include Appendix 1 of the Convention on International Trade in Endangered Species (CITES) and Binding agreements concluded under the Convention on Migratory Species (CMS) (e.g. ACAP, AEWA, ASCOBANS, ACCOBAMS and the Wadden Sea Seals Agreement). ETP species are assessed against outcome, management and information PIs.

Ontario

For the Ontario jurisdiction of Lake Erie, this assessment took into account species listed under the Species at Risk in Ontario (SARO) List and classified as either endangered or threatened[27]. The SARO List is created and maintained by the Committee on the Status of Species at Risk in Ontario (COSSARO) and operates under the 2007 Endangered Species Act[28]. It classifies those species as being either extirpated, endangered, threatened, or a special concern. Once listed, measures to protect and recover a listed wildlife species are implemented. COSSARO provides such advice to the Minister[29].

The 2019 Ontario License Condition details Endangered and Threatened species at Risk in Lake Erie as per SARO list. Under condition of licence, ON fishers are required to release all endangered or threatened ETP species alive or, if dead, to otherwise surrender the animal to a conservation officer. We note that the round pigtoe and spiny softshell are not listed in Appendix B of the ON License condition. Round pigtoe, being a mussel is not caught in gillnet and trapnet in Lake Erie, while the spiny softshell (a turtle) may be very seldom seen and hence not listed in the license condition for release. The Audit Team recommends that the latter is inserted in the Licence Condition list of at risk species, to ensure fishermen are aware of it and release it should that be necessary.

The Ontario list of Endangered and Threatened Species relevant to Lake Erie is presented below.

Table 35. Ontario Lake Erie Endangered and Threatened Species part of the Species At Risk in Ontario List (As of October 2019).

Common Name	Scientific Name	SARO Classification
Fish		
Eastern Sand Darter	*Ammocrypta pellucida*	END
Lake chubsucker	*Erimyzon sucetta*	THR
Lake Sturgeon	*Acipenser fulvescens*	END
Northern Madtom	*Noturus stigmosus*	END
Pugnose Minnow	*Opsopoeodus emiliae*	THR
Pugnose shiner	*Notropis anogenus*	THR
River darter	*Percina shumardi*	END
Shortjaw cisco	*Coregonus zenithicus*	THR
Silver Chub	*Macrhybopsis storeriana*	THR
Spotted Gar	*Lepisosteus oculatus*	END
Warmouth	*Lepomis gulosus*	END
Mussels		
Round pigtoe	*Pleurobema sintoxia*	END
Turtles		
Spiny softshell	*Apalone spinifera*	END

Source: https://www.ontario.ca/page/species-risk-ontario#section-6

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[27] https://laws-lois.justice.gc.ca/eng/acts/s-15.3/

[28] https://www.ontario.ca/laws/statute/07e06

[29] https://www.ilercampbell.com/blog/wp-content/uploads/Species-at-Risk-6-Minute-Environmental-Lawer-Paula-Boutis.pdf

US, Ohio state

For the Ohio jurisdiction of Lake Erie, this assessment took into account species listed under the US Endangered Species Act (ESA). The purpose of the ESA is to protect and recover imperiled species and the ecosystems upon which they depend. It is administered by the U.S. Fish and Wildlife Service (Service) and the Commerce Department's National Marine Fisheries Service (NMFS). The Service has primary responsibility for terrestrial and freshwater organisms, while the responsibilities of NMFS are mainly marine wildlife such as whales and anadromons fish such as salmon. Under the ESA, species may be listed as either endangered or threatened. "Endangered" means a species is in danger of extinction throughout all or a significant portion of its range. "Threatened" means a species is likely to become endangered within the foreseeable future. All species of plants and animals, except pest insects, are eligible for listing as endangered or threatened. For the purposes of the ESA, Congress defined species to include subspecies, varieties, and, for vertebrates, distinct population segments[30].

The Ohio list of Endagered and Threathened Species relevant to Lake Erie is presented below.

Table 36. US listed ESA threatened and endangered species occurring in Ohio (As of October 2019).

Species common and latina name	Status
Bean, rayed (*Villosa fabalis*)	END
Catspaw, white (pearlymussel) (*Epioblasma obliquata perobliqua*)	END
Clubshell (*Pleurobema clava*)	END
Fanshell (*Cyprogenia stegaria*)	END
Madtom, Scioto (*Noturus trautmani*)	END
Mucket, pink (pearlymussel) (*Lampsilis abrupta*)	END
Mussel, sheepnose (*Plethobasus cyphyus*)	END
Mussel, snuffbox (*Epioblasma triquetra*)	END
Purple Cat's paw (=Purple Cat's paw pearlymussel) (*Epioblasma obliquata obliquata*)	END
Rabbitsfoot (*Quadrula cylindrica cylindrica*)	THR
Riffleshell, northern (*Epioblasma torulosa rangiana*)	END

Source: https://ecos.fws.gov/ecp0/reports/ad-hoc-species-report-input (search input: Ohio, Listed Species)

ETP Species Status

The status of the ETP species listed above for Ontario and Ohio as it relates to Lake Erie is illustrated in the table below for the fisheries under assessment.

Table 37. ETP species status in Lake Erie as they relate to the yellow perch and walleye commercial fisheries in Ontario and Ohio waters.

Yellow Perch trap net fishery in Ohio MU1, MU2 and MU3	Walley "large" mesh (89 mm) gillnet fishery in Lake Erie	Yellow perch "small" mesh (57 mm) gillnet fishery in Ontario QZ1, QZ2, QZ3E and QZ3W
Eastern Sand Darter. The Eastern Sand Darter prefers shallow habitats in lakes, streams, and rivers with clean, sandy bottoms. It often buries itself completely in the sand. It feeds on aquatic insects, but due to its small mouth is limited in the size of prey it can eat. In Ontario, the Eastern Sand Darter is found in Lake St. Clair, Lake Erie, West Lake, Big Creek and in the Grand, Sydenham, Thames and Detroit rivers. River populations (4 out of 7 – 57%) are vulnerable to increased siltation, pollution and nutrient enrichment. Channel alterations, dams and water level fluctuations are additional threats (COSEWIC 2009). Round Goby (Neogobius melanostomus) has invaded at least six of the seven Ontario rivers historically occupied by Eastern Sand Darter, and ranges for these two species now overlap for all 4 river systems where the Eastern Sand Darter occurs. Predation and competition from the Round Goby has been implicated in declines of several darter species in lakes Erie and St. Clair		

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[30] https://www.fws.gov/endangered/laws-policies/

(COSEWIC 2009). The main threat to the Eastern Sand Darter is the siltation of its preferred sand habitats. Another threat to the darter is the invasive fish species Round Goby that is colonizing rivers in southern Ontario[31].		
	It is unlikely that Channel darter interacts with the gill net gear used in the Walleye fishery because of the small size (common length : 5.0 cm TL male/unsexed[32]) its distribution mostly in streams, and low population numbers. No records of catching the species are listed in Daily Catch Reports in the gill net fishery targeting Walleye.	It is unlikely that the species interacts with the gill net gear used in the Yellow perch fishery because of the small size (common length : 5.0 cm TL male/unsexed) and the distribution mostly in streams and low population numbers. No records of catching the species are listed in daily catch records in the gill net fishery targeting Yellow perch.
Lake chubsucker. The lake chubsucker is a small (less than 254 mm in total length), robust, deep- bodied member of the sucker family. Ontario specimens are usually captured in heavily vegetated, stagnant bays, channels, ponds and swamps. Using available data, critical habitat has been partially identified for extant lake chubsucker populations in the Old Ausable Channel, L Lake, St. Clair National Wildlife Area (NWA; St. Clair Unit), Point Pelee National Park, Rondeau Bay, Long Point Bay in Lake Erie (including Long Point NWA and Long Point Provincial Park), Big Creek NWA and Lyon's Creek. A schedule of studies has been developed that outlines necessary steps to further refine these critical habitat descriptions. Incidental harvest in commercial and bait fisheries may represent an additional threat but requires further investigation. The main threat to the Lake Chubsuckerin Lake Erie is habitat loss, nutrient loading, siltation and exotic species[33].		
	It is unclear if Lake chubsucker interacts with the gill nets targeting Walleye since suckers are reported in daily catch reports as one group, aside from white sucker which is reported separately. There is little potential, although size is > 26 cm, for interactions with the gill net gear targeting Walleye because of the lack of evidence for overlapping distributions (i.e. lake chubsucker population occur in defined bays and national Parks/National Wildlife Areas of Lake Erie).	It is unclear if Lake chubsucker interacts with the gill nets targeting yellow perch since suckers are reported in daily catch reports as one group, aside from white sucker which is reported separately. There is little potential, although size is > 26 cm, for interactions with the gill net gear targeting yellow perch because of the lack of evidence for overlapping distributions (i.e. lake chubsucker population occur in defined bays and national Parks/National Wildlife Areas of Lake Erie).
Lake Sturgeon. Lake Sturgeon abundance in Lake Erie has been severely reduced since the early 1900s and continues to be well below historic levels. Five historic Lake Sturgeon spawning sub-populations in the U.S. waters of Lake Erie are all considered extirpated. There are no known Lake Sturgeon spawning tributaries on the Ontario portion of Lake Erie (OMNR 2009). There is a lack of current knowledge regarding the population status of Lake Sturgeon in western Lake Erie. However, individuals are consistently captured in assessment gear in the western basin, but rarely in the central and eastern basins of Lake Erie (State of the Great Lakes 2009). No commercial or recreational fishing is permitted for Lake Sturgeon anywhere in Lake Erie. Fish community objectives for Lake Erie call for the protection and restoration of riverine and estuarine habitats to prevent the extirpation of Lake Sturgeon (Ryan et al. 2003). Although juvenile Lake Sturgeon were once scarce in Lake Erie, they have been captured more frequently in the western end of the lake in recent years (OMNR 2009). The Michigan Department of Natural Resources has developed a Lake Sturgeon rehabilitation plan that includes the Detroit and St. Clair rivers and Lake St. Clair, Lake Erie and Lake Huron (Hay–Chielewski and Whelan 1997)[34].		
	Based on available catch data Lake Sturgeon in the walleye fishery is always released back to the water alive. Released catch in the past 5 years average 81 pounds per year. It is unlikely the impacts of the released catches have	Based on available catch data Lake Sturgeon in the yellow perch fishery is always released back to the water alive. Catch in 2016-2018 was virtually none. Released catch in 2015 and 2014 averaged about 475 pounds

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[31] https://www.ontario.ca/page/eastern-sand-darter

[32] https://www.fishbase.se/summary/Ammocrypta-pellucida.html

[33] https://www.ontario.ca/page/lake-chubsucker-recovery-strategy

[34] https://www.ontario.ca/page/lake-sturgeon-recovery-strategy

	any significant effect on the rebuilding of this stock.	each year. It is unlikely the impacts of the released catches have any significant effect on the rebuilding of this stock.
Northern madtom. The Northern madtom usually lives in large creeks and rivers with a moderate to swift current, and a sand, gravel, or mud bottom. However, in Ontario, this fish has also been captured in the deeper waters of Lake St. Clair and the Detroit River. It prefers clean, unpolluted water but can tolerate slightly muddy water. Adults eat aquatic insects, crustaceans, and smaller fish. The primary threats identified for Northern Madtom include siltation, water turbidity, excessive nutrient loading, exotic species, toxic compounds, and habitat loss/degradation (COSEWIC, 2012a). For each of the four extant populations, most of these factors are considered widespread, continuous, and of medium or high concern (COSEWIC, 2012a). Remedial steps have been undertaken in the Detroit River to improve water quality and increase the amount of fish habitat (COSEWIC, 2012a). These include shoreline rehabilitation, the installation of artificial spawning reefs, and the removal of contaminated sediments. Steps have also been taken in the St. Clair River to reduce the inflow of untreated sewage (COSEWIC, 2012a)[35].		
	Its common length is 6.9 cm TL male/unsexed[36] and as such it is unlikely it would be caught in the larger gillnet used to target walleye. No catch has been recorded in the DCRs in the past 5 years. It is unlikely the fishery has negative effects on this species.	Its common length is 6.9 cm TL male/unsexed[37] and as such it is unlikely it would be caught in the gillnet used to target yellow perch. No catch has been recorded in the DCRs in the past 5 years. It is unlikely the fishery has negative effects on this species.
Pugnose Minnow. The Pugnose Minnow prefers coastal wetlands, and slow-moving rivers and streams with clear, warm water, little or no current, and abundant vegetation. The Pugnose Minnow lives in central North America in the rivers and streams of the Mississippi River basin. Its range extends from South Carolina and Florida west to Texas and north to Wisconsin. In Canada, it is at the northern limit of its range and is only found in extreme southwestern Ontario with small populations in Lake St. Clair and the Detroit River. COSEWIC (2012) identifies several assumed threats to the Pugnose Minnow, such as nutrient loading in waters inhabited by the species, sediment loading, exotic species, altered coastal processes (dredging and shoreline alteration), climate change, and pumps that could act as potential barriers to movement[38].		
	The pugnose minnow does not appear to have a distribution overlapping with the walleye fishery. No catch of this species has been recorded in the DCRs in the past 5 years. It is unlikely the fishery has negative effects on this species.	The pugnose minnow does not appear to have a distribution overlapping with the the yellow perch fishery. No catch of this species has been recorded in the DCRs in the past 5 years. It is unlikely the fishery has negative effects on this species.
Pugnose shiner. The Pugnose Shiner is a small, slender minnow that can reach five to six centimetres in length. The Pugnose Shiner is found in lakes and calm areas of rivers and creeks having clear water and bottoms of sand, mud or organic matter. It prefers water bodies with plenty of aquatic vegetation, particularly stonewort (Chara sp.). In Canada, the Pugnose Shiner is found only at a few sites in southern Ontario, including the Teeswater River, the old Ausable Channel, the Trent River and a few coastal wetlands in Lake St. Clair (and some tributaries), Lake Erie, lower Lake Huron, Lake Ontario and the St. Lawrence River. The population sizes at these sites are unknown. The main threat to the Pugnose Shiner is habitat degradation, including the alteration and destruction of wetlands and increased erosion from shoreline development. Invasive species, such as Eurasian Watermilfoil, are also a concern in some areas[39].		
	Due to the small size of this fish, it is unlikely it would be caught in the large mesh gear used in the Lake Erie walleye fishery. No catch of this species has been recorded in the DCRs in the past 5 years.	Due to the small size of this fish, it is unlikely it would be caught in the gillnet gear used in the Ontario yellow perch fishery. No catch of this species has been recorded in the DCRs in the

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[35] https://www.ontario.ca/page/northern-madtom-evaluation

[36] https://www.fishbase.se/summary/Noturus-stigmosus.html

[37] https://www.fishbase.se/summary/Noturus-stigmosus.html

[38] https://www.ontario.ca/page/pugnose-minnow-evaluation

[39] http://cossaroagency.ca/wp-content/uploads/2017/06/Final-COSSARO-Evaluation-Pugnose-Shiner_GFM-FINAL-s.pdf

<table>
<tr><td></td><td>It is unlikely the fishery has negative effects on this species.</td><td>past 5 years. It is unlikely the fishery has negative effects on this species.</td></tr>
<tr><td colspan="3">River darter. The River Darter is a small and elongate member of the perch family that grows to between four and eight centimeters in length. It can be distinguished from the River Darter from other similar looking species (i.e. Channel Darter) by the presence of their dark dorsal spots. In Ontario, the River Darter lives in medium to large rivers and lakes with moderately fast current. Unlike many other darter species, the River Darter is tolerant of turbid conditions. It is typically found on gravel and cobble substrates in relatively deep water habitats. The River Darter is known to undertake seasonal migrations, moving upstream in the spring to spawn, and downstream in the fall. It eats a variety of food items including aquatic snails, fish eggs, and insect larvae. In Ontario, it is found in several rivers and lakes of the Northwest as well as in a limited number of locations around the Great Lakes. The Great Lakes-Upper St. Lawrence populations are only known from three locations; Lake St. Clair, and the Thames and Sydenham Rivers. In the Great Lakes-Upper St. Lawrence area, the main threats to the River Darter are suspected to be invasive species, poor water quality, and habitat alteration. Invasive fish species that compete with the River Darter for food or habitat are also a threat[40].</td></tr>
<tr><td></td><td>Due to the small size of this fish, it is unlikely it would be caught in the large mesh gear used in the Lake Erie walleye fishery. No catch of this species has been recorded in the DCRs in the past 5 years. It is unlikely the fishery has negative effects on this species.</td><td>Due to the small size of this fish, it is unlikely it would be caught in the gillnet gear used in the Ontario yellow perch fishery. No catch of this species has been recorded in the DCRs in the past 5 years. It is unlikely the fishery has negative effects on this species.</td></tr>
<tr><td colspan="3">Shortjaw cisco. The Shortjaw Cisco is a member of the whitefish family. It can grow up to 40 centimetres long and weigh up to one kilogram. In Ontario, it is found in Lake Superior, Lake Nipigon and in some smaller inland lakes. It is considered extirpated from lakes Michigan, Erie and Huron. Ontario's Shortjaw Cisco population was greatly reduced by overfishing in the Great Lakes and possibly by competition or predation by exotic (non-native) species[41].</td></tr>
<tr><td></td><td>The species is no longer present in Lake Erie. No catch of this species has been recorded in the DCRs in the past 5 years. It is unlikely the fishery has negative effects on this species.</td><td>The species is no longer present in Lake Erie. No catch of this species has been recorded in the DCRs in the past 5 years. It is unlikely the fishery has negative effects on this species.</td></tr>
<tr><td colspan="3">Silver Chub. The Silver chub is a relatively large minnow that can grow up to 23 centimetres long. Throughout most of its North American range, Silver chub prefers medium to large rivers with substantial current and silt, sand or gravel bottoms, but in Ontario it is only found in the Great Lakes. It is usually found in depths between seven and 12 metres, and is believed to spawn in May and June in open water areas. It feeds on aquatic insect larvae, crustaceans and molluscs, including Zebra mussels. In Ontario, it is found in Lake Erie and Lake St. Clair. Threats to the Silver chub may include habitat degradation, changes in water temperature, sediment and nutrient loading, exotic species, changes to food supply and predators. The Silver chub was considered common in Lake Erie until the 1950s. Its decline there coincided with a reduction in prey, such as mayfly nymphs. In the 1950s and 1960s, excessive runoff of nutrients from urban and farmland pollution resulted in eutrophication of lakes, likely causing the mayfly decline[42]. Silver chub may be one species actually benefiting from the invasion of Zebra mussels, because Zebra mussels have improved water clarity in Lake Erie, which may have improved habitat for the Silver chub's main food source, mayfly nymphs; in addition, Silver chub have been shown to feed on Zebra mussels.</td></tr>
<tr><td></td><td>Reasons for the decline do not appear to be related to fishing but instead to habitat and prey availability. Silver chub could potentially interact with the walleye "large" mesh fishery. However, no catch of this species has been recorded in the DCRs in the past 5 years. It is unlikely the fishery has negative effects on this species based on available catch information.</td><td>Reasons for the decline do not appear to be related to fishing but instead to habitat and prey availability. Silver chub could potentially interact with the yellow perch "small" mesh fishery. However, no catch of this species has been recorded in the DCRs in the past 5 years. It is unlikely the fishery has negative effects on this species based on available catch information.</td></tr>
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[40] http://cossaroagency.ca/wp-content/uploads/2017/06/Accessible_Final_COSSAROEvaluation_RiverDarter_Dec2016.pdf

[41] https://www.ontario.ca/page/shortjaw-cisco

[42] https://www.ontario.ca/page/silver-chub

<table>
<tr><td colspan="3">Spotted Gar. The Spotted Gar is a relatively large (up to 760 mm in total length), heavily armoured, predatory species with a long, narrow body and elongated snout with many sharp teeth. In Ontario, the Spotted Gar lives in calm, clear pools and bays with plenty of aquatic plants. It is usually found in lakes with soft mud bottoms. During the spring breeding season, the adults move to shallow water with lots of aquatic plants, where they mate and lay eggs. The eggs are slightly sticky and attach to aquatic plants. The Spotted Gar feeds on small fishes. In Canada, the Spotted Gar is found in a few wetlands along the north shore of Lake Erie and in East Lake off of eastern Lake Ontario. There are historic single records of this species from the Bay of Quinte and from Lake St. Clair at the mouth of the Thames River, but no recent sightings in these areas. Threats to Spotted Gar populations include overall habitat loss (due to dredging, filling and harbour improvements), sediment and nutrient loading, exotic species, barriers restricting movement, climate change and possibly fishing pressure (commercial/recreational incidental harvest). Specific impacts from incidental fisheries catches are considered of low concern and low extent. Although population sizes are small, and the distribution is limited, the Spotted Gar is considered stable at Lake Erie locations based on available historical and current data (extent of occurrence and abundance data) (EERT 2008). The long-term recovery goal (greater than 20 years) of this recovery strategy is to protect, enhance and maintain Spotted Gar populations within the three coastal wetlands of Lake Erie, where extant populations occur[43].</td></tr>
<tr><td></td><td>Threats to this species in Lake Erie do not appear to be related to fishing (which is rated as low concern and low extent). Instead, overall habitat loss seems to be the main threat. Spotted gar could interact with the walleye “large” mesh fishery due to its size. However, no catch of this species has been recorded in the DCRs in the past 5 years. It is unlikely the fishery has negative effects on this species.</td><td>Threats to this species in Lake Erie do not appear to be related to fishing (which is rated as low concern and low extent). Instead, overall habitat loss seems to be the main threat. Spotted gar could interact with the yellow perch “small” mesh fishery due to its size. However, no catch of this species has been recorded in the DCRs in the past 5 years. It is unlikely the fishery has negative effects on this species.</td></tr>
<tr><td colspan="3">Warmouth. The warmouth is a small sunfish about 30 centimetres long, a warm-water species that prefers silt-free marshes, ponds and lakes with abundant aquatic plants and mucky bottoms. Males gather in loose colonies in spring and early summer and build nest depressions for the females to lay eggs. The males then guard their nest and eggs fiercely. Spawning occurs at one to two years of age, and females lay 800 to 34,000 eggs depending on their size. They can live up to eight to nine years. In Canada, the species has been reported in Lake Erie at Rondeau Bay, Long Point Bay and Point Pelee. The warmouth was first recorded in Ontario in 1966 and may be a relative newcomer to the province. Alternatively, it could have gone undiscovered because it was always rare here. Habitat loss due to the draining of wetlands for agricultural and urban development is the main threat to this species, though current Ontario populations live in protected areas and are in no immediate danger[44]. Ontario Warmouth threats include loss of suitable habitat due to vegetation removal/alteration (including invasive plants), pollution (eutrophication) and possibly climate change[45].</td></tr>
<tr><td></td><td>Because the three subpopulations of warmouth live in protected areas with no immediate danger it is unlikely the walleye fishery has any interaction with this species. No catch of this species has been recorded in the DCRs in the past 5 years. It is unlikely the fishery has negative effects on this species.</td><td>Because the three subpopulations of warmouth live in protected areas with no immediate danger it is unlikely the yellow perch fishery has any interaction with this species. No catch of this species has been recorded in the DCRs in the past 5 years. It is unlikely the fishery has negative effects on this species.</td></tr>
<tr><td colspan="3">Round pigtoe. The Round pigtoe is a medium to large-sized freshwater mussel that may reach 13 centimetres in length. In Canada, Round pigtoe are found only in southwestern Ontario, mainly in the St. Clair River delta and the Sydenham River but small populations still exist in the Grand and Thames rivers and in shallow areas near the shorelines of Lake Erie and Lake St. Clair. The greatest threats to the Round pigtoe are invasive species, pollution from agriculture and siltation, which occurs when too much soil washes into the river from nearby agricultural and urban areas. The Zebra mussel, an invasive species from</td></tr>
</table>

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[43] https://www.ontario.ca/page/spotted-gar-recovery-strategy

[44] https://www.ontario.ca/page/warmouth

[45] http://cossaroagency.ca/wp-content/uploads/2017/06/Accessible_COSSARO-evaluation-Warmouth.pdf

<table>
<tr><td colspan="3">Europe, is a serious concern because it attaches to native mussels and can interfere with breathing, feeding, excretion and movement. Conditions that threaten the fish host species can also threaten the Round pigtoe[46].</td></tr>
<tr><td></td><td>Mussels are not caught in gillnet gear and there are no records in the DCR. The only potential effect could be attributed to anchors used in gillnet gear and resting on the lakebed. However, the extent of this effect is probably negligible due to the limited footprint of the gear (e.g. anchors sitting on the seabed). Overlap with the fishery is also considered to be negligible.</td><td>Mussels are not caught in gillnet gear and there are no records in the DCR. The only potential effect could be attributed to anchors used in gillnet gear and resting on the lakebed. However, the extent of this effect is probably negligible due to the limited footprint of the gear (e.g. anchors sitting on the seabed). Overlap with the fishery is also considered to be negligible.</td></tr>
<tr><td colspan="3">Spiny softshell. The Spiny softshell is a medium-large freshwater turtle that is easily recognized by its shell, which is round, rather flat, leathery and can reach up to 54 centimetres long. Key habitat requirements are open sand or gravel nesting areas, shallow muddy or sandy areas to bury in, deep pools for hibernation, areas for basking, and suitable habitat for crayfish and other food species. In Canada, the Spiny softshell is found only in Quebec and southwestern Ontario in the Lake St. Clair, Lake Erie and western Lake Ontario watersheds. The majority of Spiny softshells in Ontario are found in the Thames and Sydenham rivers and at two sites in Lake Erie. The size of the home range of this turtle depends on availability of habitat features such as nesting and hibernation sites. The most significant threat to Canadian populations of Spiny softshell is habitat degradation, particularly due to riverbank stabilization, development along shorelines, changes in water levels, dams and recreation. Nest mortality can be very high due to human recreational activities at nest sites and nest predation by raccoons and foxes. Development and recreation may also be blocking access to nesting, hibernation, feeding and basking sites. This turtle suffers high mortality due to collisions with motorboats, trapping and incidental mortality from fisheries. The extent of the threat from commercial fishing is unknown. However, there are increasing numbers of reports of dead turtles embedded with hooks from recreational fishing (COSEWIC 2016). It is not clear whether the increasing number of reports reflects higher incidence of mortality from recreational fishing or from increased public awareness about this species at risk[47].</td></tr>
<tr><td></td><td>This species can overlap with the walleye fishery and its operation. However, the available information appears to denote that impact has mainly been recorded in recreational fisheries. No catch of this species has been recorded in the DCRs in the past 5 years. It is unlikely the fishery has negative effects on this species.</td><td>This species can overlap with the yellow perch fishery and its operation. However, the available information appears to denote that impact has mainly been recorded in recreational fisheries. No catch of this species has been recorded in the DCRs in the past 5 years. It is unlikely the fishery has negative effects on this species.</td></tr>
<tr><td colspan="3">Rayed bean. The rayed bean is a small mussel, usually less than 1.5 inches (in) (3.8 centimeters (cm)) in length (Cummings and Mayer 1992, p. 142; Parmalee and Bogan 1998, p. 244; West et al. 2000, p. 248). Of the 115 water bodies from which the rayed bean was historically recorded, 27 are in the lower Great Lakes system. The species is thought to be extant in 12 streams, but historically significant populations have been eliminated from Lake Erie and the Detroit River. Based on the species range map provided at the FWS website this species current distribution does not overlap with Lake Erie[48].</td></tr>
<tr><td>There is no overlap between this species current distribution and the yellow perch trapnet fishery. Furthermore, mussels are not caught in gillnet gear and there are no records in the DCR.</td><td></td><td></td></tr>
<tr><td colspan="3">White catspaw. The species historical range included Indiana, Michigan, Ohio. The white cat’s paw pearly mussel is a federally listed endangered subspecies that is currently known to currently exist in only a 3-mile portion of Fish Creek in Williams County in northwest Ohio. Channelization for flood control and other forms of substrate disturbance (e.g., gravel dredging operations, channel maintenance dredging, instream construction, and the removal of logs and other obstructions to flow) and siltation</td></tr>
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[46] http://cossaroagency.ca/wp-content/uploads/2017/06/COSSARO-Round-Pigtoe-Final-Evaluation-with-FR-FINAL-s.pdf

[47] https://files.ontario.ca/accessible_final_cossaroevaluation_spinysoftshell_dec2016.pdf

[48] https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=F01A

<table>
<tr><td colspan="3">due to poor agricultural practices and deforestation are probably the leading factors in the decline of the white cat's paw pearly mussel (USFWS 1990)[49]. The species distribution does not currently overlap with Lake Erie[50].</td></tr>
<tr><td>There is no overlap between this species current distribution and the yellow perch trapnet fishery. Furthermore, mussels are not caught in gillnet gear and there are no records in the DCR.</td><td></td><td></td></tr>
<tr><td colspan="3">Clubshell. The clubshell is a small to medium size (up to 3 inches long) freshwater mussel that was listed as endangered, without critical habitat, in 1993 (58 FR 5638-5642). The species historical range included Alabama, Illinois, Indiana, Kentucky, Michigan, Ohio, Pennsylvania, Tennessee, West Virginia. It's current distribution overlaps with the central-Eastern Lake Erie basin, for which Ohio has jurisdiction[51]. Adult clubshells were relocated to a number of streams required to achieve species recovery between 2014 and 2018, including in New York, Pennsylvania, West Virginia, Ohio, Kentucky, Indiana, and Illinois. As of 2019, no juvenile clubshells have been found that demonstrate that reproduction of augmented or reintroduced animals has occurred; however, due to slow growth of the species recruitment may not be observed for several years[52].</td></tr>
<tr><td>Mussels are not caught in gillnet gear and there are no records in the DCR. The only potential effect could be attributed to anchors used in trapnet gear and resting on the lakebed. However, the extent of this effect is probably negligible.</td><td></td><td></td></tr>
<tr><td colspan="3">Fanshell. The life history details of the fanshell are thought to be similar to other unionid mussel species. All streams with currently knows fanshell mussels occur within the Ohio river basin. There is no indication that this species distribution has changed substantially since the recovery plan was completed[53]. Based on the species range map provided at the FWS website this species current distribution does not overlap with Lake Erie[54].</td></tr>
<tr><td>There is no overlap between this species current distribution and the yellow perch trapnet fishery. Furthermore, mussels are not caught in gillnet gear and there are no records in the DCR.</td><td></td><td></td></tr>
<tr><td colspan="3">Scioto Madtom. The Scioto madtom is a small species of catfish in the family Ictaluridae, which has been found only in a small section of Big Darby Creek, a major tributary to the Scioto River, Ohio (40 FR 44149; USFWS 1985, 1988). Only 18 individuals of the Scioto madtom were ever collected. All were found along one stretch of Big Darby Creek in Ohio, and all but one was found within the same riffle. No Scioto madtoms have been observed since 1957, despite intensive surveys. Based on the rarity of species collections, the only known population of Scioto madtom appears to be extinct[55]. Based on the species range map provided at the FWS website this species current distribution does not overlap with Lake Erie[56].</td></tr>
<tr><td>There is no overlap between this species current distribution and the yellow perch trapnet fishery.</td><td></td><td></td></tr>
<tr><td colspan="3">Pink mucket. Pink mucket mussel is found in mud and sand and in shallow riffles and shoals swept free of silt in major rivers and tributaries. This mussel buries itself in sand or gravel, with only the edge of its shell and its feeding siphons exposed. The species historical range included Alabama, Arkansas, Illinois, Indiana, Kentucky, Louisiana, Missouri, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia. Several remaining pink mucket populations are significantly threatened by tailwater conditions downstream of hydropeaking dams, activities associated with navigation, and mining activities., while all populations are susceptible to stochastic events.[57] Based on the species range map provided at the FWS website this species current distribution does not overlap with Lake Erie[58].</td></tr>
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[49] https://ecos.fws.gov/docs/five_year_review/doc4135.pdf
[50] https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=F007
[51] https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=F01D
[52] https://ecos.fws.gov/docs/five_year_review/doc6118.pdf
[53] https://ecos.fws.gov/docs/five_year_review/doc6042.pdf
[54] https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=F02H
[55] https://ecos.fws.gov/docs/five_year_review/doc5986.pdf
[56] https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=E01T
[57] https://ecos.fws.gov/docs/five_year_review/doc6065.pdf
[58] https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=F00G

There is no overlap between this species current distribution and the yellow perch trapnet fishery.		
Sheepnose mussel. The sheepnose (*Plethobasus cyphyus*) is a member of the mussel family Unionidae and was originally described as *Obliquaria cyphya Rafinesque*, 1820. Young mussels may have 2 raised ridges (one on either side of the pressed-in mark). The sheepnose is primarily a larger- stream species occurring primarily in shallow shoal habitats with moderate to swift currents over coarse sand and gravel (Oesch 1984, p. 121). Habitats with sheepnose may also have mud, cobble, and boulders. Sheepnose in larger rivers may occur at depths exceeding 6 m (Williams et al. 2008, p. 498). [59]The species historical range included Alabama, Illinois, Indiana, Iowa, Kansas, Kentucky, Minnesota, Mississippi, Missouri, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, Wisconsin. Based on the species range map provided at the FWS website this species current distribution does not overlap with Lake Erie[60].		
There is no overlap between this species current distribution and the yellow perch trapnet fishery.		
Snuffbox mussel. The snuffbox is a small- to medium-sized mussel, with males reaching up to 2.8 in (7.0 cm) in length (Cummings and Mayer 1992, p. 162; Parmalee and Bogan 1998, p. 108). The maximum length of females is about 1.8 in (4.5 cm) (Parmalee and Bogan 1998, p. 108). The species historical range included Alabama, Arkansas, Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Mississippi, Missouri, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, Wisconsin. The snuffbox was listed as endangered in 2012. At the time of listing, the snuffbox was thought to be extant in 79 streams in 14 states and 1 Canadian province including Ohio (Grand River, Ohio River, Muskingum River, Walhonding River, Killbuck Creek, Olentangy River, Big Darby Creek, Little Darby Creek, Salt Creek, Scioto Brush Creek, South Fork Scioto Brush Creek, Little Miami River, and Stillwater River) and Ontario, Canada (Ausable River and Sydenham River)[61]. Based on the species range map provided at the FWS website this species current distribution does not overlap with Lake Erie[62].		
There is no overlap between this species current distribution and the yellow perch trapnet fishery.		
Purple Cat's paw. In 1992 when the recovery plan was issued, the purple cat's paw was only known to be extant in two river reaches – the Cumberland River in Tennessee and the Green River in Kentucky. However, no living or freshdead purple cat's paw pearly mussels have been collected in these two rivers in over 20 years. In 1994, a small population of the purple cat's paw was discovered in Killbuck Creek in Coshocton County, Ohio. Killbuck Creek was closed in 2004 to all mussel sampling and collecting except for that required in conjunction with life history research approved by the Ohio Department of Natural Resources (R. Ollis, Ohio Department of Natural Resources, Division of Wildlife, in litt. 2010). The status of the Killbuck Creek population appears to exist in a very low density with the population concentrated in a single riffle. Viability of the Killbuck Creek population is questionable due to the low density, though some recent recruitment has occurred[63]. Based on the species range map provided at the FWS website this species current distribution does not overlap with Lake Erie[64].		
There is no overlap between this species current distribution and the yellow perch trapnet fishery.		
Rabbitsfoot. The rabbitsfoot is a medium to large mussel, elongate and rectangular, reaching 12 cm (6 inches) in length (Oesch 1984). The species historical range included Alabama, Arkansas, Georgia, Illinois, Indiana, Kansas, Kentucky, Louisiana, Mississippi, Missouri, Ohio, Oklahoma, Pennsylvania, Tennessee, West Virginia. While the rabbitsfoot still occurs in 51 streams, it sustains recruitment and population viability consistently in only 11 large, extant river populations. This accounts only for 8 percent of the historical or 22 percent of the extant distribution of rabbitsfoot[65]. Based on the species range map provided at the FWS website this species current distribution does not overlap with Lake Erie[66].		
There is no overlap between this species current distribution and the yellow perch trapnet fishery.		

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[59] https://www.govinfo.gov/content/pkg/FR-2011-01-19/pdf/2011-469.pdf#page=2

[60] https://www.govinfo.gov/content/pkg/FR-2011-01-19/pdf/2011-469.pdf#page=2

[61] https://ecos.fws.gov/docs/five_year_review/doc5956.pdf

[62] https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=F03J

[63] https://ecos.fws.gov/docs/five_year_review/doc5946.pdf

[64] https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=F006

[65] https://www.govinfo.gov/content/pkg/FR-2013-09-17/pdf/2013-22245.pdf#page=1

[66] https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=F03X

<table>
<tr><td colspan="3">**Northern riffleshell.** The northern riffleshell is a small to medium size (up to 3 inches long) freshwater mussel that was listed as endangered, without critical habitat, in 1993 (58 FR 5638-5642). Historical and/or current northern riffleshell records are known from Ohio (Lake Erie, Sandusky River, Maumee River, St. Joseph River, Fish Creek, Ohio River, Scioto River, Big Darby Creek, Little Darby Creek, Big Walnut Creek, Alum Creek, Olentangy River, Muskingum River, Tuscarawas River, and Mahoning River). Ongoing threats to the northern riffleshell include water quality degradation from point and non-point sources, particularly in tributaries that have limited capability to dilute and assimilate sewage, agricultural runoff, and other pollutants. Large zebra mussel populations in Lake St. Clair, the Detroit River, and Lake Erie appear to have eliminated most native mussels from the areas colonized, including northern riffleshell, although the species may persist in refugia where habitat is less suitable for zebra mussels. In much of the remaining northern riffleshell's range, zebra mussels have not developed large populations outside of lakes and impoundments. The effect of large zebra mussel populations developing in headwater impoundments and lakes, upstream of northern riffleshell populations, is not known, but could influence food availability or result in periodic zebra mussel population spikes downstream. Based on the species range map provided at the FWS website this species current distribution has some overlap with Lake Erie[67], MU1.</td></tr>
<tr><td>Mussels are not caught in gillnet gear and there are no records in the DCR. The only potential effect could be attributed to anchors used in trapnet gear and resting on the lakebed but we note the limited footprint of the gear. However, the extent of this effect is probably negligible.</td><td></td><td></td></tr>
</table>

ETP Species Outcome summary

In summary, the walleye and yellow perch tend to have what appear to be very limited to negligible effects on ETP species recognised in Ontario and Ohio. The basis for this has been explained in the table above.

Ontario ETP Species Information

Each of the species listed has an Assessment Report, a Recovery Strategy, and a Government Response Statement providing the best available information on the status of the listed species and the management approach. As it relates to the fishery, information on ETP and all other species must be collected in the DCRs (e.g. as fish landed, released, surrendered). Furthermore, Lake Erie's fish abundance surveys may collect additional information on some of these ETP species.

Ontario ETP Species Management

The purposes of the 2007 Endangered Species Act are:

1. To identify species at risk based on the best available scientific information, including information obtained from community knowledge and aboriginal traditional knowledge.
2. To protect species that are at risk and their habitats, and to promote the recovery of species that are at risk.
3. To promote stewardship activities to assist in the protection and recovery of species that are at risk.

The preamble of the Act notes the UN Convention on Biological Diversity (Convention) as "taking note" of the precautionary principle. The Precautionary Principle requires that "where there is a threat of significant reduction or loss of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize such a threat." Canada is a signatory to the Convention[68].

COSSARO maintains criteria for assessing and classifying species; maintains and prioritizes a list of species that should be assessed and classified, including species that should be reviewed and, if appropriate, reclassified; submits reports to the Minister in accordance with this Act; provides advice to the Minister on any matter submitted to COSSARO by the Minister; and perform any other function required under this or any other Act. 2007, c. 6, s. 4 (1).

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[67] https://ecos.fws.gov/ecp0/profile/speciesProfile?sId=527#rangeInfo

[68] https://www.ilercampbell.com/blog/wp-content/uploads/Species-at-Risk-6-Minute-Environmental-Lawer-Paula-Boutis.pdf

COSSARO has to ensure that the list referred to in paragraph 2 of subsection (1) of the Act includes every Ontario species that (a) has been classified by the Committee on the Status of Endangered Wildlife in Canada as extirpated, endangered, threatened or of special concern under the Canadian Species at Risk Act (SARA); and (b) has not yet been assessed by COSSARO. 2007, c. 6, s. 4 (2)[69].
Once a recommendation is made by COSSARO, the Ministry of Natural Resources "shall make and file a regulation" that lists those species, as COSSARO has designated them. Once a species is listed on the SARO, certain prohibitions automatically apply such as prohibitions on killing the species or destroying its habitat.

Both in Ontario and federally at the SARA level, in addition to prohibitions on harming species or their habitats, recovery strategies must be established for species at risk. Under the ESA, recovery strategies must be prepared for threatened and endangered species. Section 11 of the ESA mandates the creation of a recovery strategy, which shall include:

1. identification of the habitat needs of the species;
2. A description of the threats to the survival and recovery of the species;
3. recommendations to the minister and other persons on:
    - objectives for the protection and recovery of the species,
    - approaches to achieve the objectives recommended under subparagraph I,b and
    - the area that should be considered in developing a regulation under clause 55(1)(a) that prescribes an area as the habitat of the species.

The Act currently requires the minister to produce a recovery strategy for every species newly listed as endangered or threatened and nine months later, implement a policy setting out the actions the minister will take to work towards the objectives of the recovery strategy. The Minister has the right to determine the relative priority to be given to the implementation of actions referred to in those statements, and no later than 5 years after a statement is published the Minister shall ensure that a review is conducted of progress towards the protection and recovery of the species. The Minister shall also ensure that a management plan is prepared for each species that is listed on the Species at Risk in Ontario List as a special concern species[70].

ETP Species in the Ontario Condition of License
Specific to the fisheries under assessment and as part of condition of licence, ON fishers are required to release all SARO listed endangered or threatened ETP species that may be caught alive or, if dead, to otherwise surrender the animal to a conservation officer at the when offloading catches. Furthermore, all catches must be recorded in the DCR's.

Proposed Revisions to the Canadian ESA
In January 2019[71], the government launched its consultation on how best to update the 10-year old act to improve the effectiveness of the program for species at risk by ensuring Ontario's best-in-class endangered and threatened species protections include advice and species' classifications from an independent scientific committee and modern approaches to enforcement and compliance; species and habitat protections; and recovery planning.

On April 18, 2019, the Ministry of Environment, Conservation and Parks (MECP) posted a summary of proposed amendments to Ontario's Endangered Species Act, 2007 (Act)[72]. The proposed amendments follow the transfer of the administration of the Act from the Ministry of Natural Resources and Forestry (MNRF) to the MECP effected by Order-in-Council on October 22, 2018. The proposed changes include[73]:

- enhancing government oversight and enforcement powers to ensure compliance with the act;

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[69] https://www.ontario.ca/laws/statute/07e06
[70] https://www.ilercampbell.com/blog/wp-content/uploads/Species-at-Risk-6-Minute-Environmental-Lawer-Paula-Boutis.pdf
[71] https://ero.ontario.ca/notice/013-5033
[72] https://www.lexology.com/library/detail.aspx?g=14728bbb-d7fd-4d1c-9189-1c82f158ad72
[73] https://ero.ontario.ca/notice/013-5033

- improving transparent notification of new species' listings;
- appropriate consultation with academics, communities, organizations and Indigenous peoples across Ontario on species at risk recovery planning; and
- creating new tools to streamline processes, reduce duplication and ensure costs incurred by clients are directed towards actions that will improve outcomes for the species or its habitat.

The proposed changes follow under the following five categories:

1. Assessing species at risk and listing them on the Species at Risk in Ontario List;
2. Defining and implementing species and habitat protections;
3. Developing species at risk recovery policies;
4. Issuing *Endangered Species Act* permits and agreements, and developing regulatory exemptions;
5. Enforcing the *Endangered Species Act.*

Ohio (US) ETP Species Information

Each species listed under the US Endangered Species Act (ESA) is assessed with information that include, as appropriate and available, information on current range, candidate information, federal Register documentation (e.g. notice of 5-year reviews, determination of Endangered/Threatened status, proposal to list), recovery plans, 5-year status reviews, biological opinions, critical habitats and conservation plans. As part of the ESA, endangered species cannot be retained and must be released to their environment with the least possible harm.

Ohio (US) ETP Species Management

The ESA provides a program for the conservation of threatened and endangered plants and animals and the habitats in which they are found. There are over 1,300 species listed as either endangered or threatened in the United States under the ESA[74]. The lead federal agencies for implementing ESA are the U.S. Fish and Wildlife Service (FWS) and the U.S. National Oceanic and Atmospheric Administration (NOAA) Fisheries Service. NMFS manages the marine species, and the FWS manages the remainder of the listed species, the terrestrial and freshwater species. Their responsibilities include:

- listing and delisting species,
- designating critical habitat,
- developing recovery plans, and
- evaluating the status of the species every 5 years in five-year reviews.

The law requires federal agencies, in consultation with the U.S. Fish and Wildlife Service and/or the NOAA Fisheries Service, to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat of such species. The law also prohibits any action that causes a "taking" of any listed species of endangered fish or wildlife. Likewise, import, export, interstate, and foreign commerce of listed species are all generally prohibited.

The U.S. Fish and Wildlife Service collaborates with states, tribes, private landowners, non-governmental organizations, and federal partners to achieve on-the-ground conservation for species and habitats around the country. Working with partners to achieve conservation goals, the US FWS focuses on the following principles[75]:

- Focus on recovery
- Provide conservation incentives
- Increase public participation through grants and partnerships
- Ensure clear and consistent policies and implementation

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[74] https://www.epa.gov/endangered-species/endangered-species-species-information-factsheets

[75] https://www.fws.gov/endangered/improving_esa/index.html

- Base decisions on sound science
- Provide private landowners and industry with tools to implement projects

The U.S. Fish and Wildlife Service developed the Species Status Assessment (SSA)[76] framework as part of the ongoing effort to improve implementation of the Endangered Species Act (ESA) and enhance conservation success. An SSA is a focused, repeatable, and rigorous assessment of a species' ability to maintain self-sustaining populations over time. This assessment is based on the best available scientific and commercial information regarding life history, biology, and consideration of current and future vulnerabilities. The result is a single document that delivers foundational science for informing all ESA decisions, including listing determinations, consultations, grant allocations, permitting, and recovery planning.

Proposed Revisions to the US ESA

In 2017, FWS and NOAA Fisheries sought public input on how the federal government can improve upon the regulatory framework. As a result of this process, they received substantial input from a wide range of stakeholders on modernizing the implementation of the ESA in order to improve collaboration, efficiency, and effectiveness.

The U.S. FWS and NOAA Fisheries have jointly announced revisions to regulations that implement portions of the Endangered Species Act (ESA), as part of the August 2019 Trump Administration move to modify application of the ESA.

Firstly, the agencies are finalizing changes to some of the parameters under which other federal agencies must consult with the Service and NOAA Fisheries to ensure their actions do not jeopardize the continued existence of listed species, or destroy or adversely modify critical habitat. The agencies are also finalizing various measures to clarify and improve some of the standards under which listings, delisting, and reclassifications, and critical habitat designations are made.

Additionally, the Service is changing its approach to applying protections to threatened species to align its practice with NOAA Fisheries, so the two agencies are consistent in their application of this provision of the ESA. The Service is removing its blanket rule under section 4(d) of the ESA that automatically conveys the same protections for threatened species as for endangered species[77]. This change will not affect the protections for species currently listed as threatened, but will have an effect on future Threatened status listings since species will be listed on a species by species basis. Another change to the ESA deals with the removal of language explicitly prohibiting the consideration of the economic impacts of listing a species. However, FWS has stated that they will continue to rely only on the best available science when determining whether a species should be listed[78].

A number of environmental groups have filed a lawsuit to stop the changes, and several state attorneys general have done the same [79] [80]. The revised ESA became active on the 26th September of 2019.

7.6 Habitat

The MSC Fisheries Standard v2.01 requires that the UoA does not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area covered by the governance body(s) responsible for fisheries management in the area(s) where the UoA operates. If the UoA is considered to harm habitats, a strategy should then be in place to ensure the UoA does not pose a risk of serios/irreversible harm to habitats. MSC intends that the scores will be determined for three different types of habitat status: commonly encountered, vulnerable marine ecosystems and minor encountered.

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[76] https://www.fws.gov/endangered/improving_esa/ssa.html
[77] https://www.fws.gov/endangered/improving_ESA/regulation-revisions.html
[78] https://www.nature.com/articles/d41586-019-02439-1
[79] https://www.nature.com/articles/d41586-019-02439-1
[80] https://news.stanford.edu/2019/09/26/endangered-species-act-changes/

"No serious or irreversible harm" means that a habitat can recover to at least 80% of its unimpacted structure, biological diversity and function within 5-20 years after the UoA would stop fishing. Serious or irreversible harm includes "the loss or extinction of habitat, depletion of key habitat-forming species or associated species to the extent that they meet criteria for high risk of extinction, and significant habitat alteration that causes major change in the structure, function, and/or diversity of the associated species assemblages".

Usually, habitats impacted by the fishery are bottom habitats rather than pelagic habitats. The yellow perch and walleye gillnet fisheries and the trapnet fisheries for yellow perch in Ohio would be an example of this although the impacts of this fishery stem primarily from the anchors deployed and lead lines when gear is set close to the bottom, which per se is significantly less damaging than active gear such as bottom trawl or dredging. The impacts of bottom gillnets would be considered low to medium, based on a study by Morgan & Chuenpagdee in 2003[81]. However, more specific information relating to Lake Erie fisheries and the gear indicates that the risk may be negligible due to the very small area impacted by anchors calculated using available data.

Lake Erie Habitats

Lake geomorphology and lakebed substrates

Data to classify the geomorphology of Lake Erie was compiled by the Great Lakes Aquatic Habitat Framework (GLAHF) by using many sources over years ranging from 1968-present. The majority of sources are published journal articles with maps that were heads-up digitized. Lake Erie Habitat Task Group data was collected by side scan sonar and proofed with grab samples and underwater video. The shoreline material was extended from the shoreline to the nearshore areas (0 - 30 m of depth) areas of all the Great Lakes except Erie. The shoreline material information is from the U.S. Army Corps of Engineers (2012) and the shoreline classification from Environment Canada Environmental Sensitivity Atlas (1990s). Figures showing Lake Erie geomorphology and key aquatic ecological units are shown below.

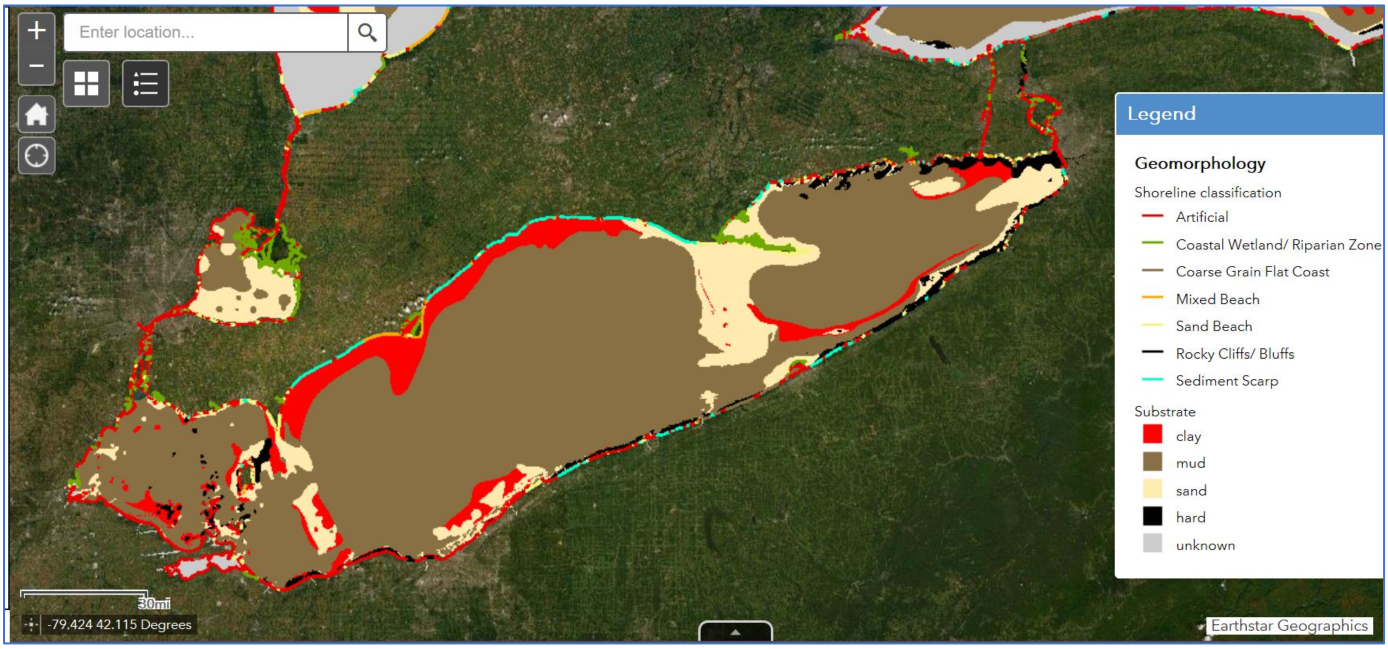

Figure 30. Geomorphology of Lake Erie including lake substrate morphology and shoreline classification. Source: https://www.glahf.org/explorer/

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[81] http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.179.1589&rep=rep1&type=pdf

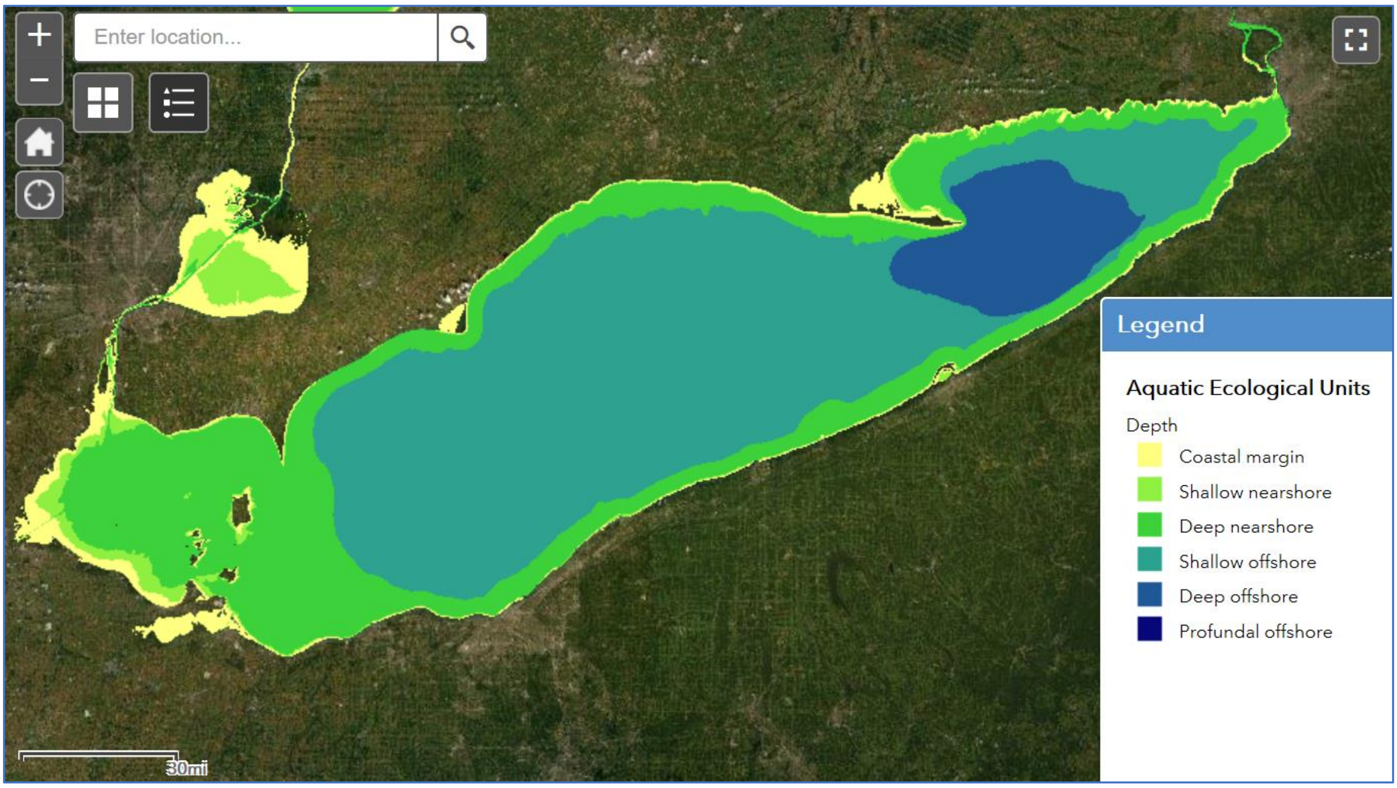

Figure 31. Lake Erie Aquatic Ecological Units based on lake depth. Coastal margin (<3 m); shallow nearshore (3-5m depth); deep nearshore (5-15m, Lake Erie only); shallow offshore (15-30m depth; Lake Erie only); deep offshore (30-100m); and profundal offshore (>100m). Source: https://www.glahf.org/explorer/

Lake Erie Western Basin Habitats

Drouin and Soper (in "The State of Lake Erie 2009" report, published in 2017[82]) described key aspects of the Lake Erie Western Basin's habitats as follows. The western-basin's morphology, hydrology, and biota are distinctive within Lake Erie. The western basin is separated from the rest of the lake by a series of islands and shoals running from west of Huron, Ohio, to Point Pelee, Ontario. It is the shallowest of Lake Erie's three basins with an average depth of 7.4 m and a maximum depth of 18.9 m and constitutes 13% of the lake's surface area and 5% of its volume (Bolsenga and Herdendorf 1993). Over 90% of the lake's annual water input enters from tributaries to this basin. Southern areas of the western basin are strongly influenced by nutrient-rich waters from the Maumee River and the Sandusky River, whereas the northern portion is largely influenced by nutrient-poor waters from Lake Huron and Lake St. Clair via the Detroit River (Zhu et al. 2008).

The divergent inflows create gradients in productivity and transparency that affect biological production and diversity in the basin. The western basin warms faster and reaches higher summer temperatures than the other basins and is the first to ice over in winter. Basin substrates vary from soft sediments that support an array of benthic invertebrates to limestone reefs and islands that attract structure-seeking fauna, including many fishes. Wetlands that formerly dominated the watershed and shorelines of a pristine western basin are greatly diminished in quantity (area) and functionality (disconnected from Lake Erie via dikes). Despite environmental degradation, the western basin still provides important spawning, nursery, and foraging habitats for the highest diversity of fishes in the lake, including key stocks of walleye, yellow perch, and lake whitefish, which have persisted as others were extirpated (Edwards and Ryder 1990; Ryan et al. 2003).

Of Lake Erie's three basins, environmental conditions and habitats in the western basin respond most rapidly to changes in weather and watershed land uses that affect tributary dynamics (e.g., discharge rates, sediment and nutrient loads, tributary water plumes in the open lake, extent of mixing zones in estuaries). Biota respond relatively

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[82] http://www.glfc.org/pubs/SpecialPubs/Sp17_01.pdf

quickly to changing conditions in the western basin, initially through production of lower-trophic-level organisms followed by lagged responses in food webs, fish recruitment, fish behavior, and fisheries performance. Over longer time periods, persistent spawning groups become stocks that lend a stabilizing influence to the fish community and food web given their adaptations to the dynamic environmental conditions (Zhu et al. 2008).

Lake Erie Central Basin Habitats

Kayle and Murray (in "The State of Lake Erie 2009" report, published in 2017[83]) described key aspects of the Lake Erie Central Basin's habitats as follows. The central basin of Lake Erie is delineated by the LEC as that part of the lake east of a north-south line between Point Pelee, Ontario, and Huron, Ohio, and west of a north-south line bounded by the Pennsylvania Ridge at Presque Isle, Pennsylvania, and the landward end of Long Point, Ontario. It has an average depth of 18.5 m, a maximum depth of 25.6 m, and makes up 63% of the lake's surface area and volume (Bolsenga and Herdendorf 1993). For fishery-management purposes (stock assessments and quota allocations), the central basin is split north-south, almost equally into west central and east central sub-basins along a jagged dividing line from Fairport Harbor, Ohio, to the U.S.-Canada boundary, then west to a line from the international boundary to Port Glasgow, Ontario (YPTG 2009).

Although the central basin is mostly mesotrophic, it became increasingly eutrophic during 2004-2008. Nutrients enter the nearshore areas from large harbors in and rivers discharging to the central basin and from Ohio rivers discharging to the western basin. Another source of total phosphorus (TP) to the central basin is release from sediments under anoxic conditions, which occurred during 2004-2008. Environmental conditions and habitats in the central basin often reflect a gradient between the shallow western basin and deep eastern basin for many abiotic and biotic features, although they also reflect features that are unique to the central basin. For example, water depths, temperatures, and lower trophic-level indicators in the central basin tend to be intermediate to those of the other basins, yet hypoxia occurs naturally only in the central basin. Additionally, the western and eastern basins have water masses that rotate within the boundaries of each country, whereas the central basin has two dominant gyres (one per sub-basin) that span the waters of both countries, with counter-clockwise rotation in the west central and clockwise rotation in the east central sub-basins (Saylor and Miller 1987). How these gyres affect food-web structure of the central basin is not well understood, but they are known to affect algal distributions (LEC 2005) and may have additional implications for pelagic food webs and fish behavior. At present, and historically, migratory fish stocks have traversed the central basin during spring or fall en route to feeding or spawning grounds. Resident stocks of many fishes were extirpated in the central basin by the 1960s, likely due to degradation of nearshore spawning and foraging habitats.

Lake Erie Eastern Basin Habitats

Markham et al. (in "The State of Lake Erie 2009" report, published in 2017[84]) described key aspects of the Lake Erie Eastern Basin's habitats as follows. The eastern basin of Lake Erie is separated from the adjacent central basin by the submerged Pennsylvania Ridge, which crosses the lake from Long Point, Ontario, to Presque Isle, Pennsylvania (Burns 1985; Ryan et al. 1999), and extends east to the head of the Niagara River at Buffalo, New York. The eastern basin has an average depth of 18.9 m, a maximum depth of 64.0 m, and makes up 24% of the lake's surface area and 32% of its volume (Bolsenga and Herdendorf 1993). The eastern basin receives most of its water from the upstream central basin but also has major river inflows on the north shore from the Grand River (Ontario) and on the south shore from Cattaraugus Creek (New York) (Sly 1976). Extensive areas of marsh and wetlands are found in Long Point Bay and in the lower reaches of the Grand River (Ryan et al. 1999). Bottom substrates vary with exposed bedrock and deposits of sand and gravel along the south shore, whereas the north shore is dominated by clay and sand. Mud bottoms predominate in the deeper waters (Burns 1985).

The eastern basin can be classified as deep dimictic; it stratifies thermally and has a thicker hypolimnetic layer of cold water than exists in the central basin (Ryan et al. 1999). At full thermal stratification (typically early September), the metalimnion usually forms at depths near 20 m but can be deeper or shallower depending on summer heat intensity or upwelling events associated with sustained strong winds. A diversity of habitats, fish species, and stock behavior

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[83] http://www.glfc.org/pubs/SpecialPubs/Sp17_01.pdf
[84] http://www.glfc.org/pubs/SpecialPubs/Sp17_01.pdf

makes the eastern basin unique among the three basins of Lake Erie. Environmental conditions and habitats are most stable in the eastern basin as compared to the western and central basins, but, when conditions change, responses in food webs and in the cool-water fish community occur initially in mesotrophic areas nearshore.

Oligotrophic offshore areas provide the vast majority of thermal habitat necessary to sustain a cold-water fish community in Lake Erie but also provide a thermal barrier that affects movements of some cool-water species and fosters the formation of localized stocks. Together, nearshore and offshore habitats support (or once supported) resident and migratory stocks of several key fish species, including walleye, yellow perch, smallmouth bass, lake trout, cisco, burbot, lake whitefish, and rainbow smelt. Spawning and nursery habitat for most of these stocks are in the nearshore waters of the eastern basin. However, adults of some cold-water fish stocks (lake whitefish and rainbow smelt presently; cisco and lake trout historically) reproduce in the western basin and migrate to the eastern basin as waters warm. Cool-water species (walleye) also spawn in the western basin and use eastern-basin habitats during warm months. The combination of having cool- and cold-water habitats and resident as well as migratory fish stocks has important implications for food-web structure, fish production, and ultimately, fisheries yield.

Benthic community of Lake Erie

A 2018 research study by Burkalova et al.[85] analysed the benthic community of the Laurentian Great Lakes, including Lake Erie in terms of spatial gradients and temporal trends from 1998 to 2014. In their study they explain that anthropogenic alteration of the Great Lakes watershed and the lakes began >200 years ago with watershed deforestation and pollution, wetland dewatering, overfishing, and culminated in strong eutrophication of Lake Erie in mid-1900s when Lake Erie was called “America's Dead Sea” (Beeton, 1965; Sweeney, 1995). Under the Great Lakes Water Quality Agreement (GLWQA) of 1972 signed by Canada and the United States, a binational effort was undertaken to restore and maintain the chemical, physical and biological integrity of the Great Lakes. As a result, one of the world's largest freshwater ecosystem monitoring programs (in geographic scale) was initiated. The U.S. EPA Great Lakes National Program Office (GLNPO) Biology Monitoring Program assesses the long-term status and trends of the lower food web in the open waters of the Great Lakes. The Program's annual monitoring of the Great Lakes began in 1983 for lakes Michigan, Huron, and Erie, in 1986 for Ontario, and in 1992 for Superior initially focused on chemical eutrophication in response to phosphorus load. Recognizing the importance of the benthic community in the evaluation and management of the Great Lakes, GLNPO added a benthic invertebrate monitoring program in 1997. A unique aspect of GLNPO's benthic monitoring program is the extent of coverage, which includes all five lakes and collects data from 58 permanent stations on an annual basis.

Following depth and productivity patterns, taxa richness was the highest in the shallowest and most productive Lake Erie (118), followed by lakes Ontario (106), Michigan (91), Huron (83), and Superior (37). The most diverse taxon groups were Chironomidae (commonly known as lake flies) (58 taxa) and Oligochaeta (i.e. aquatic worms) (55 taxa).

In Lake Erie, across the study time series, total Oligochaeta density increased at most stations, with the strongest trends observed in western and central basins. Densities of Turbellaria (a class of worms, most of which are not parasitic) increased as well. Mysis (a freshwater crustacean know as opossum shrimp) was last recorded in the eastern basin in 2006, and no Diporeia (a borrowing crustacean) have been found in the lake since the beginning of the monitoring program (1997). The total benthic density increased lake-wide, with largest increases observed in the western and eastern basins. This was due in part to the increase in Dreissena (invasive zebra / quagga mussels) density, however the trend was also positive without inclusion of Dreissena in the analyses. Tubificidae are a family of clitellate oligochaete worms and were most abundant in depths > 70 in Lake Erie over the study timeframe. Results of this study are shown in the following two figures.

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[85] https://www.sciencedirect.com/science/article/pii/S0380133018300510

Figure 32. Trends in densities (ind./m2) of major taxonomic groups and indicator species in the Great Lakes (averaged by lake, depth zone (greater than and <70 m) and years (1998–2014), and B) separately for Oligochaeta. Bivalves Dreissena and Sphaeriidae are shown separately since Dreissena spp. were not counted in 1998–2002. Source Burkalova et al. (2018) [86].

Reflecting the large differences in distribution patterns of Great Lakes benthic communities, a large shift in dominant taxa occurred in lakes Huron and Michigan between the first and the recent years of monitoring. The relative abundances of major benthic groups in the Great Lakes experienced dramatic changes between 1998–2002 and 2010–2014 manifested in the replacement of former dominant borrowing crustacean Diporeia with Dreissena zebra mussels and Oligochaeta worms in lakes Michigan, Huron, and Ontario. The only exceptions were lakes Superior and Erie where no large change in dominants (Diporeia and Oligochaeta, respectively) occurred in the 16 years analysed in the study.

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[86] https://www.sciencedirect.com/science/article/pii/S0380133018300510

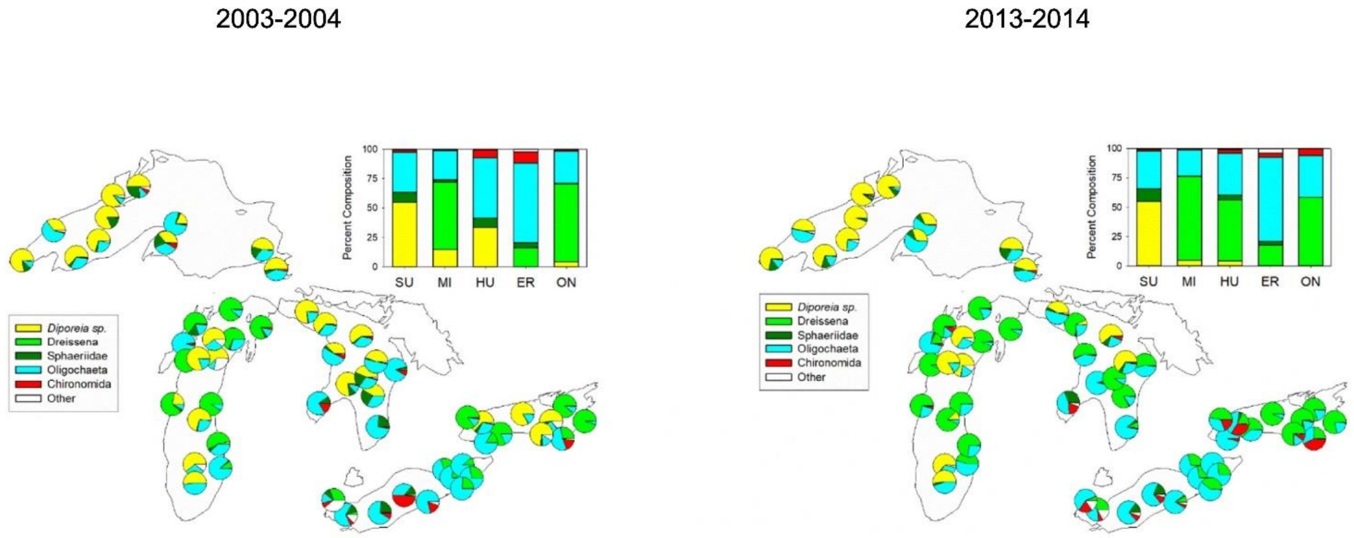

Figure 33. Relative abundances of major benthic groups in the Great Lakes averaged across the first two years when Dreissena spp. were counted in samples (2003–2004, on left), and 2013–2014 (on right). Insets show overall percent composition for each lake. Source Burkalova et al. (2018) [87].

The most diverse littoral community in the Great Lakes exhibited the highest densities at depths ≤30 m where enhanced phytoplankton densities (measured by chlorophyll) are found (Warren et al., 2018). This community is typically found at productive areas (e.g., the western and central basin of Lake Erie, Saginaw Bay, and Green Bay) favored by a warmer environment, higher food resources, and a wide range of habitats. As a result, a variety of trophic types is present in the littoral zone including shredders, scrapers, predators, scavengers, collectors and filterers, and a large variation in species tolerances is observed.

Macroinvertebrate density in large lakes tends to peak in the sublittoral zone likely due to the interaction between the generation and transport of energy resources (Auer et al., 2013; Nalepa et al., 2000) and then declines sharply with depth (e.g. Cook and Johnson, 1974; Frantz and Cordone, 1996; Hiltunen, 1967; Schuytema and Powers, 1966; Sierszen et al., 2006; Vadeboncoeur et al., 2011). The sublittoral zone lies between two major communities – the littoral and profundal, and includes species most abundant at 30–70 m depth. The upper sublittoral community of the Great Lakes (<70 m in depth) is taxonomically more diverse, while the accumulation of organic matter in combination with low hydrodynamic forcing favors collector-gatherers and pollution-tolerant Tubificidae to dominate communities of lower sublittoral zone. The amount of organic matter diminishes with depth being progressively utilized and degraded during its descent to the benthos (Jónasson, 2004; Pomeroy, 1980), leading to a decrease in the overall biomass of the community and the dominance of deposit-gatherers below the sublittoral zone (Jónasson, 2004).

While anthropogenic impacts on the lakes go back at least 200 years (Stoermer et al., 1993), the most dramatic effects were seen in the 1960s and 1970s due to accelerating eutrophication (Beeton, 1965; Sweeney, 1995). This resulted in increased oligochaete abundance across all lakes (Cook and Johnson, 1974), and caused near-extirpation of the formerly plentiful mayfly Hexagenia in the western basin of Lake Erie and in Lake Huron's Saginaw Bay (Britt, 1955; Schneider et al., 1969).

Vulnerable habitats / ecosystems in Lake Erie

Based on available information, there does not appear to be vulnerable habitats or ecosystems in Lake Erie as would be found in marine ecosystems (e.g. seamounts, hydrothermal vents, cold water corals and sponge fields). However, some records of freshwater sponges have shown to exist in the Great Lakes area, where 4 species of Porifera sponges

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[87] https://www.sciencedirect.com/science/article/pii/S0380133018300510

were found in Southern Lake Michigan, on the hull of a permanently moored long ship[88]. Save for a few isolated reports, very little is known of the diversity or distribution of freshwater sponges across the Great Lakes region[89].

In addition, as can be seen below, the potential for negative effects of gillnet and trapnet anchors used in the yellow perch and walleye fisheries of Lake Erie appear to be extremely limited in scale.

Limited extent of physical impacts from anchors

As part of this MSC assessment the Audit Team analysed the potential habitat impact of the gear used in the fisheries under assessment. Potential impacts of gillnet and trapnet gear used in these UoAs would be mainly derived by the deployment of anchors and lead line on the lake bed. The client group communicated to the audit team that the fisheries under assessment use 6 anchors per km for large mesh gill nets and 2 anchors per 1.8 km for small mesh gill net. Using those numbers they extracted the total effort (in km) from CFHIS to estimate the number of anchors used in each fishery. Based on these factors they estimated that:

- 16,276 and 16,041 anchors were deployed in the small mesh fishery in 2017 and 2018 for yellow perch, respectively (average 16,158) and that,
- 123,063 and 102,502 anchors were deployed in the large mesh fishery in 2017 and 2018, respectively (average of 112,782 anchors per year).

Ontario small mesh gillnet yellow perch fishery. Anchors used in the yellow perch fishery which hold the nets in place are set every time in a different location and weigh about 20 lb and cover an area of approximately 0.5 m^2 per anchor. Based on this, we can calculate that the area impacted each year, on average, by the yellow perch small mesh fishery is 0.008079 of a square kilometre. Given that Lake Erie has an area of 25,744 km^2 and half of this would roughly be Canadian jurisdiction (i.e. 12,872 km^2), and assuming effort is more or less even across this area, **the impacted area each year would be 0.00006% of the applicable lake area, which is considered negligible**. Even if one was to increase the calculated risk 10 fold, by invoking the precautionary approach and to account for other potential risks, the impacted area would be 0.0006%, still considered negligible.

Lake Erie large mesh walleye fishery. We assume anchors used in the Lake Erie walleye fishery weigh about 20 lb and cover an area of approximately 0.5 m^2 per anchor, in a similar fashion as the yellow perch fishery. Based on this, we can calculate that the area impacted each year, on average, by the walleye large mesh fishery is 0.056391 of a square kilometre. The large mesh gill net commercial fishery operates mostly in waters of the western basin and also in QZ2 and QZ3 when targeting White bass. Considering that MU1-MU3 represent about 70% of the Lake Erie Area of 25,744 km^2, and assuming effort is more or less even across the area, **the impacted area each year would be 0.0003108% of the applicable lake area, which is considered negligible**. Even if one was to increase the calculated risk 10 fold, by invoking the precautionary approach and to account for other potential risks, the impacted area would be 0.003108%, still considered negligible.

Ohio Yellow perch small mesh trapnet fishery. Regarding this fishery, the client group reported that after discussion with a trap net license holder, the best estimate for the number of anchors set by the Ohio industry for one full season of fishing would be approximately 4,000 anchors. We assume anchors used in the yellow perch trapnet fishery weigh about 20 lb and cover an area of approximately 0.5 m^2 per anchor, in a similar fashion as the yellow perch fishery. Based on this, we can calculate that the area impacted each year, on average, by the yellow perch trapnet fishery is 0.002 of a square kilometre. Considering that MU1 to MU3 would occupy about 70% of the overall area of Lake Erie within Ohio's jurisdiction (assumed to be approximately 50% of the total Lake Erie area) and total approx. 9,010 km^2, and assuming the effort is more or less even across the area, **the impacted area each year would be 0.000022% of the applicable lake area, which is considered negligible**. Even if one was to increase the calculated risk 10 fold, by invoking the precautionary approach and to account for other potential risks, the impacted area would be 0.00022%, still considered negligible.

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[88] https://www.sciencedirect.com/science/article/pii/S038013309670936X

[89] https://glsponges.lab.uic.edu/wp-content/uploads/2016/02/great-lakes-freshwater-sponge-study-overview.pdf

The (weight) impact of the lead lines used in these gears has not been explicitly calculated but is considered to be quite limited because although the lead line would lie on the lake bed across a distance, its weight would be distributed very widely across the line, and would almost certainly not exert the same weight and pressure on habitats and potential vulnerable sea bed biota as an anchor would (i.e. 20 lbs per 0.5 m^2 communicated by client group).

During the 4th Surveillance off site visit, fishery managers stated that fishing gear's anchors generally end up in muddy sediment with little biodiversity aside from the invertebrates living in it, and because of that, habitat impacts were thought to be quite minimal. From an Ohio perspective, near shore and reef zones (i.e. defined as an elevation of rock shown to be above the surrounding bottom area of the lake[90]) are all close to fishing (pers. comm. Brian Locke, Manager, Lake Erie Management Unit - Ontario Ministry of Natural Resources and Forestry; Travis Hartman, Lake Erie Program Administrator, Ohio Department of Natural Resources, off-site conference call meeting, October 10th 2019).

There is no other formal or agency-based assessment of potential habitat effects resulting from the UoAs specified in this report.

Habitat Management

Based on the very limited effect of gillnet / trapnet anchors on the lakebed, specific management strategies or approaches do not appear to be required, as the impacts are considered to be negligible. However, in addition to this, there are closed area /season requirements for the Ohio and Ontario fisheries that further decrease the potential for habitat effects. Further information on closed areas is shown below.

<u>Licence Conditions – Ohio Commercial Yellow perch Trapnet Fishery</u>

Closed areas and times (partial description) requirements: (i) it is unlawful to set a net within 1/4 mile of an island or the mainland bordering Lake Erie from June 15 through September 15; (ii) no person may lay out or set a net of any kind in any channel between islands or an island and the mainland at a distance from the shore of such islands or mainland greater than one-fourth the distance across such channel, (iii) it is unlawful to set a net or trotline on a reef at any time; and (iv) no fishing device may be lifted, pulled, hauled, set, or have fish removed from it from one-half hour after sunset to one-half hour before sunrise.

<u>Lake Erie Commercial Fishing License Condition for 2019 – Appendix B – Ontario yellow perch and walleye gillnet fisheries</u>

12.(a) During the period commencing 00:01 hours on March 15th to May 1st at 12:00 hours inclusive, no gill nets shall be set or lifted or remain in the waters within the area bounded to the north by a line projected easterly from latitude 41 degrees 51 minutes 00 seconds (41 51.00) N, longitude 82 degrees 54 minutes 06 seconds (82 54.10) W to latitude 41 degrees 51 minutes 00 seconds (41 51.00) N, longitude 82 degrees 38 minutes 18 seconds (82 38.30) W, on the east from the latter location by a line projected southerly to the abandoned lighthouse on Pelee Island, then following the westerly shoreline southward to Fish Point and from Fish Point southerly to the intersection of the international boundary, then bounded on the south by a line projected by the latter point following the international boundary westerly to latitude 41 degrees 46 minutes 54 seconds (41 46.90) N, longitude 82 degrees 54 minutes 06 seconds (82 54.10) W, then from this point northerly to the place of beginning to form the westerly boundary.

(b) During the period commencing 00:01 hours on July 1st to August 31st inclusive, canned nets or kited nets within the top 10 feet of the water column, may only be set or lifted in Quota Area 1 within the area bounded on the east by the boundary between Quota Area 1 and 2 then south to the international boundary, then west along the boundary to latitude 41 degrees 40 minutes 35 seconds (41 40.58) N, longitude 82 degrees 34 minutes 54 seconds (82 34.90) W, bounded on the west by a line projected northerly from the latter point to latitude 41 degrees 51 minutes 08 seconds (51 08.13) N, longitude 82 degrees 34 minutes 59 seconds (82 34 .98) W, then north-easterly to the tip of Point Pelee National Park.

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[90] https://ohioseagrant.osu.edu/products/a200f/guide-to-fishing-reefs-in-western-lake-erie

(c) During the period commencing 00:01 hours on July 1st to August 31st inclusive, no gill net containing more than 36 meshes in height shall be set or lifted or remain in the water in Quota Area 1 with a mesh size less than 89 mm (3.5 inches) in extension measure as defined in these conditions.

(d) During the period commencing 00:01 hours on June 1st to September 15th inclusive, no canned gill nets will be set for Walleye inside Long Point Bay west of a line which separates commercial fishing grids 167 and 168 at Long Point and proceeds north following Longitude 80 degrees 05 minutes 00 seconds (80 05.00) W to intersect the north shore of Lake Erie.

(e) Commercial fishing with gill nets is prohibited east of the line separating commercial grids 91 and 92 at the north shore of Lake Erie south to the international border on longitude 79 degrees 05 minutes 00 seconds.

(f) (i) During the period commencing 00:01 hours on July 1st to September 30th inclusive, no person shall use an overnight set in Quota Area 1.

The Lake Erie Habitat Task Group (HTG)

Further to the above in relation to habitat research/management, the LEC has a dedicated Habitat Working Group (HTG), which publishes activity reports every year. The Lake Erie HTG published their 2019 annual report in March 2019[91] in which they discuss recent work that entailed a three-step approach to systematically derive Priority Management Areas (PMAs) important to Lake Erie. In Step one, information on functional habitats by life stage and stock for all desired fish species was collected from technical experts around Lake Erie resulting in the creation of Habitat Actions (HA). Desirable fish species included yellow perch and walleye but also several other species commonly caught in the lake. Limiting habitat components were identified within each function habitat, their status (impeded or not), sources of impediments and proposed habitat actions with estimates time to implement, if applicable. Step two involved prioritization criteria while step three used a three-stage scoring process to identify PMAs. PMA scoring identified 12 functional habitats as very high priority (>90%), and 15 high priority PMAs (75-90%), illustrated in the figure below.

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[91] http://www.glfc.org/pubs/lake_committees/erie/HTG_docs/annual_reports/HTG_AnnualReport2018.pdf

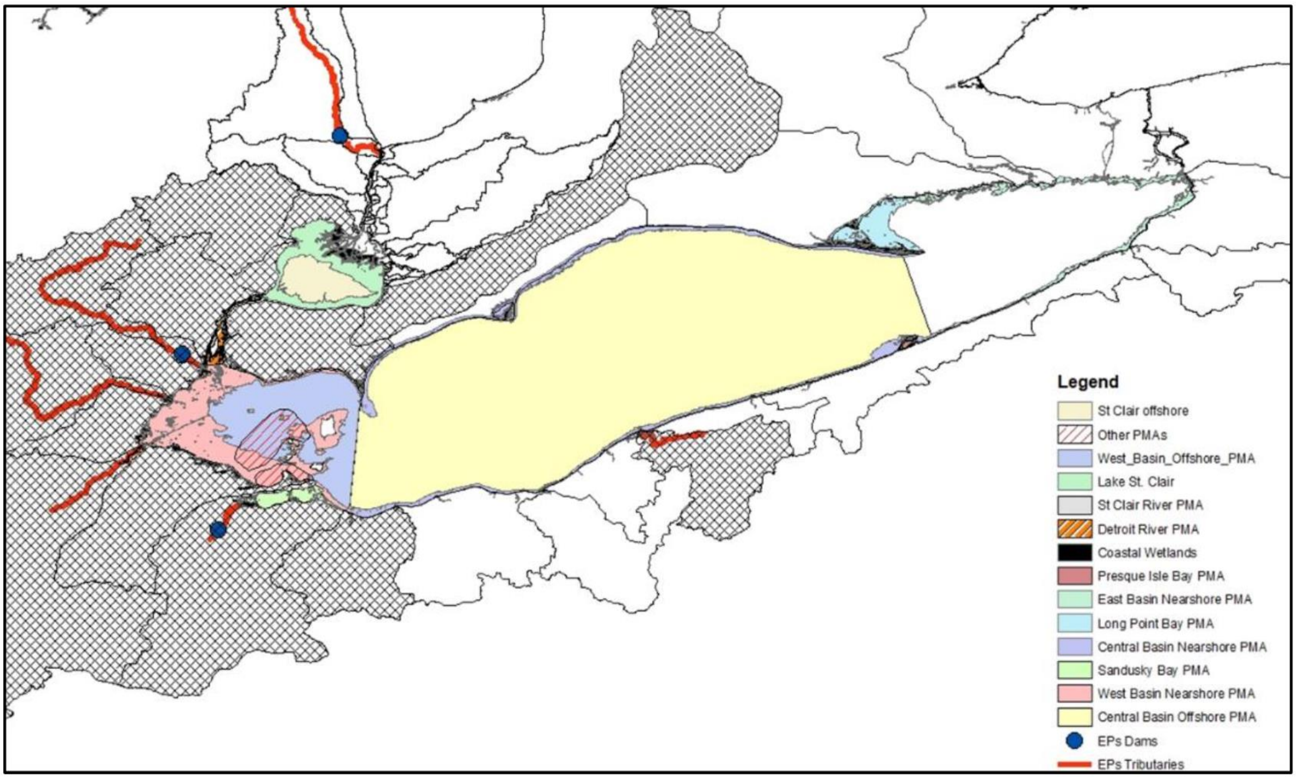

Figure 34. A map of specifically identified very high and high priority PMAs in the Lake Erie Basin based on the PMA scoring.

The PMAs is set to guide fisheries value in strategic plans such as the lake wide action plan and is being used in the development of the 2019-2023 Lake Erie-Lakewide Action Management Plan (LAMP)[92], which itself was up for public review and comment until the 26th of August 2019.[93]

The HTG and Great Lakes Aquatic Habitat Framework (GLAHF) will collaboratively explore ways to transition the PMA dataset into a geospatial framework. This will increase the power of the approach by minimizing effects the weighting of information in well studied Functional Habitats and improve the accessibility of the data for fisheries biologist, managers and other environmental organizations by enabling better data visualization.

They are many other habitat related projects that take part in Lake Erie where the HTG tends to be central or a partner of. Details for these projects can be found in the yearly HTG reports. The 2019 HTG report includes project overviews for 9 different habitat and research projects underway or completed in med to high PMAs across the Lake Erie basin[94]. These projects are:

- Reef Restoration and Maturation in the St. Clair-Detroit River System, Michigan-Ontario
- Biological and Habitat Assessment of the Lower Rouge River, Michigan
- Clinton River Mouth Ecosystem Restoration Project, Michigan
- Henry Ford Estate Dam fish passage to the Rouge River, Michigan
- Celeron and Stony Islands Habitat Restoration, Michigan
- Removal of the Ballville Dam on the Sandusky River, Ohio
- Maumee River Sturgeon Restoration, Ohio
- Remediating the effects of the Dunnville Dam on the Grand River, Ontario
- Niagara River Habitat Restoration Projects, New York

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[92] https://binational.net/wp-content/uploads/2019/06/Draft-Lake-Erie-LAMP-061819-English.pdf

[93] https://binational.net/2019/06/27/2019-erie-lamp-paap/

[94] http://sealamprey.info/pubs/lake_committees/erie/HTG_docs/annual_reports/HTG_ExecutiveSummary2019.pdf

For Lake Erie, a Basin and Lake-Wide Habitat-Related Project Inventory is also available for viewing at: http://www.glfc.org/pubs/lake_committees/erie/spatial_inventory/basin_lake.html

A recent habitat related project is the current Lake Erie Lake Trout Movement project (code LELTM) with project duration spanning from March 2016 to December 2021[95]. This is summarised below.

The Lake Erie Fish Community Goals and Objectives state that "the goal for the eastern basin is a balanced cold-water community with Lake Trout as the dominant predator." Native Lake Trout stocks were extirpated from Lake Erie approximately 50 years ago and restoration efforts have been ongoing since the mid-1980s. The Lake Erie Committee's "Strategic Plan for the Rehabilitation of Lake Trout" identifies three strategies for reaching the management objectives: 1) increasing stocking rates of yearlings, 2) maintaining Sea Lamprey abundances to prescribed levels, and 3) identifying potential Lake Trout spawning habitat. The first two strategies are addressed on an annual basis by the management agencies; however, the ability to address the third strategy has lagged. From 2006 to 2011, members of the Lake Erie Habitat Task Group combined efforts to conduct high resolution substrate mapping and underwater photography of potential Lake Trout spawning reefs within the eastern basin. This effort resulted in substrate classifications, bathymetry measures, and measures of connectivity to potential nursery areas. While this information indicated that potential spawning habitat existed in the eastern basin, the authors highlighted that movement data would provide the connection needed between spawning habitat and Lake Trout use. Lake Erie's existing acoustic receiver infrastructure presents an exceptional low-cost opportunity to detect Lake Trout movements during the spawning season as well as through all seasons. Thus, this project will also inform seasonal inter-basin movements of Lake Trout. Anecdotal evidence surprisingly suggests that the western basin reefs and the Detroit River historically provided important spawning habitat for Lake Erie Lake Trout. Whether mature feral hatchery lake trout migrate to these areas during the spawning season is unknown. Lastly, an understanding of western basin versus eastern basin reef occupancy during spawning times will help inform potential stocking locations in the future. The ability to rehabilitate Lake Erie Lake Trout is hindered until more information on spawning habitat occupancy and seasonal movements are quantified.

7.7 Ecosystem

In the MSC Fisheries Standard v2.01, ecosystem status requirements request that the UoA does not cause serious or irreversible harm to the key elements of ecosystem structure and function. If risks exist there should be management measures in place to ensure the UoA does not harm ecosystem structure and function. "Key" ecosystem elements are the features of an ecosystem considered as being most crucial to giving the ecosystem its characteristic nature and dynamics, and are considered relative to the scale and intensity of the UoA. They are features most crucial to maintaining the integrity of its structure and functions and the key determinants of the ecosystem resilience and productivity. The Ecosystem component addresses system-wide issues, primarily impacted indirectly by the fishery, including ecosystem structure, trophic relationships and biodiversity.

Relatively few fisheries would have the information needed to address ecosystem issues quantitatively, and usually they will be assessed using surrogates, analogy, general observations, qualitative assessment and expert judgement. Harm to ecosystem structure is normally inferred from impacts on populations, species and functional groups, which can often be measured directly. Harm to ecosystem functions is normally inferred from impacts on ecosystem processes and properties such as trophic relationships, community resilience etc. and often have to be inferred from conceptual or analytical models or analyses.

Lake Erie Ecosystem

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[95] https://glatos.glos.us/home/project/LELTM

In a 2018 ecosystem study of the Great Laurentian Lakes, Ives et al. 2018[96] explored the foodweb structure and ecosystem structure of Lake Erie, illustrating a synthesised conceptual model that provides resource managers a tool to more systematically interpret how lower food-web dynamics influence harvestable fish populations, and vice versa, and to act accordingly such that sustainable resource practices can be achieved. In their study they explain that Lake Erie is the shallowest, warmest, and most productive of the Great Lakes. Its three basins, the small, shallow and highly productive western basin; large central basin; and deep, least-productive eastern basin, are distinct in terms of geology, hydrology, trophic status, and food-web dynamics (Morrison, Whittle, & Haffner, 2002). Lake Erie has a diverse fish community (Cudmore-Vokey & Crossman, 2000), which supports valuable commercial and recreational fisheries for walleye and yellow perch. Its food-web structure and dynamics are the most altered among the Great Lakes due to a combination of invasive species, nutrient inputs resulting in regional eutrophication and hypoxic zones, historic intensive commercial fishing, land-use changes, and industrial pollution. These stressors induced community changes beginning in the late 1800s, and by the mid-1960s, led to extinction of blue pike *Sander vitreus glaucus* and extirpation of cisco and sauger *Sander canadensis* (Eshenroder et al., 2016; Regier & Hartman, 1973) and major population reductions of key species such as lake sturgeon *Acipenser fulvescens*, lake trout and lake whitefish (Leach & Nepszy, 1976). Lake Erie has therefore experienced widespread functional loss[97].

High nutrient inputs prior to the 1970s were a major force driving the 1972 and subsequent (1978, 2012) Great Lakes Water Quality Agreements (GLWQA). Phosphorus abatement to reach GLWQA-mandated loads led to declines in phosphorus and chlorophyll-a concentrations in all basins until about 1990. However, starting in the late 1990s and continuing to the present, Lake Erie is experiencing re-eutrophication, particularly in the western basin and nearshore areas of the central and eastern basins (Kane, Conroy, Richards, Baker, & Culver, 2014; Scavia et al., 2014). Recent trends show increases in dissolved phosphorus from 1990 to 2013 from the Maumee River, partially driven by increases in precipitation, while TP has remained stable (Stow et al., 2015). Potential impacts of recent commitments under the 2012 GLWQA to reduce nutrient loads are difficult to predict, but will certainly influence food-web dynamics and productivity of Lake Erie and potentially downstream to Lake Ontario.

Lake Erie is notorious for large harmful algal blooms (HABs) in the western basin, which, beginning in the late 1990s, have occurred sporadically during late summer (Watson et al., 2016). Total phytoplankton biomass has, since the 1990s, been increasing in Lake Erie, driven in part by the soluble reactive phosphorus load in the Maumee River (Kane et al., 2014).

Lake Erie has been invaded by 67 fishes and invertebrates, some of which have played major roles in altering trophic structure and influencing growth and population dynamics of native species (Crane & Einhouse, 2016; Guzzo, Haffner, Legler, Rush, & Fisk, 2013). In particular, dreissenid mussels, Bythotrephes, the amphipod *Echinogammarus ischnus*, and round goby *Neogobius melanostomus* have created a novel Ponto-Caspian food chain, integrated within the larger food web, dramatically reengineering the nearshore zone (Campbell et al., 2009; Hecky et al., 2004; Parker, Rudstam, Mills, & Einhouse, 2001) and thereby altering the delivery of nutrients to offshore habitats.

Nutrient sequestration by dreissenid mussels has led to enhanced algal (including macrophytes) and benthic invertebrate production in Lake Erie's nearshore and reduced offshore nutrient transport, thus potentially reducing nearshore–offshore coupling. Replacement of native planktivores (Coregonus spp.) with the non-native rainbow smelt in the mid-1900s represented another major shift in connections among habitats and possibly a loss of historical profundal–pelagic coupling, as rainbow smelt are known to contribute less to lake-wide DVM than Coregonus spp. in other lakes (Ahrenstorff et al., 2011; Gorman et al., 2012).

Ives et al. 2018 continued to explain that Walleye are currently the primary coupler among habitats and basins, and through selective piscivory influence fish community structure, a situation unlike that in the other Great Lakes (Knight & Vondracek, 1993). In late spring or early summer, abundant cool-water species, including gizzard shad *Dorosoma cepedianum*, yellow perch and walleye, migrate from spawning grounds in the western basin into the cooler central

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[96] https://onlinelibrary.wiley.com/doi/full/10.1111/fwb.13203
[97] https://onlinelibrary.wiley.com/doi/full/10.1111/fwb.13203

and eastern basins, following the progression of the thermal bar (Wang et al., 2007; Zhao, Einhouse, & MacDougall, 2011). Movements are both temperature and size-dependent, with larger walleye tending to migrate while juveniles remain in the productive western basin despite temperatures exceeding their optimal growth window (20–23°C; Wang et al., 2007). Lake trout, lake whitefish, and burbot are mobile generalist predators, but primarily confined to the eastern basin during stratification. During isothermal conditions, mobile generalist species are likely to be important couplers of profundal, pelagic, and nearshore habitats due to their fall spawning migrations (Cook, Johnson, Locke, & Morrison, 2005)[98].

Lake Erie Food Web

The Great Lakes Environmental Research Laboratory (GLERL) has developed food-web diagrams for all of the Great Lakes and Lake St. Clair, including Lake Erie. A diagram summarising the energy flow of Lake Erie[99] is based on a model from a paper published in 2003[100] supported by both NOAA and the Great Lakes Fishery Commission.

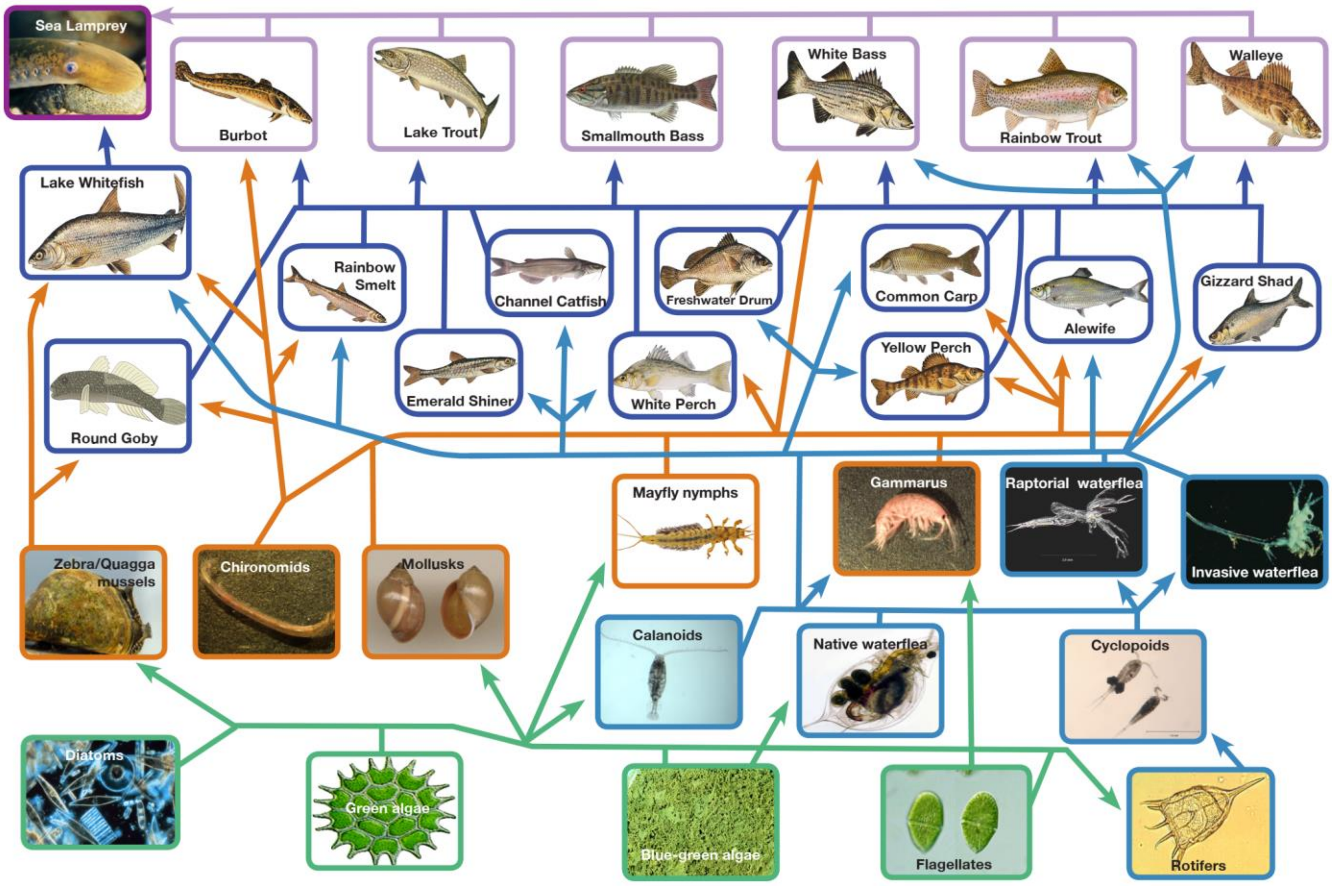

Figure 35. Lake Erie foodweb based on "Impact of exotic invertebrate invaders on food web structure and function in the Great Lakes: A network analysis approach" by Mason, Krause, and Ulanowicz, 2002 - Modifications for Lake Erie, 2009.

Color codes for the Lake Erie foodweb as well as a brief functional description of its key components are shown below.

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[98] https://onlinelibrary.wiley.com/doi/full/10.1111/fwb.13203

[99] https://www.glerl.noaa.gov/pubs/brochures/foodweb/LEfoodweb.pdf

[100] https://www.glerl.noaa.gov/pubs/fulltext/2003/20030014.pdf

Sea Lamprey

Sea lamprey (*Petromyzon marinus*). An aggressive, non-native parasite that fastens onto its prey and rasps out a hole with its rough tongue.

Piscivores (Fish Eaters)

Rainbow trout or Steelhead (*Oncorhynchus mykiss*). A lake strain of non-native rainbow trout, rarely found deeper than 35 feet. Supplemented by stocking.

White bass (*Morone Chrysops*). Prefers clear open water in lakes and large rivers. Visual feeders, uses sight instead of smell to find prey.

Smallmouth bass (*Micropterus dolomieui*). Native coolwater species. Intolerant of pollution so is a good indicator of a healthy environment.

Lake trout (*Salvelinus namaycush*). Nearly eliminated by sea lampreys during the 1950s and 1960s. Stocking and lamprey control are resulting in it's resurgence.

Walleye (*Stizostedion vitreum*). Carnivorous night feeders, eating fishes such as yellow perch and freshwater drum, insects, crayfish, snails, and mudpuppies.

Burbot (*Lota lota*). Elongated, cylindrical, freshwater codfish.

Forage Fish

Lake whitefish (*Coregonus clupeaformis*). Native found in cold waters. Bottom feeder—diets have shifted to include zebra and quagga mussels.

Channel catfish (*Ictalurus punctatus*). Prefer cool, deep water with a sand or gravel bottom. Primarily bottom feeders, but also feed at the surface.

Common carp (*Cyprinus carpio*). Large, omnivorous fish. Uproot plants on which ducks feed, muddy the water, and destroy plants and cover needed by other fish.

White perch (*Morone americana*). Invaded the Great Lakes through the Erie and Welland canals in 1950. Diet consists of walleye, white bass, and other fish eggs.

Yellow perch (*Perca flavescens*). Native that schools near shore, usually at depths less than 30 feet.

Emerald shiner (*Notropis atherinoides*). Very abundant in Lake Erie where they are important forage for sport fish.

Rainbow Smelt (*Osmerus mordax*). Found in both coastal and offshore habitats. Light-sensitive, so prefer deeper, cooler waters during the warmer seasons.

Freshwater drum (*Aplodinotus grunniens*). Gets its name from the odd grunting noises produced by muscles vibrating against the swim bladder.

Alewife (*Alosa pseudoharengus*). Atlantic species that invaded Lake Erie in 1931 via the Welland canal.

Gizzard shad (*Dorosoma cepedianum*). Commonly grows to 9-14 inches. Found in large schools. Has no commercial value.

Round goby (*Neogobius melanostomus*). Invasive, introduced into the Great Lakes via freighter ballast. Feeds on bivalves, including zebra mussels, crustaceans, insects, and small fishes.

Macroinvertebrates

Chironomids/Oligochaetes. Larval insects and worms that live on the lake bottom. Feed on detritus. Species present are a good indicator of water quality.

Mayfly nymphs (*Hexagenia* spp.). A burrowing insect larvae found in warm, shallow water bays and basins, usually in soft sediments. The presence of this sensitive organism indicates good water quality conditions.

Amphipods (*Gammarus*). A common amphipod found in warm, shallow regions.

Mollusks. A mixture of native and non-native species of snails and clams are eaten by lake whitefish and other bottom feeding fish.

Zebra and quagga mussels (*Dreissena polymorpha* and *Dreissena bugensis*). Invaded Lake Erie in 1988/89, filter-feeders that remove huge quantities of plankton.

Zooplankton (Microscopic animals found in the water column)

Invasive Spiny waterfleas (*Bythotrephes longimanus*). Visual raptorial predator that can depress native waterflea populations.

Native Raptorial waterfleas (*Leptodora kindtii*). Slow moving and patchy distribution of small swarms at relatively low numbers.

Cyclopoid copepods (e.g., *Cyclops bicuspidatus*). Carnivorous copepods that feed on rotifers and other microzooplankton.

Native waterfleas (e.g., *Daphnia galeata*). Filter-feeding waterfleas that can be important for controlling phytoplankton.

Calanoid copepods (e.g., *Diaptomus* spp.). Omnivores that feed on both phytoplankton and microzooplankton.

Rotifers. A diverse group of microzooplankton that, depending on species, feed on phytoplankton, detritus, or other microzooplankton.

Phytoplankton (Algae found in the water column)

Blue-green algae (aka Cyanobacteria). Often inedible and frequently toxic; blooms in late summer and can look like spilled paint on the water surface.

Green algae. Microscopic (single-celled) plants that form the main support of the summer food web. Also includes large nuisance species such as *Cladophora*.

Diatoms. Cold-loving microscopic (single celled) plants encased in silica shells that support the first wave of production in the spring.

Flagellates. Motile, single-celled plants or animals frequently found in high numbers. Most eat bacteria and so may help funnel bacterial products back into the food chain.

130 species of fish, including at least 18 non-natives, make their homes in the waters of Lake Erie. Ten species of native fish have been extirpated from Lake Erie. This food web includes only the dominant species.

Figure 36. Functional description of key components in the Lake Erie foodweb.

Lake Erie Biodiversity

Lake Erie is unique among the Great Lakes. Its shallow waters and southern location result in the highest primary production, biological diversity and fish production of all the Great Lakes. Three distinct basins provide a variety of offshore habitats. The Detroit River, Maumee River, and smaller tributaries drain into the western basin, which averages 24 feet deep and contains extremely nutrient-rich water. The central basin lies east of Point Pelee, Ontario (Canada), and the Lake Erie Islands. This basin averages 60 feet deep and is slightly less productive. The eastern basin, which lies to the east of Erie, Pennsylvania (U.S.), and Long Point, Ontario (Canada), is the deepest and least productive of the three basins. Here, water up to 210 feet deep provides colder conditions for fish that cannot tolerate warm summer temperatures elsewhere in the lake.[101]

This highly valuable resource is also situated in the most altered basin, and has suffered from invasive species, increases in nutrient concentrations, pollution and habitat destruction. These anthropogenic changes have caused wildlife and plant populations to decline and in some locations disappear, changing Lake Erie's natural biological diversity and diminishing many of its ecological services. Through the efforts of many agencies, organizations, and individuals working over decades, Lake Erie has shown the ability to recover, and it is expected that that future, focused efforts will lead to further restoration of the functions and ecological richness of the lake.

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[101] https://www.michiganseagrant.org/topics/great-lakes-fast-facts/lake-erie/

Lake Erie Ecosystem Management

The Lake Erie Biodiversity Conservation Strategy (LEBCS)[102] is a binational initiative designed to support the efforts of the Lake Erie LaMP by identifying specific strategies and actions to protect and conserve the native biodiversity of Lake Erie. It is the product of a two year planning process involving over 190 experts from 87 agencies and organizations around the basin. The goals of this planning process included:

- Assemble available biodiversity information for Lake Erie;
- Define a binational vision of biodiversity conservation for Lake Erie;
- Develop shared strategies for protecting and restoring critical biodiversity areas;
- Describe the ways in which conservation strategies can benefit people by protecting and restoring important ecosystem services; and
- Promote coordination of biodiversity conservation in the Lake Erie basin.

By applying a biodiversity focus to synthesize and prioritize existing related efforts, the LEBCS reaffirms and advances many existing complementary plans and initiatives. The scope of Lake Erie Biodiversity Conservation Strategy includes the lake itself, the Connecting Channels, including Lake St. Clair, St. Clair River, Detroit River and upper Niagara River, the immediate coastal area (roughly 2 km inland from the shoreline), and the watersheds of the tributaries in the basin, to the extent that they affect the biodiversity of the lake. To address the differences within the Lake and along the coastal zone, we divided the lake into four generally recognized basins for reporting units: Eastern Basin, Central Basin, Western Basin and Huron-Erie Corridor, further dividing these reporting units into offshore and coastal-nearshore units to facilitate assessments of viability (health) and threats to biodiversity and inform development of strategies. Eight focal targets were identified that define the biodiversity of Lake Erie:

1. Open Water Benthic and Pelagic Ecosystem (offshore waters deeper than 15 m)
2. Nearshore Zone (waters less than 15 m in depth, including the coastal margin)
3. Native Migratory Fish (Lake Erie fish with populations that require tributaries for a portion of their life cycle, including lake sturgeon, walleye, suckers and sauger)
4. Lake Erie Connecting Channels (Huron – Erie Corridor and Upper Niagara River)
5. Coastal Wetlands (wetlands with historic and current hydrologic connectivity to, and directly influenced by, Lake Erie)
6. Islands (including both naturally formed and artificial islands)
7. Coastal Terrestrial Systems (upland systems within ~2 km of the shoreline)
8. Aerial Migrants (migrating birds, insects, and bats dependent on the Lake Erie shoreline).

Engaging numerous experts and employing recognized Key Ecological Attributes (KEAs) and indicators of health, the current viability status of each of the eight targets was identified by assessment unit, reporting unit and lake wide. These assessments provide a snapshot of the status of biodiversity in Lake Erie and their desired state. Lakewide viability is presented in Table 38, which also shows viability by each reporting units and by target.

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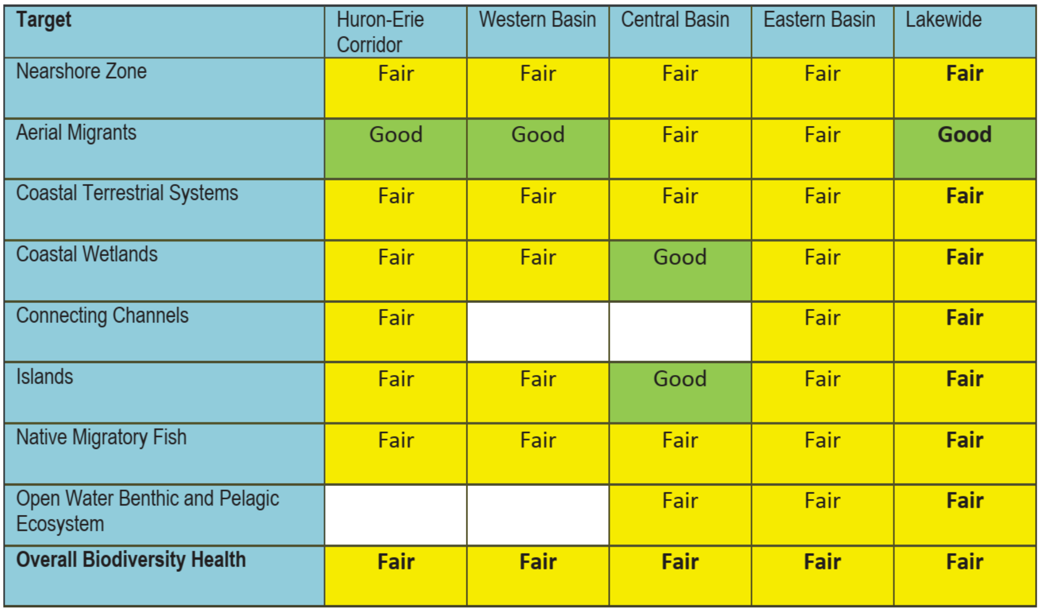
[102] https://binational.net//wp-content/uploads/2015/02/LakeErieBCSen.pdf

Table 38. Lakewide (Erie) viability for 8 targets from the LEBCS.



Target	Huron-Erie Corridor	Western Basin	Central Basin	Eastern Basin	Lakewide
Nearshore Zone	Fair	Fair	Fair	Fair	**Fair**
Aerial Migrants	Good	Good	Fair	Fair	**Good**
Coastal Terrestrial Systems	Fair	Fair	Fair	Fair	**Fair**
Coastal Wetlands	Fair	Fair	Good	Fair	**Fair**
Connecting Channels	Fair			Fair	**Fair**
Islands	Fair	Fair	Good	Fair	**Fair**
Native Migratory Fish	Fair	Fair	Fair	Fair	**Fair**
Open Water Benthic and Pelagic Ecosystem			Fair	Fair	**Fair**
Overall Biodiversity Health	**Fair**	**Fair**	**Fair**	**Fair**	**Fair**

Summary Goals were set for 2030 to assure long-term viability. Some of these are relevant to the walleye and yellow perch fisheries under consideration, and included the following:

Open Water Benthic and Pelagic Ecosystem Goals. By 2030, to assure that the Open Water Benthic and Pelagic zone of Lake Erie is characterized by a more stable food web that supports a diverse fishery and is resilient to invasive species:

- Native fish will comprise 50% of the prey biomass;
- Lake trout will maintain self-sustaining populations in each major area of the offshore;
- Self sustaining populations of native predators (such as yellow perch, walleye, lake whitefish and lake trout) maintain relatively stable populations consistent with Fish Community Objectives.

Nearshore Zone targets. By 2030, to assure adequate water quality for sustaining native plants, fish, and invertebrates:

- Based on multi year averages, reduce the load of dissolved phosphorus by 50% by 2030 in at least the priority watersheds. HAB toxin measures will be reduced to the point that no HAB advisories at public beaches will be recorded and issued. The native fish community will have abundant populations of smallmouth bass, walleye, yellow perch, northern pike, muskellunge, rock bass, emerald shiners, white sucker and cyprinids.

Native Migratory Fish. By 2030, to provide adequate access to spawning habitat:

- At least 50% of the total length of each type of stream is connected to the lake;
- Each river-spawning Lake Erie fish species is represented by at least two viable populations in each applicable region (i.e. assessment unit) of the lake.
- Tributary connectivity is maximized for Lake Erie migratory fish, while increased risk of aquatic invasive species spread and proliferation is minimized.

For further detail please see the Lake Erie Biodiversity Conservation Strategy at https://binational.net//wp-content/uploads/2015/02/LakeErieBCSen.pdf.

Lake Erie Committee (LEC) Community Goals

The LEC, comprised of representatives of fisheries-management agencies from Michigan, New York, Ohio, Ontario, and Pennsylvania, has two broad goals: (1) "to secure a balanced, predominantly cool-water fish community with walleye as a key predator in the western basin, central basin, and the nearshore waters of the eastern basin, characterized by self-sustaining indigenous and naturalized species that occupy diverse habitats, provide valuable fisheries, and reflect a healthy ecosystem," and (2) "to secure a predominantly cold-water fish community in the deep, offshore waters of the eastern basin with lake trout and burbot as key predators" (Ryan et al. 2003). Achievement of these goals depends on progress toward 13 objectives aimed at having suitable environmental conditions and habitats to support key predator and prey species interacting through a well-functioning food web to sustain valuable fisheries in all jurisdictions on the lake. In the Lake Erie Status report in 2009 (2004-2008 reporting period), published in 2017[103], seven of the goals were rated as Partially Achieved while six were rated as Mostly Achieved. Two of these, directly related to the health of the food web, included:

- **Forage fish.** Maintain a diversity of forage fishes to support terminal predators and to sustain human use. *Mostly achieved*.
- **Food-web structure.** Manage the food-web structure of Lake Erie to optimize production of highly valued fish species; recognize the importance of Diporeia and Hexagenia as key species in the food web and as important indicators of habitat suitability. *Mostly achieved.*

Lake Erie Lakewide Action and Management Plan (LAMP) 2019-2023

The LAMP is a binational, five-year ecosystem-based strategy for restoring and protecting the water quality of Lake Erie and the St. Clair-Detroit River System. The latest LAMP was published in 2019 and has objective for the Lake until 2023[104]. The Lake Erie LAMP fulfills a United States and Canadian commitment under the 2012 Great Lakes Water Quality Agreement (the Agreement) to assess ecosystem conditions, identify environmental threats and appropriate actions to address these threats, and set priorities for research and monitoring. The Agreement recognizes that the best approach to restore the Lake Erie ecosystem and improve water quality is for the two countries to adopt common objectives, implement cooperative programs, and collaborate to address environmental threats.

The Lake Erie Partnership actively works to ensure that management actions identified in this LAMP are complementary to other international management efforts established under various binational treaties, agreements, and programs (e.g. International Joint Commission Activities, Water Withdrawals Management, fishery management with the Great Lakes Fishery Commission and its LEC) which also work within the Lake Erie ecosystem.

Objective 5 fulfills the Great Lakes Water Quality Agreement by setting a goal to support healthy and productive wetlands and other habitat to sustain resilient populations of native species.

Ecosystem Status

Ives et al. 2018[105] highlighted that for the past century, Great Lakes fishery management has undergone a slow evolution from single species towards an ecosystem-level focus (e.g., Guthrie, 2017). Evidence of changes include investment, since 2002, in an international coordinated science and monitoring initiative program (e.g., Richardson, Warren, Nielson, & Horvatin, 2012) to focus on whole food-web sampling of each Great Lake on a rotational cycle, incorporation of fish and fish habitat into the 2012 GLWQA, and the ongoing development by Great Lakes fishery managers of ecosystem objectives to complement fish community objectives (http://www.glfc.org/joint-strategic-plan-committees.php). While managers recognise that the lower food web responds more rapidly to environmental and anthropogenic modifiers and precedes—sometimes by a decade—shifts in top predators, there continues to be a need for both a systematic means of interpreting and tools for acting on such food-web changes (e.g., trophic cascades, nutrient loadings, or shifting production among habitats).

Traditionally, Laurentian Great Lakes fishery management issues and associated levers have often been evaluated and implemented from a top-down perspective, focusing on stocking and harvest policy. By contrast, from a water quality perspective, the reverse is true; water quality managers often focused on nutrient input effects on chemical composition of the lakes. These top-down and bottom-up approaches have yet to merge to form a more holistic view

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[103] http://www.glfc.org/pubs/SpecialPubs/Sp17_01.pdf

[104] https://binational.net/wp-content/uploads/2019/06/Draft-Lake-Erie-LAMP-061819-English.pdf

[105] https://onlinelibrary.wiley.com/doi/full/10.1111/fwb.13203

of the health of the Great Lakes ecosystem. Ives et al. 2018 explains that for example, during the early 2000s, the Lake Erie Committee explored establishing a harvest strategy for yellow perch using a suite of ecosystem-state indicators. This effort ultimately was not adopted by the Committee due to a lack of explicit linkage between lower food-web dynamics, ecosystem state indicators, and fishery production, and difficulties in easily communicating these linkages to stakeholders. The Ives et al. 2018 conceptual model provides resource managers a tool to more systematically interpret how lower food-web dynamics influence harvestable fish populations, and vice versa, and to act accordingly such that sustainable resource practices can be achieved[106].

Lake Erie Foodweb models

There are foodweb models for Laker Erie. Recently, Zhang at al. 2016[107], developed an Ecopath with Ecosim (EwE) food web model forecasting the impacts of Silver and Bighead Carp on the Lake Erie foodweb, two invasive species that threaten to invade and disrupt food webs and fisheries in the Laurentian Great Lakes through their high consumption of plankton. The study suggested that that these Asian carps would affect Lake Erie's foodweb by competing with other planktivorous fishes and by providing additional prey for piscivores.

Even more recently, Zhang et. al. 2019[108], modified the 2016 EwE model to assess the impacts of another three aquatic invasive species on the Lake Erie foodweb, Eurasian ruffe *Gymnocephalus cernua*, killer shrimp *Dikerogammarus villosus*, and golden mussel *Limnoperna fortune* where they found that while all three species may induce negative effects if introduced to Lake Erie, golden mussels may pose the highest risk of impact for Lake Erie’s food web.

Although the use of foodweb models has been utilised recently to assess the risk of invasive species in Lake Erie, there does not appear to be a direct and explicit consideration of the effects of the walleye and yellow perch fisheries on other foodweb components. The stock assessments for walleye and yellow perch, for example, do not make reference to explicit consideration relating to how the harvest of these species may potentially benefit or limit the effects on other species in the ecosystem. Having said that, we note that the current conservative harvest exploitation rates implemented for walleye and yellow perch may by themselves implicitly account for such considerations.

Due to the above, explicitly scoring the MSC ecosystem status requirement (PI 2.5.1) remains somewhat challenging. Accordingly, to score this PI, the Audit Team defaulted to using the Scale Intensity Consequence Analysis (SICA) which is part of the MSC Risk Based Framework (RBF).

SICA – Main Ecosystem Risk Causing Activities

Risk causing activities identified for yellow perch gillnet (ON) and trapnet (Ohio) fisheries can be summarised as follows:

- Fishing and its potential removal effects on other species in the ecosystem such as prey and predators. **POTENTIAL.** The main risk /potential worst-case scenario for the ecosystem would be for the commercial fishery to remove an important species, which has potential repercussion on the stability of the Lake Erie food web and the trophic structure.
- Gear loss is NOT CONSIDERED SIGNIFICANT.
- Bait Collection is NOT APPLICABLE TO THESE FISHERIES.
- Other (e.g. phosphorus pollution) NOT APPLICABLE TO THESE FISHERIES.

Table 39. SICA scoring template for PI 2.5.1 Ecosystem. Ontario yellow perch small mesh gillnet fishery

Performance Indicator PI 2.5.1 Ecosystem outcome	Spatial scale of fishing activity	Temporal scale of fishing activity	Intensity of fishing activity	Relevant subcomponents	Consequence Score
	4	**5**	**3**	Species composition	

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[106] https://onlinelibrary.wiley.com/doi/full/10.1111/fwb.13203

[107] https://www.tandfonline.com/doi/full/10.1080/00028487.2015.1069211

[108] https://link.springer.com/article/10.1007/s10530-019-01929-7

Table 39. SICA scoring template for PI 2.5.1 Ecosystem. Ontario yellow perch small mesh gillnet fishery

Ontario yellow perch small mesh gillnet fishery				Functional group composition	
				Distribution of the community	
				Trophic size/structure	**80**
Rationale for spatial scale of fishing activity	The yellow perch small mesh gillnet fishery takes place along the top horizontal half of Lake Erie, in the Canadian Ontario jurisdiction, within QZ1, QZ2, QZ3W and QZ3E (3 of the 4 QZs areas extending from the West to the East Basin). This area makes up 38% (i.e. 9784.4 km^2)[109] of the total Lake Erie surface Area of 25,744 km^2. This equates to a SICA Spatial Score of 4 (31-45% spatial overlap).				
Rationale for temporal scale of fishing activity	The fishery is prosecuted year-round with a total of 65[110]-70[111] vessels that do not fish at the same time. The gillnet fishery is not seasonal (opened from Jan 1st to Dec 31st) and it is likely that there is at least some fishing activity on 200 to 300 day of the year. This equates to a SICA Temporal Score of 5 (201 to 300 days per year).				
Rationale for intensity of fishing activity	As mentioned in the spatial scale rationale, the fishery takes place over about 38% of the lake area, but seasonal patterns reflect localised availability that changes according to spawning migrations from the central to western basins. Accordingly, fishing intensity varies on a local basis and while it is difficult to characterise, it seems reasonable to conclude that there may be moderate detection of activity at broader spatial scale, or obvious but local detection. In some areas of the lake there will be no activity. Furthermore, as part of the yellow perch HCR in 2019, the overall fishing pressure in MU1-3 is set at 31.5% of F_{MSY} indicating that fishing pressure is relatively low and conservative on the stock. This equates to a SICA Intensity score of 3 (Moderate detectability of fishing activity at broader spatial scale, or obvious but local detectability).				
Rationale for consequence score	The (trophic size/structure) risk of removing a predator and affecting trophic structure would be the major risk. The fishing gear is selective by size. The fishery takes only a portion of the total available biomass as it takes only a % of F_{MSY}. The LEC has two broad ecosystem goals, which are divided in 12 goals, two of which are directly related to the health of the food web, and include: **Forage Fish** (Maintain a diversity of forage fishes to support terminal predators and to sustain human use) rated as Mostly achieved; and **Food-web structure** (Manage the food-web structure of Lake Erie to optimize production of highly valued fish species; recognize the importance of Diporeia and Hexagenia as key species in the food web and as important indicators of habitat suitability) also rated as Mostly achieved[112]. We conclude that while there may be a change in mean trophic level, this will be less than 5%. The consequence score would be 80.				

Table 40. SICA scoring template for PI 2.5.1 Ecosystem. Ohio yellow perch small trapnet fishery in MU1 to MU3

Performance Indicator PI 2.5.1 Ecosystem outcome	Spatial scale of fishing activity	Temporal scale of fishing activity	Intensity of fishing activity	Relevant subcomponents	Consequence Score
	4	**5**	**3**	Species composition	
				Functional group composition	
				Distribution of the community	

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[109] Figure 2.1 of YPTG 2019 Report http://www.glfc.org/pubs/lake_committees/erie/YPTG_docs/annual_reports/YPTG_report_2019.pdf

[110] See the 2015 MSC Certification report for this fishery where auditors highlighted that 65 Ontario gillnet vessels filed at least one Daily Catch Record (DCR) in 2013.

[111] https://this.fish/fishery/yellow-perch-gillnet-ontario-lake-erie/

[112] http://www.glfc.org/pubs/SpecialPubs/Sp17_01.pdf

Table 40. SICA scoring template for PI 2.5.1 Ecosystem. Ohio yellow perch small trapnet fishery in MU1 to MU3

Ohio yellow perch small trapnet fishery in MU1 to MU3				Trophic size/structure	**80**
Rationale for spatial scale of fishing activity	The yellow perch trapnet fishery occurs in the lower half of Lake Erie within Ohio's jurisdiction, in MU 1, MU2 and MU3. These areas make up 35%[113] of the total Lake Erie surface Area of 25,744 km^2. This equates to a SICA Spatial Score of 4 (31-45% spatial overlap).				
Rationale for temporal scale of fishing activity	In Ohio, it is unlawful for any person to take or attempt to take yellow perch, with any commercial fishing device in the Lake Erie Fishing District except from May 1 to December 10 of each year. There is a there is at least some fishing activity on 215 days per year. This equates to a SICA Temporal Score of 5 (201 to 300 days per year).				
Rationale for intensity of fishing activity	Yellow perch trapnet effort is quite limited (see YPTG 2019/2018/2017 reports, Figure 1.8: 2018/2017/2016 spatial effort)[114] [115] [116] within the MU1 to MU3, where about 50% of Ohio's MU1-MU3 was fished on average in the 3 years. It is estimated that the fishery takes place in about 25% of the Lake area. There are a limited number of traps operating in a large area (18 licenses issued in 2017 and 2018 each[117]) and these are not moved frequently. Accordingly, it seems reasonable to conclude that there may be moderate detection of activity at broader spatial scale, or obvious but local detection. In large areas of the lake there will be no activity. Furthermore, as part of the yellow perch HCR in 2019, the overall fishing pressure in MU1-3 is set at 31.5% of F_{MSY} indicating that fishing pressure is relatively low and conservative on the stock. This equates to a SICA Intensity score of 3 (Moderate detectability of fishing activity at broader spatial scale, or obvious but local detectability).				
Rationale for consequence score	The (trophic size/structure) risk of removing a predator and affecting trophic structure would be the major risk. The fishing gear is selective by size. The fishery takes only a portion of the total potential as it take only a % of F_{MSY}. The LEC has two broad ecosystem goals, which are divided in 12 goals, two of which are directly related to the health of the food web, and include: **Forage Fish** (Maintain a diversity of forage fishes to support terminal predators and to sustain human use) rated as Mostly achieved; and **Food-web structure** (Manage the food-web structure of Lake Erie to optimize production of highly valued fish species; recognize the importance of Diporeia and Hexagenia as key species in the food web and as important indicators of habitat suitability) also rated as Mostly achieved[118]. We conclude that while there may be a change in mean trophic level, this will be less than 5%. The consequence score would be 80.				

Risk causing activities identified for the Lake Erie walleye (large mesh gillnet) fisheries:

- Fishing and its potential removal effects on other species in the ecosystem such as prey and predators. **POTENTIAL.** The main risk /potential worst case scenario for the ecosystem would be for the commercial fishery to remove an important predator, which has potential repercussion on the stability of the Lake Erie food web and the trophic structure.
- Gear loss is NOT CONSIDERED SIGNIFICANT.
- Bait Collection is NOT APPLICABLE TO THESE FISHERIES.
- Other (e.g. phosphorus pollution) NOT APPLICABLE TO THESE FISHERIES.

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[113] Figure 2.1 of YPTG 2019 Report http://www.glfc.org/pubs/lake_committees/erie/YPTG_docs/annual_reports/YPTG_report_2019.pdf
[114] http://www.glfc.org/pubs/lake_committees/erie/YPTG_docs/annual_reports/YPTG_report_2017.pdf
[115] http://www.glfc.org/pubs/lake_committees/erie/YPTG_docs/annual_reports/YPTG_report_2018.pdf
[116] http://www.glfc.org/pubs/lake_committees/erie/YPTG_docs/annual_reports/YPTG_report_2017.pdf
[117] Lake Erie 3rd Surveillance Report Apr2019.
[118] http://www.glfc.org/pubs/SpecialPubs/Sp17_01.pdf

Table 41. SICA scoring template for PI 2.5.1 Ecosystem. Lake Erie walleye (large mesh gillnet) fisheries

Performance Indicator PI 2.5.1 Ecosystem outcome **Lake Erie walleye (large mesh gillnet) fisheries**	Spatial scale of fishing activity	Temporal scale of fishing activity	Intensity of fishing activity	Relevant subcomponents	Consequence Score
	4	**5**	**3**	Species composition	
				Functional group composition	
				Distribution of the community	
				Trophic size/structure	**80**
Rationale for spatial scale of fishing activity	The commercial walleye fishery takes place along the top horizontal half of Lake Erie, in the Canadian Ontario jurisdiction, within QZ1 to QZ3 (W&E). Commercial catch of walleye in Ohio waters is unlawful. This area makes up about 35% of the total Lake Erie surface Area of 25,744 km^2. This equates to a SICA Spatial Score of 4 (31-45% spatial overlap).				
Rationale for temporal scale of fishing activity	The fishery is prosecuted year round with a total of 65[119]-70[120] vessels that do not fish at the same time. The gillnet fishery is not seasonal (opened from Jan 1st to Dec 31st) and it is likely that there is at least some fishing activity on 200 to 300 day of the year. This equates to a SICA Temporal Score of 5 (201 to 300 days per year).				
Rationale for intensity of fishing activity	The commercial fishery takes place in less than 50% of the Lake Erie area but seasonal patterns reflect localised availability that changes according to spawning migrations from the central to western basins. Accordingly, fishing intensity varies on a local basis and while it is difficult to characterise, it seems reasonable to conclude that there may be moderate detection of activity at broader spatial scale, or obvious but local detection. Furthermore, the fishery is currently managed by having a target Fishing Mortality of 60% of the Maximum Sustainable Yield (60%FMSY)[121], which indicates a relatively conservative exploitation regime. The walleye stock is in a very healthy condition in Lake Erie. This equates to a SICA Intensity score of 3 (Moderate detectability of fishing activity at broader spatial scale, or obvious but local detectability).				
Rationale for consequence score	The (trophic size/structure) risk of removing a predator and affecting trophic structure would be the major risk. Walleye fishing gear is selective by size. The fishery takes only a portion of the total potential as it take only 60% of F_{MSY}. A significant portion of total walleye catches in Lake Erie are taken by sport fisheries. The LEC has two broad ecosystem goals, which are divided in 12 goals, two of which are directly related to the health of the food web, and include: **Forage Fish** (Maintain a diversity of forage fishes to support terminal predators and to sustain human use) rated as Mostly achieved; and **Food-web structure** (Manage the food-web structure of Lake Erie to optimize production of highly valued fish species; recognize the importance of Diporeia and Hexagenia as key species in the food web and as important indicators of habitat suitability) also rated as Mostly achieved[122]. We conclude that while there may be a change in mean trophic level, this will be less than 5%. The consequence score would be 80.				

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[119] See the 2015 MSC Certification report for this fishery where auditors highlighted that 65 Ontario gillnet vessels filed at least one Daily Catch Record (DCR) in 2013.

[120] https://this.fish/fishery/yellow-perch-gillnet-ontario-lake-erie/

[121] http://www.glfc.org/pubs/lake_committees/erie/WTG_docs/annual_reports/WTG_report_2019.pdf

[122] http://www.glfc.org/pubs/SpecialPubs/Sp17_01.pdf

Ecosystem Information

Recent Ecosystem Monitoring Activities

Long-term, basin-wide monitoring programs for habitats and species are conducted by federal, state, provincial agencies and their partners. The Lake Erie Biodiversity Conservation Strategy provided a health assessment of eight conservation features that represent the lake's biological health (Pearsall et al. 2012). State of the Great Lakes ecosystem indicator reports provide recent information on status and trends (ECCC and U.S. EPA 2019). A summary of recent survey indexes are provided below, as reported in the Report of the Lake Erie Forage Task Group, 2019 [123].

LTL Monitoring

The lower trophic level monitoring (LTLA) program has measured nine environmental variables at 18 stations around Lake Erie since 1999 to characterize ecosystem trends. The Trophic State Index, which is a combination of phosphorus levels, water transparency, and Chl a measures, indicate that the western basin is slightly above the targeted mesotrophic status, the central basin is within targeted mesotrophic status, which favors percid production, and both the nearshore and offshore waters of the eastern basin are oligotrophic. Trends across Lake Erie in recent years indicate that overall productivity has slowly declined since 2010. Low hypolimnetic dissolved oxygen continues to be an issue in the central basin during the summer months.

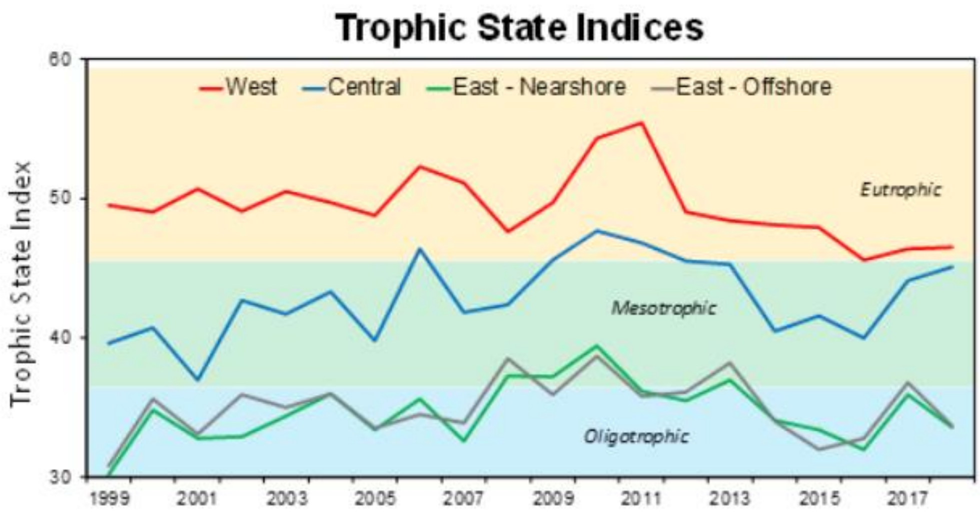

Figure 37. Trophic State Indices of Lake Erie 1999-2018.

Zooplankton Biomass in Lake Erie

Mean zooplankton biomass varies among basins and years. In the west basin, the 2018 average biomass was 190.8 mg/m3, which was the third highest value in the time series and well above the long-term mean of 105.9 mg/m3. Cladocerans (small crustaceans commonly called water fleas) provide the bulk of the biomass of zooplankton in the west basin although increases in both calanoid and cyclopoid copepods have been observed in recent years. In the central basin, the 2018 mean zooplankton biomass was 94.6 mg/m3, which was less than the long-term mean biomass (129.4 mg/m3). Zooplankton biomass in the central basin has been stable over the past five years. Looking at larger trends, there appeared to be a gradient of high zooplankton biomass in the west and lower biomass in the east from 2000 to 2007. From 2009 through 2013, zooplankton biomass increased in the central and east basins, but shifted back to the west basin in 2015 with declines observed in the central and east basins. Cladocerans are typically more dominant in the west basin zooplankton community and decline to the east while calanoid and cyclopoid copepods tend to be higher in biomass in the central and east basins.

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[123] http://www.glfc.org/pubs/lake_committees/erie/FTG_docs/annual_reports/FTG_report_2019.pdf

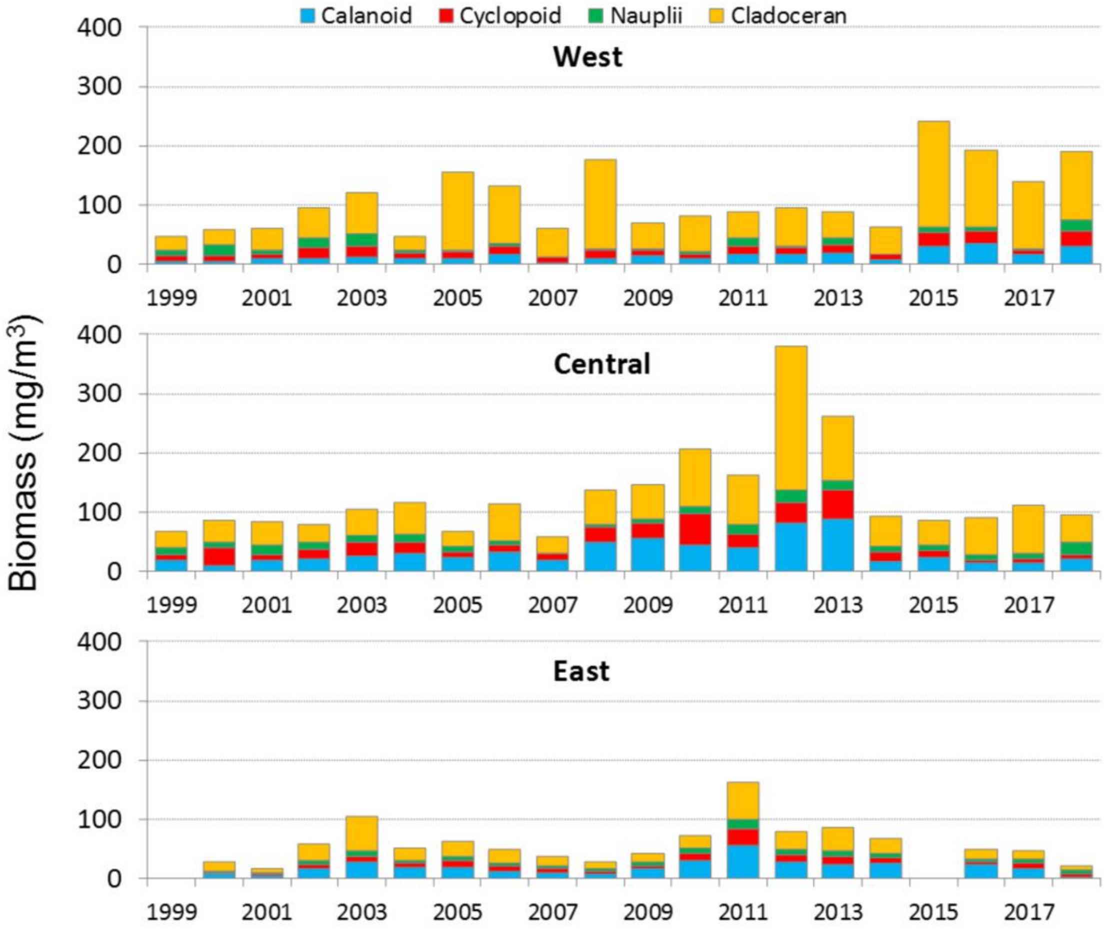

Figure 38. Mean zooplankton biomass (mg/m3) by major taxonomic group by basin, 1999 through 2018. There is no data for 1999 and 2015 in the east basin. West basin includes stations 3 through 6, central basin stations 7 through 12, and east basin stations 15 through 18. Data excludes rotifers and veligers. Harpacticoid zooplankton comprise a miniscule biomass for most years and are not included in the graph.

Status of Forage Fish in 2018

West Basin Status of Forage. In 2018, hypolimnetic dissolved oxygen levels were below the 2 mg per liter threshold at three sites during the August trawling survey (all located near the eastern interface with the central basin). In total, data from 71 sites were used in 2018. Total forage abundance declined but was near the ten-year mean. Total forage biomass increased 33%. Age-0 Walleye relative abundance in 2018 was the highest ever recorded in the time series (255/ha), twelve times greater than the ten-year mean (21/ha) and 40% higher than the historic 2003-year class. Young-of-the-year (age-0) Yellow Perch (959/ha) was well above the long-term mean (340/ha). Young-of-the year Gizzard Shad declined 75% from 2017 and remain highly variable. Young-of-the-year Rainbow Smelt (0.1/ha) and yearling and-older (age-1+) Rainbow Smelt densities (0.3/ha) returned to minimal levels after high densities in 2017. Age-0 Freshwater Drum and all ages of Troutperch densities were well above ten-year averages. Densities of age-0 and age-1+ Emerald Shiners have increased for two years straight but remain very low (~20% of the ten-year mean). Round Goby abundance was the lowest since the fish was first detected in the west basin (1997).

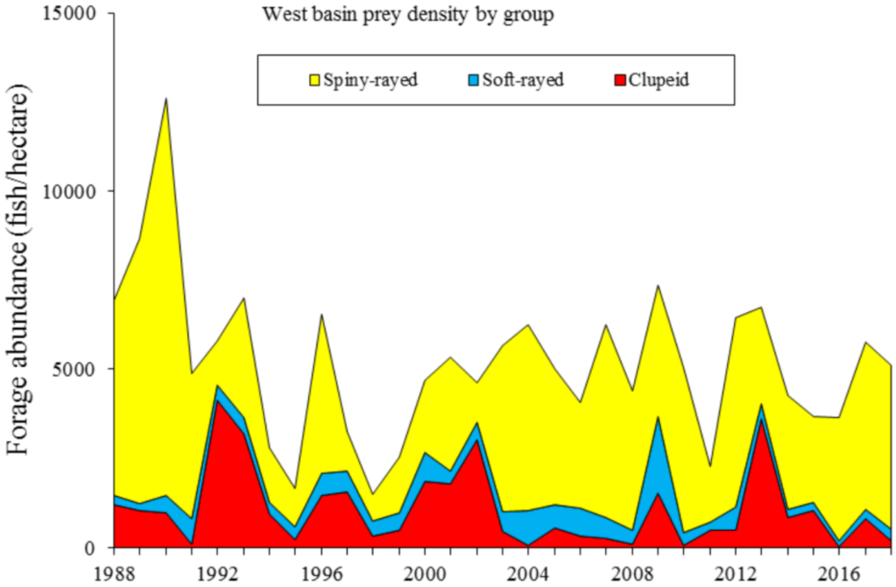

Figure 39. Mean density (number per hectare) of prey fish by functional group in western Lake Erie, August 1988-2018.

Central Basin Status of Forage. Forage abundance in Ohio waters has generally decreased since 2012. In 2018, most forage species continued to decline and are at the lowest densities since 1993. Spiny-rayed species increased slightly from 2017 but remain well below average. Emerald Shiner indices continue to be well below long-term means throughout the basin. In 2018, indices for the primary forage species, Rainbow Smelt, Emerald Shiner, Round Goby and Gizzard Shad were all well below long-term means in Ohio. Young-of-the-year and age-1+ indices for all species were some of the lowest in the last ten years. In 2018, Yellow Perch age-0 indices in Ohio increased over the last two years and are slightly above long-term means.

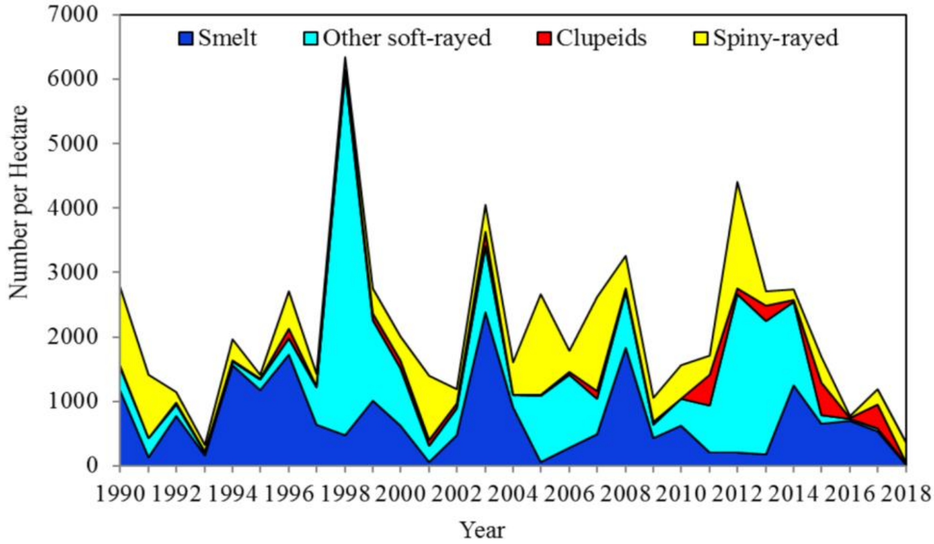

Figure 40. Mean density of prey fish (number per hectare) by functional group in the Ohio waters of the central basin, Lake Erie, 1990-2018.

East Basin Status of Forage. Total forage fish abundance in 2018 increased in Ontario over 2017 but remained well below the long-term mean. Abundance decreased in New York. Pennsylvania did not sample due to vessel constraints. Catches of age-0 and age-1+ Rainbow Smelt were below long-term means in both jurisdictions. Young-of-the-year Emerald Shiner catches were low in both jurisdictions. Yearling-and-older catches were low in Ontario but high in New York, above long-term means. Catches of age-0 Yellow Perch have generally been above long-term means in recent years. Round Goby densities were generally consistent with long-term means. Catches of all other species were low.

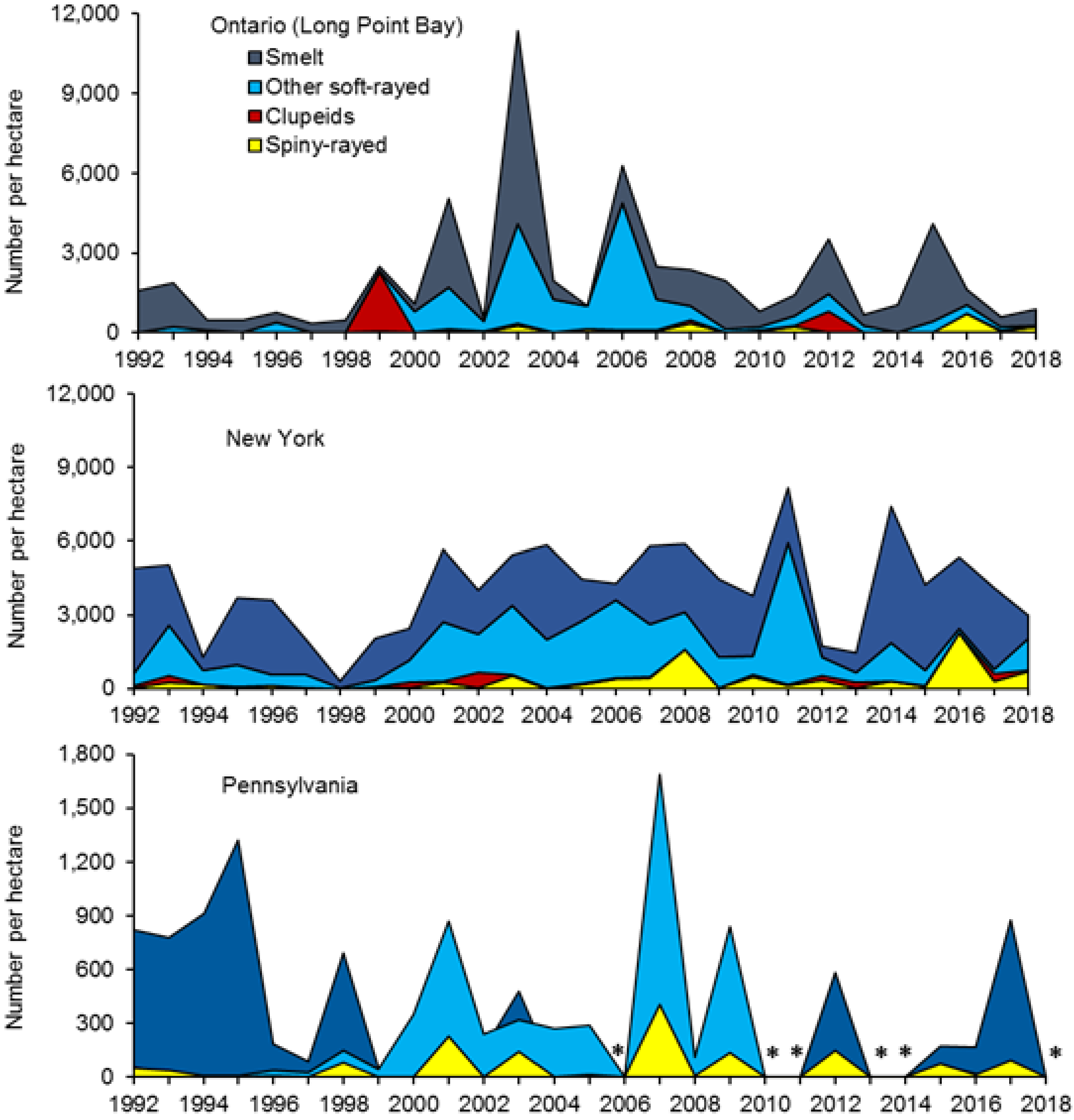

Figure 41. Mean density of prey fish (number per hectare) by functional group in the Ontario, New York and Pennsylvania waters of the eastern basin, Lake Erie, 1992-2018. Note that the y-axis values are lower for Pennsylvania. Asterix (*) indicate years in which agencies were not able to sample.

2019 Lake Erie Cooperative Science and Monitoring Initiative (CSMI)

Each year, one of the Great Lakes is the focus of a binational cooperative science effort called the Cooperative Science and Monitoring Initiative (CSMI). In 2019, Lake Erie was the focus of the CSMI field year[124]. The priority science and information needs identified for this intensive field year include understanding of: drivers of eutrophication and harmful and nuisance algal blooms; distribution of critical habitats for species; distribution of contaminants in air, water, sediment and the food web; and the role of storm events on beach water quality. These priorities were developed during a series of meetings and workshops held in 2017 that brought together U.S. and Canadian Lake Erie experts from research and management organizations.

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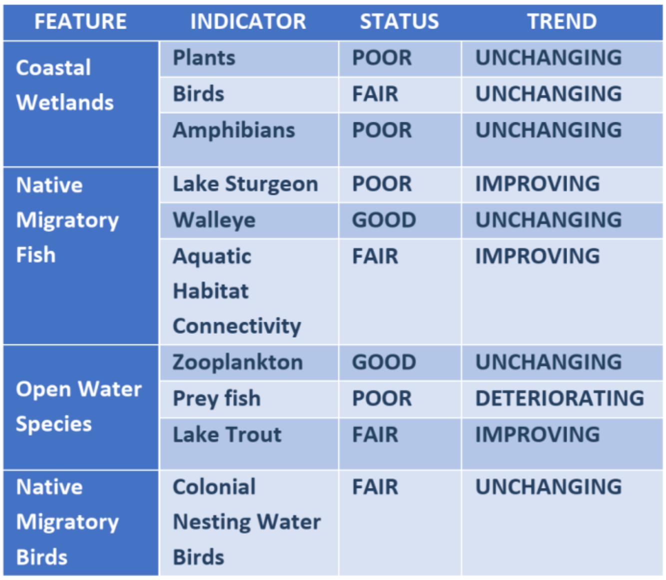
[124] https://binational.net/wp-content/uploads/2019/03/LE_LAMP_AR_2018_final.pdf

State of Great Lake indicator

More recently, a summary of the Lake Erie status and trends for habitat and species was provided by the State of Great Lake indicator (ECCC and U.S. EPA 2019)[125]. The condition of Lake Erie's habitats and species indicators is variable, ranging from "poor" to "good", with varying trends from "deteriorating" to "improving". For further details please refer to the 2019-2023 LAMP report.

Table 42. Summary of the Lake Erie status and trends for habitat and species by the State of Great Lake indicator (ECCC and U.S. EPA 2019).



FEATURE	INDICATOR	STATUS	TREND
Coastal Wetlands	Plants	POOR	UNCHANGING
	Birds	FAIR	UNCHANGING
	Amphibians	POOR	UNCHANGING
Native Migratory Fish	Lake Sturgeon	POOR	IMPROVING
	Walleye	GOOD	UNCHANGING
	Aquatic Habitat Connectivity	FAIR	IMPROVING
Open Water Species	Zooplankton	GOOD	UNCHANGING
	Prey fish	POOR	DETERIORATING
	Lake Trout	FAIR	IMPROVING
Native Migratory Birds	Colonial Nesting Water Birds	FAIR	UNCHANGING

P2 Scoring Elements

During this assessment the following P2 scoring elements were selected.

Table 43. Scoring elements.

Component	Scoring elements	Designation	Data-deficient
Primary species (UoA 8: Walleye fishery in Lake Erie)	- Yellow Perch	Minor	No
Primary species (several UoAs)	- Walleye	Main/Minor	No
Secondary species (UoA 5: Yellow Perch trapnet in MU1-MU3)	- Channel catfish - Freshwater Drum	Main	Yes, PSA used
Secondary Species (UoA 8: Walleye fishery in Lake Erie)	- White bass	Main	No
ETP Species	- None (no significant effects detected)		
Habitat	- Main habitat – muddy/sandy lake substrate - Minor habitat – rocky reef zones - (No Vulnerable habitats identified)	Main/Minor	No
Ecosystems	- PI 2.5.1 (trophic size/structure sub element)	NA	Yes, SICA used

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[125] https://binational.net/wp-content/uploads/2019/06/Draft-Lake-Erie-LAMP-061819-English.pdf

7.7.1 Principle 2 Performance Indicator scores and rationales

PI 2.1.1 – Primary species outcome

<table>
<tr><th colspan="2">PI 2.1.1</th><th colspan="3">The UoA aims to maintain primary species above the point where recruitment would be impaired (PRI) and does not hinder recovery of primary species if they are below the PRI</th></tr>
<tr><td colspan="2">Scoring Issue</td><td>SG 60</td><td>SG 80</td><td>SG 100</td></tr>
<tr><td rowspan="3">a</td><td colspan="4">**Main primary species stock status**</td></tr>
<tr><td>Guide post</td><td>Main primary species are **likely** to be above the PRI.

OR

If the species is below the PRI, the UoA has measures in place that are **expected** to ensure that the UoA does not hinder recovery and rebuilding.</td><td>Main primary species are **highly likely** to be above the PRI.

OR

If the species is below the PRI, there is either **evidence of recovery** or a demonstrably effective strategy in place **between all MSC UoAs which categorise this species as main**, to ensure that they collectively do not hinder recovery and rebuilding.</td><td>There is a **high degree of certainty** that main primary species are above the PRI **and are** fluctuating around a level consistent with MSY.</td></tr>
<tr><td>Met?</td>
<td><table>
<tr><th>UoA</th><th>Scoring element</th><th>Met?</th></tr>
<tr><td>UoA 1</td><td>Walleye</td><td>Yes</td></tr>
<tr><td>UoA 2</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 3</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 4</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 5</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 6</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 7</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 8</td><td>none</td><td>Yes</td></tr>
</table></td>
<td><table>
<tr><th>UoA</th><th>Scoring element</th><th>Met?</th></tr>
<tr><td>UoA 1</td><td>Walleye</td><td>Yes</td></tr>
<tr><td>UoA 2</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 3</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 4</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 5</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 6</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 7</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 8</td><td>none</td><td>Yes</td></tr>
</table></td>
<td><table>
<tr><th>UoA</th><th>Scoring element</th><th>Met?</th></tr>
<tr><td>UoA 1</td><td>Walleye</td><td>Yes</td></tr>
<tr><td>UoA 2</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 3</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 4</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 5</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 6</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 7</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 8</td><td>none</td><td>Yes</td></tr>
</table></td></tr>
<tr><td colspan="5">Rationale</td></tr>
</table>

UoA 1 (Yellow perch small mesh gillnet in Ontario QZ1). Walleye is the only main primary species.

The LEC Walleye Task Group uses a SCAA model to estimate the abundance of Walleye in Lake Erie from 1978 to 2018[126]. The stock assessment model estimates population abundance of age 2 and older Walleye using fishery-dependent and fishery-independent data sources. The Lake Erie Percid Management Advisory Group (LEPMAG) developed an updated Walleye model, which the WTG began using in 2013. The target fishing rate, (60%FMSY =0.334) in the harvest policy was applied since the probability of the projected spawner biomass in 2020 (56.410. million kg) falling below the limit reference point (SSB20% = 12.184 million kg) after fishing at 60%FMSY in 2019 was less than 5% (p< 0.05). Thus, the probabilistic control rule (P*) to reduce target fishing rate and conserve spawner biomass was not invoked during the 2019 determination of the Recommended Allowable Harvest (RAH).

Biomass has been fluctuating at a level consistent with MSY for several years. See P1 scores for further detail. SG 100 is likely met.

UoA 2 (Yellow perch small mesh gillnet in Ontario QZ2). No Main primary species. SG 100 is likely met.

UoA 3 (Yellow perch small mesh gillnet in Ontario QZ3W). No Main primary species. SG 100 is likely met.

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[126] WTG Annual Report 2019. http://www.glfc.org/pubs/lake_committees/erie/WTG_docs/annual_reports/WTG_report_2019.pdf

PI 2.1.1	**The UoA aims to maintain primary species above the point where recruitment would be impaired (PRI) and does not hinder recovery of primary species if they are below the PRI**

UoA 4 (Yellow perch small mesh gillnet in Ontario QZ3E). No Main primary species. SG 100 is likely met.

UoA 5 (Yellow perch small mesh trapnet in Ohio MU1): No Main primary species. SG 100 is likely met.

UoA 6 (Yellow perch small mesh trapnet in Ohio MU2): No Main primary species. SG 100 is likely met.

UoA 7 (Yellow perch small mesh trapnet in Ohio MU3): No Main primary species. SG 100 is likely met.

UoA 8 (Walleye large mesh gill net in Lake Erie): No Main primary species. SG 100 is likely met.

b	**Minor primary species stock status**			
	Guide post			Minor primary species are highly likely to be above the PRI. OR If below the PRI, there is evidence that the UoA does not hinder the recovery and rebuilding of minor primary species.
	Met?			See table below

UoA	Scoring element	Met?
UoA 1	none	Yes
UoA 2	Walleye	Yes
UoA 3	Walleye	Yes
UoA 4	Walleye	Yes
UoA 5	none	Yes
UoA 6	none	Yes
UoA 7	none	Yes
UoA 8	Yellow P.	Yes

Rationale

UoA 1 (Yellow perch small mesh gillnet in Ontario QZ1). The only species with active management (e.g. quotas, ITQs) are walleye and yellow perch. Walleye is assessed as a main primary species. Hence, there are no minor primary (managed) species. SG 100 is likely met.

UoA 2 (Yellow perch small mesh gillnet in Ontario QZ2). Walleye is a minor primary species. Walleye (3.38% of QZ2 5-year average catches) is likely to be above the PRI. The Lake Erie Percid Management Advisory Group (LEPMAG) developed an updated Walleye model, which the WTG began using in 2013. The target fishing rate, (60%FMSY =0.334) in the harvest policy was applied since the probability of the projected spawner biomass in 2020 (56.410. million kg) falling below the limit reference point (SSB20% = 12.184 million kg) after fishing at 60%FMSY in 2019 was less than 5% ($p< 0.05$). See P1 scores for further detail. SG 100 is likely met.

UoA 3 (Yellow perch small mesh gillnet in Ontario QZ3W). Walleye is a minor primary species. Walleye (2.94% of QZ3W 5-year average catches) is likely to be above the PRI. The Lake Erie Percid Management Advisory Group (LEPMAG) developed an updated Walleye model, which the WTG began using in 2013. The target fishing rate, (60%FMSY =0.334) in the harvest policy was applied since the probability of the projected spawner biomass in 2020 (56.410. million kg) falling below the limit reference point (SSB20% = 12.184 million kg) after fishing at 60%FMSY in 2019 was less than 5% ($p< 0.05$). SG 100 is likely met.

PI 2.1.1	The UoA aims to maintain primary species above the point where recruitment would be impaired (PRI) and does not hinder recovery of primary species if they are below the PRI

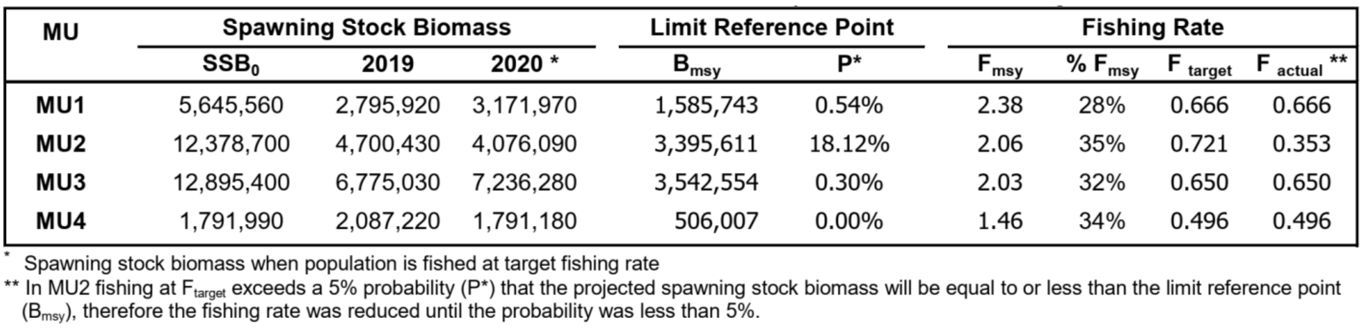
UoA 4 (Yellow perch small mesh gillnet in Ontario QZ3E). Walleye is a minor primary species. Walleye (4.17% of QZ3E 5-year average catches) is likely to be above the PRI. The Lake Erie Percid Management Advisory Group (LEPMAG) developed an updated Walleye model, which the WTG began using in 2013. The target fishing rate, (60%FMSY =0.334) in the harvest policy was applied since the probability of the projected spawner biomass in 2020 (56.410. million kg) falling below the limit reference point (SSB20% = 12.184 million kg) after fishing at 60%FMSY in 2019 was less than 5% (p< 0.05). SG 100 is likely met.

UoA 5 (Yellow perch small mesh trapnet in Ohio MU1). The only species with active management (e.g. quotas, ITQs) are walleye and yellow perch. Hence, there are no minor primary (managed) species. SG 100 is likely met.

UoA 6 (Yellow perch small mesh trapnet in Ohio MU2). The only species with active management (e.g. quotas, ITQs) are walleye and yellow perch. Hence, there are no minor primary (managed) species. SG 100 is likely met.

UoA 7 (Yellow perch small mesh trapnet in Ohio MU3). The only species with active management (e.g. quotas, ITQs) are walleye and yellow perch. Hence, there are no minor primary (managed) species. SG 100 is likely met.

UoA 8 (Walleye large mesh gill net in Lake Erie). Yellow perch is a minor primary species. Yellow perch (0.4% of UoA 5-year average catches) is managed using limit and target reference points and is highly likely to be above the PRI across Lake Erie[127]. The table 3 from the YPTG Annual Report 2019 shows the parameters used in the 2019 HCR[128]. SG 100 is likely met.



MU	Spawning Stock Biomass			Limit Reference Point		Fishing Rate			
	SSB_0	2019	2020 *	B_{msy}	P*	F_{msy}	% F_{msy}	F_{target}	F_{actual} **
MU1	5,645,560	2,795,920	3,171,970	1,585,743	0.54%	2.38	28%	0.666	0.666
MU2	12,378,700	4,700,430	4,076,090	3,395,611	18.12%	2.06	35%	0.721	0.353
MU3	12,895,400	6,775,030	7,236,280	3,542,554	0.30%	2.03	32%	0.650	0.650
MU4	1,791,990	2,087,220	1,791,180	506,007	0.00%	1.46	34%	0.496	0.496

* Spawning stock biomass when population is fished at target fishing rate

** In MU2 fishing at F_{target} exceeds a 5% probability (P*) that the projected spawning stock biomass will be equal to or less than the limit reference point (B_{msy}), therefore the fishing rate was reduced until the probability was less than 5%.

References

- *See footnotes referenced within text as well as background information provided in the P2 background.*
- *OCFA submission of catch profiles for every UoA.*

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	Applicable SGs/elements likely met			Likely overall PI score (All UoAs)
	SG60	SG80	SG100	
UoA 1-4 Scoring element 1 (Walleye)	1 of 1	1 of 1	2 of 2	≥80
UoA 8 Scoring element 1 (Yellow perch)	NA	NA	1 of 1	≥80
All other UoAs – No main/minor primary species (NA automatically meets SGXX)	NA	NA	NA	≥80

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[127] YPTG Annual Report 2019: http://www.glfc.org/pubs/lake_committees/erie/YPTG_docs/annual_reports/YPTG_report_2019.pdf

[128] http://www.glfc.org/pubs/lake_committees/erie/YPTG_docs/annual_reports/YPTGexesum2019.pdf

PI 2.1.1	The UoA aims to maintain primary species above the point where recruitment would be impaired (PRI) and does not hinder recovery of primary species if they are below the PRI						
Overall Performance Indicator score	Applicable SGs/elements met						Likely Overall PI score **All UoAs ≥80**
	SG60		SG80		SG 100		
	UoA	Met?	UoA	Met?	UoA	Met?	
	UoA 1	1 of 1	UoA 1	1 of 1	UoA 1	2 of 2	
	UoA 2	1 of 1	UoA 2	1 of 1	UoA 2	2 of 2	
	UoA 3	1 of 1	UoA 3	1 of 1	UoA 3	2 of 2	
	UoA 4	1 of 1	UoA 4	1 of 1	UoA 4	2 of 2	
	UoA 5	Yes	UoA 5	Yes	UoA 5	Yes	
	UoA 6	Yes	UoA 6	Yes	UoA 6	Yes	
	UoA 7	Yes	UoA 7	Yes	UoA 7	Yes	
	UoA 8	Yes	UoA 8	Yes	UoA 8	1 of 1	
Information gap indicator	Information sufficient to score PI						

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Individual scoring elements (add rows as required; delete if not scoring by elements)		Applicable SGs met per individual scoring element			Scoring element scores
		SG60	SG80	SG100	
1	Scoring element 1	X of x	X of x	X of x	
2	Scoring element 2	X of x	X of x	X of x	
3	Scoring element 3	X of x	X of x	X of x	
4	Scoring element 4	X of x	X of x	X of x	
Overall Performance Indicator score		Applicable SGs/elements met			Overall score
		SG60	SG80	SG100	
		X of x	X of x	X of x	
Condition number (if relevant)					

PI 2.1.2 – Primary species management strategy

<table>
<tr><th colspan="2">PI 2.1.2</th><th colspan="3">There is a strategy in place that is designed to maintain or to not hinder rebuilding of primary species, and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch</th></tr>
<tr><td colspan="2">Scoring Issue</td><td>SG 60</td><td>SG 80</td><td>SG 100</td></tr>
<tr><td rowspan="3">a</td><td colspan="4">Management strategy in place</td></tr>
<tr><td>Guide post</td><td>There are measures in place for the UoA, if necessary, that are expected to maintain or to not hinder rebuilding of the main primary species at/to levels which are likely to be above the PRI.</td><td>There is a partial strategy in place for the UoA, if necessary, that is expected to maintain or to not hinder rebuilding of the main primary species at/to levels which are highly likely to be above the PRI.</td><td>There is a strategy in place for the UoA for managing main and minor primary species.</td></tr>
<tr><td>Met?</td>
<td><table>
<tr><td>UoA</td><td>Scoring element</td><td>Met?</td></tr>
<tr><td>UoA 1</td><td>Walleye (main)</td><td>Yes</td></tr>
<tr><td>UoA 2</td><td>No main</td><td>Yes</td></tr>
<tr><td>UoA 3</td><td>No main</td><td>Yes</td></tr>
<tr><td>UoA 4</td><td>No main</td><td>Yes</td></tr>
<tr><td>UoA 5</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 6</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 7</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 8</td><td>No main</td><td>Yes</td></tr>
</table></td>
<td><table>
<tr><td>UoA</td><td>Scoring element</td><td>Met?</td></tr>
<tr><td>UoA 1</td><td>Walleye (main)</td><td>Yes</td></tr>
<tr><td>UoA 2</td><td>No main</td><td>Yes</td></tr>
<tr><td>UoA 3</td><td>No main</td><td>Yes</td></tr>
<tr><td>UoA 4</td><td>No main</td><td>Yes</td></tr>
<tr><td>UoA 5</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 6</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 7</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 8</td><td>No main</td><td>Yes</td></tr>
</table></td>
<td><table>
<tr><td>UoA</td><td>Scoring element</td><td>Met?</td></tr>
<tr><td>UoA 1</td><td>Walleye (main)</td><td>Yes</td></tr>
<tr><td>UoA 2</td><td>Walleye (minor)</td><td>Yes</td></tr>
<tr><td>UoA 3</td><td>Walleye (minor)</td><td>Yes</td></tr>
<tr><td>UoA 4</td><td>Walleye (minor)</td><td>Yes</td></tr>
<tr><td>UoA 5</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 6</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 7</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 8</td><td>Yellow perch (minor)</td><td>Yes</td></tr>
</table></td></tr>
</table>

Rationale

UoA 1 (Yellow perch small mesh gillnet in Ontario QZ1)

Main primary: Walleye.

Since 1984, walleye (and yellow perch) have been co-managed by several jurisdictions around Lake Erie (i.e., Ontario, Ohio, Michigan, Pennsylvania and New York) under a management system comprising of annual total allowable catches, quota allocation among jurisdictions, and Individual Transferable Quotas (ITQs), Daily Catch Report requirements, a limited entry system[129], but also gear restriction, by mesh size (i.e. caught by "large" mesh mid-water gill nets with minimum mesh size 89 mm), and closed areas in certain jurisdictions. Walleye is managed under a comprehensive Fishery Management Plan (2015-2019)[130] specifying limit and target reference points which has been extended for another 5 years starting in 2020[131] with a planned performance evaluation set to commence in 2024. The stock is very healthy and has been for many years above the PRI.

There are no minor primary (managed) species in this UoA. SG 100 is likely met.

UoA 2 (Yellow perch small mesh gillnet in Ontario QZ2). No Main primary species. Walleye (see above) is the only Minor primary species in this UoA. SG 100 is likely met.

UoA 3 (Yellow perch small mesh gillnet in Ontario QZ3W). No Main primary species. Walleye (see above) is the only Minor primary species in this UoA. SG 100 is likely met.

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[129] https://www.nrcresearchpress.com/doi/abs/10.1139/cjfas-2017-0217%40cjfas-cfr/issue01#.Xaxt7ehKg2x

[130] http://www.glfc.org/pubs/lake_committees/erie/LEC_docs/position_statements/walleye_managment_plan.pdf

[131] http://www.glfc.org/pubs/lake_committees/erie/LEC_docs/other_docs/2018%20LEC%20Announcement%20WMP%205%20year_final.pdf

PI 2.1.2	**There is a strategy in place that is designed to maintain or to not hinder rebuilding of primary species, and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch**

UoA 4 (Yellow perch small mesh gillnet in Ontario QZ3E). No Main primary species. Walleye (see above) is the only minor primary species in this UoA. SG 100 is likely met.

UoA 5 (Yellow perch small mesh trapnet in Ohio MU1). No Main primary species. There are no minor primary (managed) species in this UoA. SG 100 is likely met.

UoA 6 (Yellow perch small mesh trapnet in Ohio MU2). No Main primary species. There are no minor primary (managed) species in this UoA. SG 100 is likely met.

UoA 7 (Yellow perch small mesh trapnet in Ohio MU3). No Main primary species. There are no minor primary (managed) species in this UoA. SG 100 is likely met.

UoA 8 (Walleye large mesh gill net in Lake Erie). No Main primary species.

Yellow perch (0.4% of UoA 5-year average catches) is the only minor primary species caught in this UoA. Since 1984, yellow perch (and walleye) have been co-managed by several jurisdictions around Lake Erie (i.e., Ontario, Ohio, Michigan, Pennsylvania and New York) under a management system comprising of annual total allowable catches, quota allocation among jurisdictions, and Individual Transferable Quotas (ITQs)[132], Daily Catch Report requirements, a limited entry system, but also gear restriction, mesh size (i.e. caught by "small" gill net mesh size is 57mm), and closed areas/seasons. Yellow perch in Lake Erie is also managed subject to a Fishery Management Plan specifying limit and target reference points[133]. Yellow perch (0.4% of UoA 5-year average catches) is highly likely to be above the PRI across Lake Erie[134]. SG 100 is likely met.

b	Management strategy evaluation			
	Guide post	The measures are considered **likely** to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/species).	There is some **objective basis for confidence** that the measures/partial strategy will work, based on some information directly about the fishery and/or species involved.	**Testing** supports **high confidence** that the partial strategy/strategy will work, based on information directly about the fishery and/or species involved.
	Met?	see below	see below	see below

UoA	Scoring element	Met?
UoA 1	Walleye (main)	Yes
UoA 2	No main	Yes
UoA 3	No main	Yes
UoA 4	No main	Yes
UoA 5	none	Yes
UoA 6	none	Yes
UoA 7	none	Yes
UoA 8	No main	Yes

UoA	Scoring element	Met?
UoA 1	Walleye (main)	Yes
UoA 2	No main	Yes
UoA 3	No main	Yes
UoA 4	No main	Yes
UoA 5	none	Yes
UoA 6	none	Yes
UoA 7	none	Yes
UoA 8	No main	Yes

UoA	Scoring element	Met?
UoA 1	Walleye (main)	Yes
UoA 2	Walleye (minor)	Yes
UoA 3	Walleye (minor)	Yes
UoA 4	Walleye (minor)	Yes
UoA 5	none	Yes
UoA 6	none	Yes
UoA 7	none	Yes
UoA 8	Yellow perch (minor)	Yes

Rationale

UoA 1 (Yellow perch small mesh gillnet in Ontario QZ1). Main primary: Walleye.

For walleye, managers, scientist and stakeholders carried out a Management Strategy Evaluation (MSE) that evaluated the HCR though a model of the entire management and assessment process, to account for the uncertainties in information

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[132] https://www.nrcresearchpress.com/doi/abs/10.1139/cjfas-2017-0217%40cjfas-cfr/issue01#.Xaxt7ehKg2x

[133] YPTG Annual Report 2019: http://www.glfc.org/pubs/lake_committees/erie/YPTG_docs/annual_reports/YPTG_report_2019.pdf

[134] YPTG Annual Report 2019: http://www.glfc.org/pubs/lake_committees/erie/YPTG_docs/annual_reports/YPTG_report_2019.pdf

PI 2.1.2	There is a strategy in place that is designed to maintain or to not hinder rebuilding of primary species, and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch

gathering and implementation as well as “system uncertainties,” culminating in an evaluation of the performance of alternate management procedures. Model runs were completed for 250 simulations of 25-year time horizons[135].

There are no minor primary (managed) species in this UoA. SG 100 is likely met.

UoA 2 (Yellow perch small mesh gillnet in Ontario QZ2). No Main primary species. Walleye (see above) is the only Minor primary species in this UoA. SG 100 is likely met.

UoA 3 (Yellow perch small mesh gillnet in Ontario QZ3W). No Main primary species. Walleye (see above) is the only Minor primary species in this UoA. SG 100 is likely met.

UoA 4 (Yellow perch small mesh gillnet in Ontario QZ3E). No Main primary species. Walleye (see above) is the only Minor primary species in this UoA. SG 100 is likely met.

UoA 5 (Yellow perch small mesh trapnet in Ohio MU1). No Main primary species. There are no minor primary (managed) species in this UoA. SG 100 is likely met.

UoA 6 (Yellow perch small mesh trapnet in Ohio MU2). No Main primary species. There are no minor primary (managed) species in this UoA. SG 100 is likely met.

UoA 7 (Yellow perch small mesh trapnet in Ohio MU3). No Main primary species. There are no minor primary (managed) species in this UoA. SG 100 is likely met.

UoA 8 (Walleye large mesh gill net in Lake Erie). No Main primary species.

Yellow perch is a minor primary species. The LEPMAG members provided input to the LEC to develop population objectives and conduct a Management Strategy Evaluation for yellow perch in Lake Erie. As a result, the 2019 TAC in each of the three western most management units is lower than the 2018 level. A Management Strategy Evaluation process was recently completed and used to inform 2019 decisions regarding sustainable yellow perch harvest[136]. SG 100 is likely met.

<table>
<tr><td rowspan="3">c</td><td colspan="4">Management strategy implementation</td></tr>
<tr><td>Guide post</td><td></td><td>There is some evidence that the measures/partial strategy is being implemented successfully.</td><td>There is clear evidence that the partial strategy/strategy is being implemented successfully and is achieving its overall objective as set out in scoring issue (a).</td></tr>
<tr><td>Met?</td><td></td><td>
<table>
<tr><td>UoA</td><td>Scoring element</td><td>Met?</td></tr>
<tr><td>UoA 1</td><td>Walleye (main)</td><td>Yes</td></tr>
<tr><td>UoA 2</td><td>No main</td><td>Yes</td></tr>
<tr><td>UoA 3</td><td>No main</td><td>Yes</td></tr>
<tr><td>UoA 4</td><td>No main</td><td>Yes</td></tr>
<tr><td>UoA 5</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 6</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 7</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 8</td><td>No main</td><td>Yes</td></tr>
</table>
</td><td>
<table>
<tr><td>UoA</td><td>Scoring element</td><td>Met?</td></tr>
<tr><td>UoA 1</td><td>Walleye (main)</td><td>Yes</td></tr>
<tr><td>UoA 2</td><td>Walleye (minor)</td><td>Yes</td></tr>
<tr><td>UoA 3</td><td>Walleye (minor)</td><td>Yes</td></tr>
<tr><td>UoA 4</td><td>Walleye (minor)</td><td>Yes</td></tr>
<tr><td>UoA 5</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 6</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 7</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 8</td><td>Yellow perch (minor)</td><td>Yes</td></tr>
</table>
</td></tr>
<tr><td colspan="5">Rationale</td></tr>
</table>

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[135] http://www.glfc.org/pubs/lake_committees/erie/LEC_docs/position_statements/walleye_managment_plan.pdf

[136] http://www.glfc.org/pubs/pressrel/LEC%20news%20release%202019_FINAL.pdf

PI 2.1.2	**There is a strategy in place that is designed to maintain or to not hinder rebuilding of primary species, and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch**			
UoA 1 (Yellow perch small mesh gillnet in Ontario QZ1). Main primary: Walleye. Based on the very healthy status of walleye in Lake Erie (stock is highly likely to be above PRI and at MSY level)[137] there is clear evidence that the partial strategy/strategy is being implemented successfully and is achieving its overall objective as set out in scoring issue (a). There are no minor primary (managed) species in this UoA. SG 100 is likely met. **UoA 2 (Yellow perch small mesh gillnet in Ontario QZ2).** No Main primary species. Walleye (see above) is the only Minor primary species in this UoA. SG 100 is likely met. **UoA 3 (Yellow perch small mesh gillnet in Ontario QZ3W).** No Main primary species. Walleye (see above) is the only Minor primary species in this UoA. SG 100 is likely met. **UoA 4 (Yellow perch small mesh gillnet in Ontario QZ3E).** No Main primary species. Walleye (see above) is the only Minor primary species in this UoA. SG 100 is likely met. **UoA 5 (Yellow perch small mesh trapnet in Ohio MU1).** No Main primary species. There are no minor primary (managed) species in this UoA. SG 100 is likely met. **UoA 6 (Yellow perch small mesh trapnet in Ohio MU2).** No Main primary species. There are no minor primary (managed) species in this UoA. SG 100 is likely met. **UoA 7 (Yellow perch small mesh trapnet in Ohio MU3).** No Main primary species. There are no minor primary (managed) species in this UoA. SG 100 is likely met. **UoA 8 (Walleye large mesh gill net in Lake Erie).** No Main primary species. Yellow perch is a minor primary species. The yellow perch stock in Lake Erie is considered to be highly likely to be above its PRI[138] in MU1 to MU4. SG 100 is likely met.				
d	Shark finning			
	Guide post	It is **likely** that shark finning is not taking place.	It is **highly likely** that shark finning is not taking place.	There is a **high degree of certainty** that shark finning is not taking place.
	Met?	**NA**	**NA**	**NA**
Rationale				
No sharks are caught in Lake Erie. Sharks would not survive the cold and freshwater regime of Lake Erie or the Great Lakes since they are generally not well adapted to freshwater systems. The freshwater regime would inflict damage to their kidneys and respiratory system and affect buoyancy.				
e	Review of alternative measures			
	Guide post	There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main primary species.	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main primary	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of all primary species, and they are implemented, as appropriate.

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[137] http://www.glfc.org/pubs/lake_committees/erie/WTG_docs/annual_reports/WTG_report_2019.pdf

[138] http://www.glfc.org/pubs/lake_committees/erie/YPTG_docs/annual_reports/YPTGexesum2019.pdf

<table>
<tr><th colspan="2">PI 2.1.2</th><th colspan="3">There is a strategy in place that is designed to maintain or to not hinder rebuilding of primary species, and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch</th></tr>
<tr><td></td><td></td><td></td><td>species and they are implemented as appropriate.</td><td></td></tr>
<tr><td></td><td>Met?</td>
<td><table>
<tr><td>UoA</td><td>Scoring element</td><td>Met?</td></tr>
<tr><td>UoA 1</td><td>Walleye (main)</td><td>Yes</td></tr>
<tr><td>UoA 2</td><td>No main</td><td>Yes</td></tr>
<tr><td>UoA 3</td><td>No main</td><td>Yes</td></tr>
<tr><td>UoA 4</td><td>No main</td><td>Yes</td></tr>
<tr><td>UoA 5</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 6</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 7</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 8</td><td>No main</td><td>Yes</td></tr>
</table></td>
<td><table>
<tr><td>UoA</td><td>Scoring element</td><td>Met?</td></tr>
<tr><td>UoA 1</td><td>Walleye (main)</td><td>Yes</td></tr>
<tr><td>UoA 2</td><td>No main</td><td>Yes</td></tr>
<tr><td>UoA 3</td><td>No main</td><td>Yes</td></tr>
<tr><td>UoA 4</td><td>No main</td><td>Yes</td></tr>
<tr><td>UoA 5</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 6</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 7</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 8</td><td>No main</td><td>Yes</td></tr>
</table></td>
<td><table>
<tr><td>UoA</td><td>Scoring element</td><td>Met?</td></tr>
<tr><td>UoA 1</td><td>Walleye (main)</td><td>no</td></tr>
<tr><td>UoA 2</td><td>Walleye (minor)</td><td>no</td></tr>
<tr><td>UoA 3</td><td>Walleye (minor)</td><td>no</td></tr>
<tr><td>UoA 4</td><td>Walleye (minor)</td><td>no</td></tr>
<tr><td>UoA 5</td><td>none</td><td>yes</td></tr>
<tr><td>UoA 6</td><td>none</td><td>yes</td></tr>
<tr><td>UoA 7</td><td>none</td><td>yes</td></tr>
<tr><td>UoA 8</td><td>Yellow perch (minor)</td><td>no</td></tr>
</table></td></tr>
</table>

Rationale

UoA 1 (Yellow perch small mesh gillnet in Ontario QZ1). Main primary: Walleye.

Through the annual stock assessment process there is a regular review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of walleye and they are implemented as appropriate. The process is managed holistically through the quota system following the result of the stock assessment process. It is not clear if there is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of all primary species.

There are no minor primary (managed) species in this UoA. SG 80 is likely met. It is not clear if SG100 can be met.

UoA 2 (Yellow perch small mesh gillnet in Ontario QZ2). No Main primary species. Walleye (see above) is the only Minor primary species in this UoA. SG 80 is likely met.

UoA 3 (Yellow perch small mesh gillnet in Ontario QZ3W). No Main primary species. Walleye (see above) is the only Minor primary species in this UoA. SG 80 is likely met.

UoA 4 (Yellow perch small mesh gillnet in Ontario QZ3E). No Main primary species. Walleye (see above) is the only Minor primary species in this UoA. SG 80 is likely met.

UoA 5 (Yellow perch small mesh trapnet in Ohio MU1). No Main primary species. There are no minor primary (managed) species in this UoA. SG 100 is likely met.

UoA 6 (Yellow perch small mesh trapnet in Ohio MU2). No Main primary species. There are no minor primary (managed) species in this UoA. SG 100 is likely met.

UoA 7 (Yellow perch small mesh trapnet in Ohio MU3). No Main primary species. There are no minor primary (managed) species in this UoA. SG 100 is likely met.

UoA 8 (Walleye large mesh gill net in Lake Erie). No Main primary species.

Yellow perch is a minor primary species. Through the annual stock assessment process there is a regular review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of yellow perch and they are implemented as appropriate. The process is managed holistically through the quota system following the result of the stock assessment process. It is not clear if there is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of all primary species.

SG 80 is likely met. It is not clear if SG100 can be met.

PI 2.1.2	There is a strategy in place that is designed to maintain or to not hinder rebuilding of primary species, and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch

References

- *See footnotes referenced within text as well as background information provided in the P2 background.*
- *Appendix B and C of License Condition (Ontario)*

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Individual scoring elements (add rows as required; delete if not scoring by elements)		Applicable SGs likely met per individual scoring element			Likely scoring element scores
		SG60	SG80	SG100	
UoA 1-4	Scoring element 1 (Walleye)	3 of 3	4 of 4	3 of 4	≥80
UoA 8	Scoring element 1 (Yellow perch)	NA	NA	3 of 4	≥80
All other UoAs	No main/minor primary species (NA automatically meets SGXX)	NA	NA	NA	≥80
Draft scoring range		Applicable SGs/elements likely met			Likely overall PI score
		SG60	SG80	SG100	
		UoA Met? UoA 1 3 of 3 UoA 2 3 of 3 UoA 3 3 of 3 UoA 4 3 of 3 UoA 5 Yes UoA 6 Yes UoA 7 Yes UoA 8 Yes	UoA Met? UoA 1 4 of 4 UoA 2 4 of 4 UoA 3 4 of 4 UoA 4 4 of 4 UoA 5 Yes UoA 6 Yes UoA 7 Yes UoA 8 Yes	UoA Met? UoA 1 3 of 4 UoA 2 3 of 4 UoA 3 3 of 4 UoA 4 3 of 4 UoA 5 Yes UoA 6 Yes UoA 7 Yes UoA 8 3 of 4	**All UoAs** ≥80
Information gap indicator		Information sufficient to score PI			

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Individual scoring elements (add rows as required; delete if not scoring by elements)		Applicable SGs met per individual scoring element			Scoring element scores
		SG60	SG80	SG100	
1	Scoring element 1	X of x	X of x	X of x	
2	Scoring element 2	X of x	X of x	X of x	
3	Scoring element 3	X of x	X of x	X of x	
Overall Performance Indicator score		Applicable SGs/elements met			Overall score
		SG60	SG80	SG100	
		X of x	X of x	X of x	
Condition number (if relevant)					

PI 2.1.3 – Primary species information

<table>
<tr><th colspan="2">PI 2.1.3</th><th colspan="3">Information on the nature and extent of primary species is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage primary species</th></tr>
<tr><td colspan="2">Scoring Issue</td><td>SG 60</td><td>SG 80</td><td>SG 100</td></tr>
<tr><td rowspan="3">a</td><td colspan="4">Information adequacy for assessment of impact on main primary species</td></tr>
<tr><td>Guide post</td><td>Qualitative information is adequate to estimate the impact of the UoA on the main primary species with respect to status.
OR
If RBF is used to score PI 2.1.1 for the UoA:
Qualitative information is adequate to estimate productivity and susceptibility attributes for main primary species.</td><td>Some quantitative information is available and is adequate to assess the impact of the UoA on the main primary species with respect to status.
OR
If RBF is used to score PI 2.1.1 for the UoA:
Some quantitative information is adequate to assess productivity and susceptibility attributes for main primary species.</td><td>Quantitative information is available and is adequate to assess with a high degree of certainty the impact of the UoA on main primary species with respect to status.</td></tr>
<tr><td>Met?</td><td><table>
<tr><td>UoA</td><td>Scoring element</td><td>Met?</td></tr>
<tr><td>UoA 1</td><td>Walleye (main)</td><td>Yes</td></tr>
<tr><td>UoA 2</td><td>No main</td><td>Yes</td></tr>
<tr><td>UoA 3</td><td>No main</td><td>Yes</td></tr>
<tr><td>UoA 4</td><td>No main</td><td>Yes</td></tr>
<tr><td>UoA 5</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 6</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 7</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 8</td><td>No main</td><td>Yes</td></tr>
</table></td><td><table>
<tr><td>UoA</td><td>Scoring element</td><td>Met?</td></tr>
<tr><td>UoA 1</td><td>Walleye (main)</td><td>Yes</td></tr>
<tr><td>UoA 2</td><td>No main</td><td>Yes</td></tr>
<tr><td>UoA 3</td><td>No main</td><td>Yes</td></tr>
<tr><td>UoA 4</td><td>No main</td><td>Yes</td></tr>
<tr><td>UoA 5</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 6</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 7</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 8</td><td>No main</td><td>Yes</td></tr>
</table></td><td><table>
<tr><td>UoA</td><td>Scoring element</td><td>Met?</td></tr>
<tr><td>UoA 1</td><td>Walleye (main)</td><td>No</td></tr>
<tr><td>UoA 2</td><td>No main</td><td>Yes</td></tr>
<tr><td>UoA 3</td><td>No main</td><td>Yes</td></tr>
<tr><td>UoA 4</td><td>No main</td><td>Yes</td></tr>
<tr><td>UoA 5</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 6</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 7</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 8</td><td>No main</td><td>Yes</td></tr>
</table></td></tr>
<tr><td colspan="5">Rationale</td></tr>
</table>

All UoAs

Walleye and yellow perch, the only primary (actively managed) species in the 8 UoAs in question are surveyed through a Partnership Gill Net Index survey, a Trawl Survey and a hydroacoustic survey, as well as sport fish and angling surveys[139] [140].

These is a considerable amount of high quality quantitative information on all catch that is landed, released, and surrended which is required to be provided in the Daily Catch Reports, itself inputted into a database by OCFA (see License Condition B Ontario) and used by OMNR, OCFA and others to provide information required to quantify the full removals and impacts resulting from the walleye and yellow perch fisheries in Lake Erie with a high degree of certainty. Information for the all the main primary species is available at the stock level.

As per Ohio regulations in Lake Erie[141], trap net licensees are required to keep an accurate daily record of their catch (quota and non-quota species) on an electronic catch reporting system as established by the chief of the Division of

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[139] http://www.glfc.org/pubs/lake_committees/erie/LEC_docs/position_statements/walleye_managment_plan.pdf

[140] http://www.glfc.org/pubs/lake_committees/erie/YPTG_docs/annual_reports/YPTG_report_2017.pdf

[141] https://wildlife.ohiodnr.gov/portals/wildlife/pdfs/publications/laws%20&%20regs/pub002.pdf

Wildlife. The licensee shall pay the cost of the electronic equipment, operation, installation, and maintenances of these devices and any replacement thereof.

On top of landings, released, discarded surrendered catch from the Ohio yellow perch MU1 to MU3 trap net fishery became available in 2017 while this was already collected since 2011 in all the other UoAs. Fishery managers in both Ontario and Ohio are relatively confident with the quality of the data contained in the DCRs. Furthermore, the dockside inspection program covers about 60-65% of all landings through inspection from Port Observers or Conservation Officers (pers. comm. Brian Locke, Manager, Lake Erie Management Unit - Ontario Ministry of Natural Resources and Forestry; Travis Hartman, Lake Erie Program Administrator, Ohio Department of Natural Resources, off-site conference call meeting, October 10th 2019).

There is not a routine lake observer program to monitor and verify the appropriate recording of catches, bycatch, discards. Furthermore, discards are not currently accounted for in terms of potential mortality resulting from post release mortality. For example, from 2002 to 2006, the recreational fishery was estimated to release between 25-60% of the total lake-wide catch of Yellow Perch, but latent mortality (from hooking injuries or barotrauma) from these discards has not been estimated (STC 2007). Independent technical reviews of both fisheries stressed the need to estimate discard mortality and highlighted barotrauma and hooking injuries as primary mechanisms to be investigated and quantified (Lester et al. 2005; STC 2007). Further, recent anecdotal evidence suggests that discard mortality may be linked to barotrauma[142]. Another recent study highlighted that barotrauma in angling released walleye may result in as much as 50% mortality when untreated[143].

Hence the audit team cannot be sure the data is of a quality adequate to assess with a high degree of certainty. SG 80 is likely met for UoA 1. SG 100 is likely met for UoA 2-8.

b	**Information adequacy for assessment of impact on minor primary species**			
	Guide post			Some quantitative information is adequate to estimate the impact of the UoA on minor primary species with respect to status.
	Met?			See table below

UoA	Scoring element	Met?
UoA 1	No minor	yes
UoA 2	Walleye (minor)	yes
UoA 3	Walleye (minor)	yes
UoA 4	Walleye (minor)	yes
UoA 5	none	yes
UoA 6	none	yes
UoA 7	none	yes
UoA 8	Yellow perch (minor)	yes

Rationale

All UoAs

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[142] https://fwspubs.org/doi/pdf/10.3996/062018-JFWM-056

[143] https://fwspubs.org/doi/pdf/10.3996/112017-JFWM-096

PI 2.1.3	Information on the nature and extent of primary species is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage primary species

The same species and rationale / evidence provided above in PI 2.1.3 a also applies here. There is some quantitative information adequate to estimate the impact of the UoAs on minor primary species with respect to status. SG 100 may be met.

<table>
<tr><td rowspan="3">c</td><td colspan="4">Information adequacy for management strategy</td></tr>
<tr><td>Guide post</td><td>Information is adequate to support measures to manage main primary species.</td><td>Information is adequate to support a partial strategy to manage main primary species.</td><td>Information is adequate to support a strategy to manage all primary species, and evaluate with a high degree of certainty whether the strategy is achieving its objective.</td></tr>
<tr><td>Met?</td>
<td><table>
<tr><td>UoA</td><td>Scoring element</td><td>Met?</td></tr>
<tr><td>UoA 1</td><td>Walleye (main)</td><td>Yes</td></tr>
<tr><td>UoA 2</td><td>No main</td><td>Yes</td></tr>
<tr><td>UoA 3</td><td>No main</td><td>Yes</td></tr>
<tr><td>UoA 4</td><td>No main</td><td>Yes</td></tr>
<tr><td>UoA 5</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 6</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 7</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 8</td><td>No main</td><td>Yes</td></tr>
</table></td>
<td><table>
<tr><td>UoA</td><td>Scoring element</td><td>Met?</td></tr>
<tr><td>UoA 1</td><td>Walleye (main)</td><td>Yes</td></tr>
<tr><td>UoA 2</td><td>No main</td><td>Yes</td></tr>
<tr><td>UoA 3</td><td>No main</td><td>Yes</td></tr>
<tr><td>UoA 4</td><td>No main</td><td>Yes</td></tr>
<tr><td>UoA 5</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 6</td><td>none</td><td>Yes</td></tr>
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<tr><td>UoA 6</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 7</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 8</td><td>Yellow perch (minor)</td><td>Yes</td></tr>
</table></td></tr>
</table>

Rationale

All UoAs

The same species and rationale / evidence provided above in PI 2.1.3 a also applies here. The fishery dependent and independent information collected for walleye and yellow perch is adequate to support the individual harvest control rules to ultimately manage these species within target and limit reference points, and evaluate with a high degree of certainty whether the strategy is achieving its objective.

The available data appear to be adequate to detect any changes in risk level to walleye and yellow perch, in such cases such as changes in the operation of the UoA or the effectiveness or implementation of the management system. SG 100 may be met.

References

As listed within the text.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Individual scoring elements (add rows as required; delete if not scoring by elements)		Applicable SGs likely met per individual scoring element			Likely scoring element scores
		SG60	SG80	SG100	
UoA 1	Scoring element 1 (Walleye)	2 of 2	2 of 2	2 of 3	≥80

<table>
<tr><th colspan="2">PI 2.1.3</th><th colspan="4">Information on the nature and extent of primary species is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage primary species</th></tr>
<tr><td>UoA 2-4</td><td>Scoring element 1 (Walleye)</td><td>2 of 2</td><td>2 of 2</td><td>3 of 3</td><td>≥80</td></tr>
<tr><td>UoA 8</td><td>Scoring element 1 (Yellow perch)</td><td>NA</td><td>NA</td><td>2 of 2</td><td>≥80</td></tr>
<tr><td>All other UoAs</td><td>No main/minor primary species (NA automatically meets SGXX)</td><td>NA</td><td>NA</td><td>NA</td><td>≥80</td></tr>
<tr><td colspan="2" rowspan="3">Draft scoring range</td><td colspan="3">Applicable SGs/elements <u>likely</u> met</td><td rowspan="2"><u>Likely</u> overall PI score</td></tr>
<tr><td>SG60</td><td>SG80</td><td>SG100</td></tr>
<tr><td><table><tr><td>UoA</td><td>Met?</td></tr><tr><td>UoA 1</td><td>2 of 2</td></tr><tr><td>UoA 2</td><td>2 of 2</td></tr><tr><td>UoA 3</td><td>Yes</td></tr><tr><td>UoA 4</td><td>Yes</td></tr><tr><td>UoA 5</td><td>Yes</td></tr><tr><td>UoA 6</td><td>Yes</td></tr><tr><td>UoA 7</td><td>Yes</td></tr><tr><td>UoA 8</td><td>Yes</td></tr></table></td><td><table><tr><td>UoA</td><td>Met?</td></tr><tr><td>UoA 1</td><td>2 of 2</td></tr><tr><td>UoA 2</td><td>2 of 2</td></tr><tr><td>UoA 3</td><td>Yes</td></tr><tr><td>UoA 4</td><td>Yes</td></tr><tr><td>UoA 5</td><td>Yes</td></tr><tr><td>UoA 6</td><td>Yes</td></tr><tr><td>UoA 7</td><td>Yes</td></tr><tr><td>UoA 8</td><td>Yes</td></tr></table></td><td><table><tr><td>UoA</td><td>Met?</td></tr><tr><td>UoA 1</td><td>2 of 3</td></tr><tr><td>UoA 2</td><td>3 of 3</td></tr><tr><td>UoA 3</td><td>Yes</td></tr><tr><td>UoA 4</td><td>Yes</td></tr><tr><td>UoA 5</td><td>Yes</td></tr><tr><td>UoA 6</td><td>Yes</td></tr><tr><td>UoA 7</td><td>Yes</td></tr><tr><td>UoA 8</td><td>2 of 2</td></tr></table></td><td>All UoAs ≥80</td></tr>
<tr><td colspan="2">Information gap indicator</td><td colspan="4">Information sufficient to score PI</td></tr>
</table>

Overall Performance Indicator scores added from Client and Peer Review Draft Report

<table>
<tr><td colspan="2" rowspan="2">Individual scoring elements (add rows as required; delete if not scoring by elements)</td><td colspan="3">Applicable SGs met per individual scoring element</td><td rowspan="2">Scoring element scores</td></tr>
<tr><td>SG60</td><td>SG80</td><td>SG100</td></tr>
<tr><td>1</td><td>Scoring element 1</td><td>X of x</td><td>X of x</td><td>X of x</td><td></td></tr>
<tr><td>2</td><td>Scoring element 2</td><td>X of x</td><td>X of x</td><td>X of x</td><td></td></tr>
<tr><td>3</td><td>Scoring element 3</td><td>X of x</td><td>X of x</td><td>X of x</td><td></td></tr>
<tr><td>4</td><td>Scoring element 4</td><td>X of x</td><td>X of x</td><td>X of x</td><td></td></tr>
<tr><td colspan="2" rowspan="3">Overall Performance Indicator score</td><td colspan="3">Applicable SGs/elements met</td><td rowspan="2">Overall score</td></tr>
<tr><td>SG60</td><td>SG80</td><td>SG100</td></tr>
<tr><td>X of x</td><td>X of x</td><td>X of x</td><td></td></tr>
<tr><td colspan="5">Condition number (if relevant)</td><td></td></tr>
</table>

PI 2.2.1 – Secondary species outcome

<table>
<tr><th colspan="2">PI 2.2.1</th><th colspan="3">The UoA aims to maintain secondary species above a biologically based limit and does not hinder recovery of secondary species if they are below a biological based limit</th></tr>
<tr><td colspan="2">Scoring Issue</td><td>SG 60</td><td>SG 80</td><td>SG 100</td></tr>
<tr><td rowspan="3">a</td><td colspan="4">Main secondary species stock status</td></tr>
<tr><td>Guide post</td><td>Main secondary species are likely to be above biologically based limits.

OR

If below biologically based limits, there are measures in place expected to ensure that the UoA does not hinder recovery and rebuilding.</td><td>Main secondary species are highly likely to be above biologically based limits.

OR

If below biologically based limits, there is either evidence of recovery or a demonstrably effective partial strategy in place such that the UoA does not hinder recovery and rebuilding.
AND
Where catches of a main secondary species outside of biological limits are considerable, there is either evidence of recovery or a, demonstrably effective strategy in place between those MSC UoAs that have considerable catches of the species, to ensure that they collectively do not hinder recovery and rebuilding.</td><td>There is a high degree of certainty that main secondary species are above biologically based limits.</td></tr>
<tr><td>Met?</td>
<td><table>
<tr><td></td><td>Scoring element</td><td>Met?</td></tr>
<tr><td>UoA 1</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 2</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 3</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 4</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 5</td><td>Channel catfish and
Freshwater drum</td><td>Yes
Yes</td></tr>
<tr><td>UoA 6</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 7</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 8</td><td>White bass</td><td>Yes</td></tr>
</table></td>
<td><table>
<tr><td>UoA</td><td>Scoring element</td><td>Met?</td></tr>
<tr><td>UoA 1</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 2</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 3</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 4</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 5</td><td>Channel catfish and
Freshwater drum</td><td>Yes
Yes</td></tr>
<tr><td>UoA 6</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 7</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 8</td><td>White bass</td><td>Yes</td></tr>
</table></td>
<td><table>
<tr><td>UoA</td><td>Scoring element</td><td>Met?</td></tr>
<tr><td>UoA 1</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 2</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 3</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 4</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 5</td><td>Channel catfish and
Freshwater drum</td><td>No
No</td></tr>
<tr><td>UoA 6</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 7</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 8</td><td>White bass</td><td>Yes</td></tr>
</table></td>
</tr>
<tr><td colspan="5">Rationale</td></tr>
</table>

UoA 1 (Yellow perch small mesh gillnet in Ontario QZ1). White perch (not scored) is the only main secondary species in this UoA. SG 100 may be met.

This is one of the most abundant invasive species in Lake Erie. As in the previous MSC Certification Report in 2015, and although above the 5% catch profile threshold in a number of UoAs, white perch is not considered for scoring in this assessment as it is an invasive species in Lake Erie (as per MSC SD3.1.1.1 b). The client group confirmed that white perch is still classified as an invasive species. Within Lake Erie, including both the Ontario and Ohio jurisdictions, white perch does not have a quota, discards requirements or a management strategy. In their entirety, these elements are considered by managers to be aligned and consistent to an informal eradication strategy for white perch (pers. comm. Brian Locke, Manager, Lake Erie Management Unit - Ontario Ministry of Natural Resources and Forestry; Travis Hartman, Lake Erie Program Administrator, Ohio Department of Natural Resources, off-site conference call meeting, October 10th 2019).

UoA 2 (Yellow perch small mesh gillnet in Ontario QZ2). White perch (not scored) is the only main secondary species in this UoA. SG 100 may be met.

PI 2.2.1 | The UoA aims to maintain secondary species above a biologically based limit and does not hinder recovery of secondary species if they are below a biological based limit

UoA 3 (Yellow perch small mesh gillnet in Ontario QZ3W). White perch (not scored) is the only main secondary species in this UoA. SG 100 may be met.

UoA 4 (Yellow perch small mesh gillnet in Ontario QZ3E). No main secondary species in this UoA. SG 100 may be met.

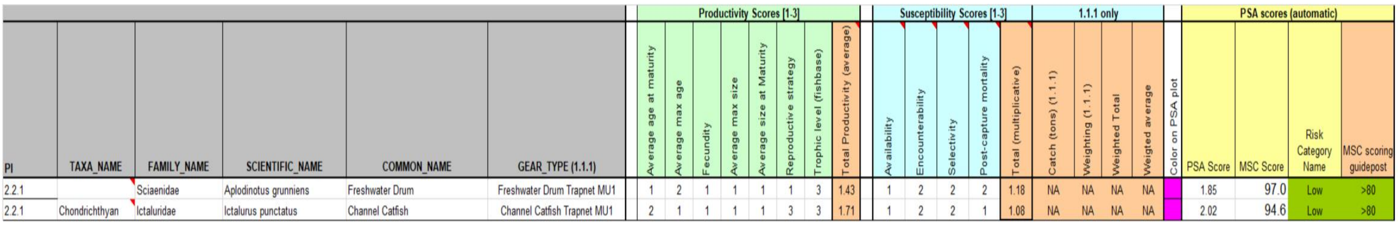
UoA 5 (Yellow perch small mesh trapnet in Ohio MU1). White perch (not scored), **channel catfish** and **freshwater drum** are the main secondary species in this UoA.

Harvest data inclusive of released catch of channel catfish and freshwater drum is available in MU1 since 2017.

Estimated release of channel catfish was 4.15% in 2017 and 37% in 2018.
Estimated release of freshwater drum was 6.3% in 2017 and 13% in 2018.

Both fish have swim bladder that makes them potentially susceptible to barotrauma if fished at relatively deep depths. Although not easily comparable with other species, having a swim bladder affects the potential for barotrauma. In a recent study by Knight at. al. 2019[144], barotrauma resulting from discard mortality for Lake Erie yellow perch was calculated as having a small effect and affecting < 1% of lake-wide population size estimates. In another study (Eberts et al. 2019)[145], mortality from angling catch and release caused barotrauma of Walleye was found to be as high as 50%. Such studies may offer some insight into the possible release related mortality of channel catfish and freshwater drum since both species have swim bladders and may be affected by barotrauma.

Channel catfish and freshwater drum are not actively managed (like walleye and yellow perch) in MU1. They currently do not have a stock assessment indicating their status, however, during the second surveillance audit in 2017, the LEC Data Deficient Working Group conducted a formal Productivity Susceptibility Analysis (PSA) due to the lack of more substantive assessment information. The PSA Productivity and Susceptibility Attributes have remained consistent between version 1.3 (2nd Surveillance) and 2.01 (current re-assessment) of the MSC standard.
The productivity information has been checked again on Fishbase in October 2019 as part of the re-assessment and the information was found to be still current, as well as the resulting productivity scores. The two species both score low risk with an MSC score of >80. The summary results table is shown below.



						Productivity Scores [1-3]								Susceptibility Scores [1-3]					1.1.1 only					PSA scores (automatic)			
PI	TAXA_NAME	FAMILY_NAME	SCIENTIFIC_NAME	COMMON_NAME	GEAR_TYPE (1.1.1)	Average age at maturity	Average max age	Fecundity	Average max size	Average size at Maturity	Reproductive strategy	Trophic level (fishbase)	Total Productivity (average)	Availability	Encounterability	Selectivity	Post-capture mortality	Total (multiplicative)	Catch (tons) (1.1.1)	Weighting (1.1.1)	Weighted Total	Weigted average	Color on PSA plot	PSA Score	MSC Score	Risk Category Name	MSC scoring guidepost
2.2.1		Sciaenidae	Aplodinotus grunniens	Freshwater Drum	Freshwater Drum Trapnet MU1	1	2	1	1	1	1	3	1.43	1	2	2	2	1.18	NA	NA	NA	NA	🟪	1.85	97.0	Low	>80
2.2.1	Chondrichthyan	Ictaluridae	Ictalurus punctatus	Channel Catfish	Channel Catfish Trapnet MU1	2	1	1	1	1	3	3	1.71	1	2	2	1	1.08	NA	NA	NA	NA	🟪	2.02	94.6	Low	>80

Channel catfish and freshwater drum are **highly likely** to be above biologically based limits. SG 80 may be met.. It is unclear if SG 100 can be met.

UoA 6 (Yellow perch small mesh trapnet in Ohio MU2). White perch (not scored) is the only main secondary species in this UoA. SG 100 may be met.

UoA 7 (Yellow perch small mesh trapnet in Ohio MU3). No main secondary species in this UoA. SG 100 may be met.

UoA 8 (Walleye large mesh gill net in Lake Erie)

White perch (not scored) and **white bass** are the two main secondary species in this UoA.

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[144] https://fwspubs.org/doi/pdf/10.3996/062018-JFWM-056
[145] https://fwspubs.org/doi/pdf/10.3996/112017-JFWM-096

PI 2.2.1	**The UoA aims to maintain secondary species above a biologically based limit and does not hinder recovery of secondary species if they are below a biological based limit**

The Lake Erie White Bass stock assessment used a statistical catch-at-age (SCA) model built in Auto Differentiation Model Builder (ADMB Project, 2015) was modified from the Walleye Task Group (WTG) SCA model used between 2001 and 2014 (Walleye Task Group, 2001). White bass has been assessed in 2017 with projections for 2018. The abundance and biomass of White Bass in recent years (2011-2017) has been high relative to the early 1990's. The resulting biomass of this stock in 2017 is shown below.

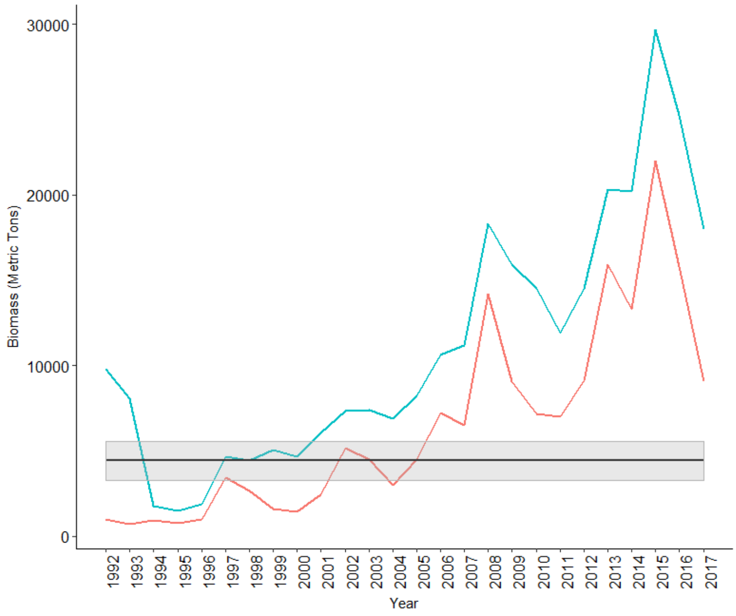
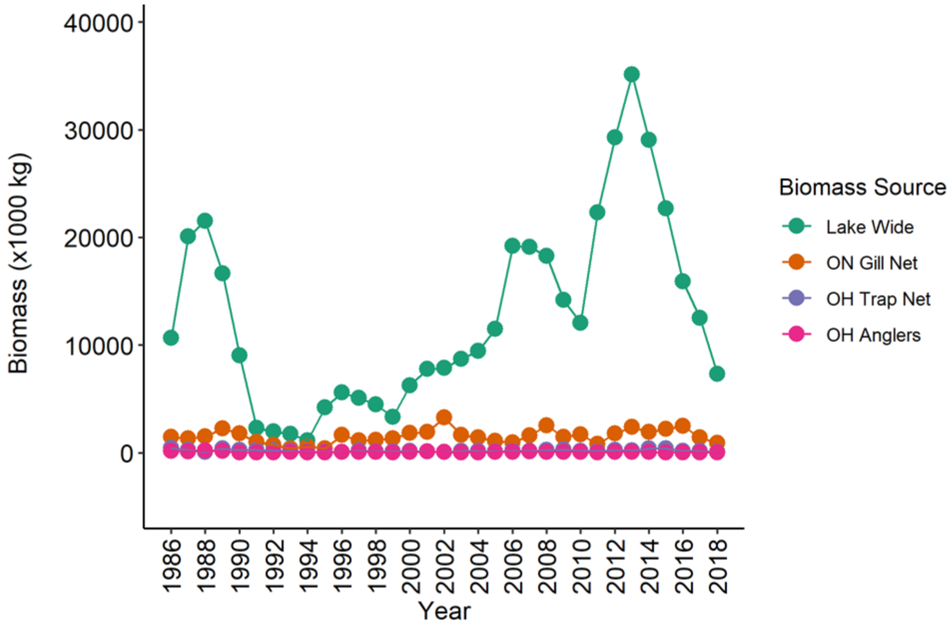


Figure 42. White bass unfished spawning stock biomass (blue) and fished spawning stock biomass (red) estimated using the Lake Eire White Bass SCA model. The mean and 95% CI for 40% of the unfished spawning stock biomass over the time-series is represented by the solid black line and grey shaded area, respectively. The lower reference points were left off of the graph for display purposes (Source: 2017 Stock Assessment provided by OCFA).

The white bass stock assessment was updated in 2018. White Bass biomass in Lake Erie was estimated to be 7.3 million kg in 2018 (Figure 45), with most of the biomass produced by the 2016 (age 2) and 2012 cohorts.



PI 2.2.1	The UoA aims to maintain secondary species above a biologically based limit and does not hinder recovery of secondary species if they are below a biological based limit

Figure 43. Biomass of White Bass in Lake Erie, the Ontario commercial gill net catch, the Ohio commercial trap net catch, and the Ohio open-water recreational harvest. The lake wide biomass was estimated using a statistical catch-at-age model. Ontario and Ohio catches were observed using catch reporting programs. Ohio open-water recreational harvest was estimated from annual creel surveys conducted in the Ohio waters of Lake Erie (Source: 2018 Stock Assessment provided by OCFA).

Biomass of the population has shown a steady decline since a population high in 2013 of 35.2 million kg. The large biomass of White Bass in 2013 was supported by two strong recruitment events that occurred in 2010 and 2012. The 2012 cohort was large enough that age 6 individuals are still a dominant source of biomass in the system. The total harvest of White Bass has been rather stable from 1986-2018 (mean = 1.8 million kg, min = 0.5 million kg, max = 3.4 million kg), while the total and gill net fishing mortality rates have shown a consistent decline over the time series. At peak White Bass biomass (2011-2015), the total harvest of White Bass did not show any appreciable increase and remained at relatively low levels (min = 1 million kg, max = 2.7 million kg), which suggests that commercial fishing was not a major contributor to the recent decline in White Bass biomass. Recruitment of White Bass in 2018 was moderate in the west basin (33rd percentile for series). Data from 2019 surveys are still being processed and validated. However, preliminary analyses indicate the recruitment in 2019 was similar to 2018.

If we are to assume the same reference point proposed in the 2017 stock assessment is still appropriate, the 2018 stock is still above the 40% unfished spawning stock biomass threshold.

There is a high degree of certainty that white bass is above biologically based limits. SG 100 may be met.

b	Minor secondary species stock status			
	Guide post			Minor secondary species are highly likely to be above biologically based limits. OR If below biologically based limits', there is evidence that the UoA does not hinder the recovery and rebuilding of secondary species
	Met?			

UoA	Met?
UoA 1	No
UoA 2	No
UoA 3	No
UoA 4	No
UoA 5	No
UoA 6	No
UoA 7	No
UoA 8	No

Rationale

All UoAs

Based on the fact the vast majority of minor secondary species in the UoAs of Lake Erie (most of which have negligible catches below 0.1% of the corresponding UoA) are generally not actively managed or assessed through formal stock assessment, this requirement is likely not met. SG 100 may not be met.

PI 2.2.1	**The UoA aims to maintain secondary species above a biologically based limit and does not hinder recovery of secondary species if they are below a biological based limit**
References	
As referenced within the text.	

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Individual scoring elements (add rows as required; delete if not scoring by elements)		Applicable SGs likely met per individual scoring element			Likely scoring element scores
		SG60	SG80	SG100	
UoA 5	Scoring element 1 (channel catfish)	1 of 1	1 of 1	0 of 2	≥80
UoA 5	Scoring element 2 (freshwater drum)	1 of 1	1 of 1	0 of 2	≥80
UoA 8	Scoring element 1 (white bass)	1 of 1	1 of 1	1 of 2	≥80
All other UoAs	No main/minor secondary species (NA automatically meets SGXX)	NA	NA	1 of 2	≥80
Draft scoring range		Applicable SGs/elements likely met			Likely overall PI score
		SG60	SG80	SG100	
		UoA Met? UoA 1 Yes UoA 2 Yes UoA 3 Yes UoA 4 Yes UoA 5 1 of 1 UoA 6 Yes UoA 7 Yes UoA 8 1 of 1	UoA Met? UoA 1 Yes UoA 2 Yes UoA 3 Yes UoA 4 Yes UoA 5 1 of 1 UoA 6 Yes UoA 7 Yes UoA 8 1 of 1	UoA Met? UoA 1 1 of 2 UoA 2 1 of 2 UoA 3 1 of 2 UoA 4 1 of 2 UoA 5 0 of 2 UoA 6 1 of 2 UoA 7 1 of 2 UoA 8 1 of 2	**All UoAs** ≥80
Information gap indicator		Information is sufficient to score PI.			

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Individual scoring elements (add rows as required; delete if not scoring by elements)		Applicable SGs met per individual scoring element			Scoring element scores
		SG60	SG80	SG100	
1	Scoring element 1	X of x	X of x	X of x	
2	Scoring element 2	X of x	X of x	X of x	
3	Scoring element 3	X of x	X of x	X of x	
Overall Performance Indicator score		Applicable SGs/elements met			Overall score
		SG60	SG80	SG100	
		X of x	X of x	X of x	
Condition number (if relevant)					

PI 2.2.2 – Secondary species management strategy

<table>
<tr><th colspan="2">PI 2.2.2</th><th colspan="3">There is a strategy in place for managing secondary species that is designed to maintain or to not hinder rebuilding of secondary species and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch</th></tr>
<tr><td colspan="2">Scoring Issue</td><td>SG 60</td><td>SG 80</td><td>SG 100</td></tr>
<tr><td rowspan="3">a</td><td colspan="4">Management strategy in place</td></tr>
<tr><td>Guide post</td><td>There are measures in place, if necessary, which are expected to maintain or not hinder rebuilding of main secondary species at/to levels which are highly likely to be above biologically based limits or to ensure that the UoA does not hinder their recovery.</td><td>There is a partial strategy in place, if necessary, for the UoA that is expected to maintain or not hinder rebuilding of main secondary species at/to levels which are highly likely to be above biologically based limits or to ensure that the UoA does not hinder their recovery.</td><td>There is a strategy in place for the UoA for managing main and minor secondary species.</td></tr>
<tr><td>Met?</td><td>
<table>
<tr><td>UoA</td><td>Scoring element</td><td>Met?</td></tr>
<tr><td>UoA 1</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 2</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 3</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 4</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 5</td><td>Channel catfish and
Freshwater drum</td><td>Yes
Yes</td></tr>
<tr><td>UoA 6</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 7</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 8</td><td>White bass</td><td>Yes</td></tr>
</table>
</td><td>
<table>
<tr><td>UoA</td><td>Scoring element</td><td>Met?</td></tr>
<tr><td>UoA 1</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 2</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 3</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 4</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 5</td><td>Channel catfish and
Freshwater drum</td><td>Yes
Yes</td></tr>
<tr><td>UoA 6</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 7</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 8</td><td>White bass</td><td>Yes</td></tr>
</table>
</td><td>
<table>
<tr><td>UoA</td><td>Met?</td></tr>
<tr><td>UoA 1</td><td>No</td></tr>
<tr><td>UoA 2</td><td>No</td></tr>
<tr><td>UoA 3</td><td>No</td></tr>
<tr><td>UoA 4</td><td>No</td></tr>
<tr><td>UoA 5</td><td>No</td></tr>
<tr><td>UoA 6</td><td>No</td></tr>
<tr><td>UoA 7</td><td>No</td></tr>
<tr><td>UoA 8</td><td>No</td></tr>
</table>
</td></tr>
</table>

Rationale

UoA 1 (Yellow perch small mesh gillnet in Ontario QZ1). White perch (not scored) is the only main secondary species in this UoA. Neither measures nor strategy are required for this species. White perch is not considered for scoring in this assessment as it is an invasive species in Lake Erie (as per MSC SD3.1.1.1 b). The client group confirmed that white perch is still classified as an invasive species. Within Lake Erie, including both the Ontario and Ohio jurisdictions, white perch does not have a quota, discards requirements or a management strategy. SG 80 could be met. It is not clear if a strategy is in place for the UoA for managing minor secondary species. SG 100 is likely not met.

UoA 2 (Yellow perch small mesh gillnet in Ontario QZ2). White perch (not scored) is the only main secondary species in this UoA. SG 80 could be met. It is not clear if a strategy is in place for the UoA for managing minor secondary species. SG 100 is likely not met.

UoA 3 (Yellow perch small mesh gillnet in Ontario QZ3W). White perch (not scored) is the only main secondary species in this UoA. SG 80 could be met. It is not clear if a strategy is in place for the UoA for managing minor secondary species. SG 100 is likely not met.

UoA 4 (Yellow perch small mesh gillnet in Ontario QZ3E). No main secondary species in this UoA. SG 80 could be met. It is not clear if a strategy is in place for the UoA for managing minor secondary species. SG 100 is likely not met.

UoA 5 (Yellow perch small mesh trapnet in Ohio MU1). White perch (not scored), **channel catfish** and **freshwater drum** are the main secondary species in this UoA.

PI 2.2.2	There is a strategy in place for managing secondary species that is designed to maintain or to not hinder rebuilding of secondary species and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch

Channel catfish and freshwater drum are not subject to active quota management. Several management measures relate to all retained species in the Yellow perch fishery: including limited entry, gear configuration and mesh size (57 mm minimum), closed seasons and areas (see ON License Condition Appendix B). All these measures control fishing effort, offer some protection to nursery areas and minimize catch of juveniles. In Ohio's waters there is an additional measure of minimum landing size for Channel catfish (14.5"), a similar measure has not been defined for Freshwater drum[146].

The MSC Guidance to the Fishery Standard v2.01 (Table GSA3) specifies that for: *a "partial strategy", specific measures may not have been designed to manage the impact on that component specifically, but if such a measure/ measures are effective in assisting the UoA to achieve the SG80 level for the primary or secondary species Outcome PI then this could be considered as a management measure under the primary or secondary species Management Strategy PI*. Based on the current PSA performed on these two fish species, the risk level is considered to be low. The outcome PIs for the species have been met at the SG 80 level. These measures can be considered to be equivalent to a partial strategy. SG 80 could be met. It is not clear if a strategy is in place for the UoA for managing minor secondary species. SG 100 is likely not met.

UoA 6 (Yellow perch small mesh trapnet in Ohio MU2). White perch (not scored) is the only main secondary species in this UoA. SG 80 could be met. It is not clear if a strategy is in place for the UoA for managing minor secondary species. SG 100 is likely not met.

UoA 7 (Yellow perch small mesh trapnet in Ohio MU3). No main secondary species in this UoA. SG 80 could be met. It is not clear if a strategy is in place for the UoA for managing minor secondary species. SG 100 is likely not met.

UoA 8 (Walleye large mesh gill net in Lake Erie). White perch (not scored) and **white bass** are the two main secondary species in this UoA.

White bass is not subject to active quota management[147]. Several management measures relate to all retained species in the walleye fishery: including limited entry, gear configuration and mesh size (89 mm minimum size), closed seasons and areas (see ON License Condition Appendix B). All these measures control fishing effort, offer some protection to nursery areas and minimize catch of juveniles. In Ohio's waters there is an additional measure of minimum landing size for white bass (11")[148].
According to the MSC definition of Partial Strategy and based on the fact the stock appears to be well above the 40% Unfished SSB target level for over 10 years. these measures can be considered to be equivalent to a partial strategy, effective at maintaining the stock at healthy levels. SG 80 could be met. It is not clear if a strategy is in place for the UoA for managing minor secondary species. SG 100 is likely not met.

b	**Management strategy evaluation**			
	Guide post	The measures are considered **likely** to work, based on plausible argument (e.g. general experience, theory or comparison with similar UoAs/species).	There is **some objective basis for confidence** that the measures/partial strategy will work, based on some information directly about the UoA and/or species involved.	**Testing** supports **high confidence** that the partial strategy/strategy will work, based on information directly about the UoA and/or species involved.

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[146] https://wildlife.ohiodnr.gov/portals/wildlife/pdfs/publications/laws%20&%20regs/pub002.pdf
[147] https://www.nrcresearchpress.com/doi/abs/10.1139/cjfas-2017-0217%40cjfas-cfr/issue01#.Xaxt7ehKg2x
[148] https://wildlife.ohiodnr.gov/portals/wildlife/pdfs/publications/laws%20&%20regs/pub002.pdf

PI 2.2.2	There is a strategy in place for managing secondary species that is designed to maintain or to not hinder rebuilding of secondary species and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch

Met?

UoA	Scoring element	Met?	UoA	Scoring element	Met?	UoA	Scoring element	Met?
UoA 1	None	Yes	UoA 1	None	Yes	UoA 1	None	Yes
UoA 2	None	Yes	UoA 2	None	Yes	UoA 2	None	Yes
UoA 3	None	Yes	UoA 3	None	Yes	UoA 3	None	Yes
UoA 4	None	Yes	UoA 4	None	Yes	UoA 4	None	Yes
UoA 5	Channel catfish and Freshwater drum	Yes Yes	UoA 5	Channel catfish and Freshwater drum	Yes Yes	UoA 5	Channel catfish and Freshwater drum	No No
UoA 6	none	Yes	UoA 6	none	Yes	UoA 6	none	Yes
UoA 7	none	Yes	UoA 7	none	Yes	UoA 7	none	Yes
UoA 8	White bass	Yes	UoA 8	White bass	Yes	UoA 8	White bass	No

Rationale

UoA 1 (Yellow perch small mesh gillnet in Ontario QZ1). White perch (not scored) is the only main secondary species in this UoA. Neither measures nor strategy are required for this species. White perch is not considered for scoring in this assessment as it is an invasive species in Lake Erie (as per MSC SD3.1.1.1 b). The client group confirmed that white perch is still classified as an invasive species. Within Lake Erie, including both the Ontario and Ohio jurisdictions, white perch does not have a quota, discards requirements or a management strategy. SG80 and 100 are likely met.

UoA 2 (Yellow perch small mesh gillnet in Ontario QZ2). White perch (not scored) is the only main secondary species in this UoA. SG80 and 100 are likely met.

UoA 3 (Yellow perch small mesh gillnet in Ontario QZ3W). White perch (not scored) is the only main secondary species in this UoA. SG80 and 100 are likely met.

UoA 4 (Yellow perch small mesh gillnet in Ontario QZ3E). No main secondary species in this UoA. SG80 and 100 are likely met.

UoA 5 (Yellow perch small mesh trapnet in Ohio MU1). White perch (not scored), **channel catfish** and **freshwater drum** are the main secondary species in this UoA.

Channel catfish and freshwater drum are not subject to active quota management. Several management measures relate to all retained species in the Yellow perch fishery: including limited entry, gear configuration and mesh size (57 mm minimum), closed seasons and areas (see ON License Condition Appendix B). All these measures control fishing effort, offer some protection to nursery areas and minimize catch of juveniles. In Ohio's waters there is an additional measure of minimum landing size for Channel catfish (14.5"), a similar measure has not been defined for Freshwater drum[149].
Channel catfish harvest rate in Ohio waters appear to be have been increasing since 2009, especially when seine gear is taken into account. Also, the biomass proportion of channel catfish in the Western Lake (MU1) appears to have been consistent in the from 2013 to 2017 and dominating the overall proportion of fish in the survey trawl.

Freshwater drum catches in Ohio waters have been increasing to some degree with a specific spike in catches in 2015. Also, the biomass proportion of freshwater drum in the Western Lake (MU1) appears to have been consistent in the from 2013 to 2017. Furthermore, the Ohio 2018 Fisheries Annual reported that young-of-year freshwater drum and all ages of trout-perch were well above their respective long-term means in 2018 in District 1 (roughly equivalent to MU1). Furthermore, Young-of-the-year freshwater drum in District 2 and yellow perch in district 3 where the only survey indices that were above the long term mean in 2018.

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[149] https://wildlife.ohiodnr.gov/portals/wildlife/pdfs/publications/laws%20&%20regs/pub002.pdf

Based on the current PSA performed on these two fish species, the risk level is considered to be low. Also, the catch and survey indices appear to indicate that none of these species has been experiencing impaired productivity. The outcome PIs for the species have been met at the SG 80 level. There is some objective basis for confidence that the partial strategy will work, based on some information directly about MU 1 and the two species. No strategy testing has occurred. SG80 is likely met but not SG100.

UoA 6 (Yellow perch small mesh trapnet in Ohio MU2). White perch (not scored) is the only main secondary species in this UoA. SG80 and 100 are likely met.

UoA 7 (Yellow perch small mesh trapnet in Ohio MU3). No main secondary species in this UoA. SG80 and 100 are likely met.

UoA 8 (Walleye large mesh gill net in Lake Erie). White perch (not scored) and **white bass** are the two main secondary species in this UoA.

White bass is not subject to active quota management[150]. Several management measures relate to all retained species in the walleye fishery: including limited entry, gear configuration and mesh size (89 mm minimum size), closed seasons and areas (see ON License Condition Appendix B). All these measures control fishing effort, offer some protection to nursery areas and minimize catch of juveniles. In Ohio's waters there is an additional measure of minimum landing size for white bass (11")[151].
Based on the fact the stock appears to be well above the 40% Unfished SSB target level for over 10 years there is some objective basis for confidence that the partial strategy will work, based on some information directly about the UoA effect on the species. No strategy testing has occurred. SG80 is likely met but not SG100.

<table>
<tr><td rowspan="3">c</td><td colspan="4">Management strategy implementation</td></tr>
<tr><td>Guide post</td><td></td><td>There is some evidence that the measures/partial strategy is being implemented successfully.</td><td>There is clear evidence that the partial strategy/strategy is being implemented successfully and is achieving its objective as set out in scoring issue (a).</td></tr>
<tr><td>Met?</td><td></td><td>
<table>
<tr><td>UoA</td><td>Scoring element</td><td>Met?</td></tr>
<tr><td>UoA 1</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 2</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 3</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 4</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 5</td><td>Channel catfish and
Freshwater drum</td><td>Yes
Yes</td></tr>
<tr><td>UoA 6</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 7</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 8</td><td>White bass</td><td>Yes</td></tr>
</table>
</td><td>
<table>
<tr><td>UoA</td><td>Scoring element</td><td>Met?</td></tr>
<tr><td>UoA 1</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 2</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 3</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 4</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 5</td><td>Channel catfish and
Freshwater drum</td><td>No
No</td></tr>
<tr><td>UoA 6</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 7</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 8</td><td>White bass</td><td>No</td></tr>
</table>
</td></tr>
</table>

Rationale

UoA 1 (Yellow perch small mesh gillnet in Ontario QZ1). White perch (not scored) is the only main secondary species in this UoA. Neither measures nor strategy are required for this species. White perch is not considered for scoring in this assessment as it is an invasive species in Lake Erie (as per MSC SD3.1.1.1 b). The client group confirmed that white perch is still classified as an invasive species. Within Lake Erie, including both the Ontario and Ohio

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[150] https://www.nrcresearchpress.com/doi/abs/10.1139/cjfas-2017-0217%40cjfas-cfr/issue01#.Xaxt7ehKg2x

[151] https://wildlife.ohiodnr.gov/portals/wildlife/pdfs/publications/laws%20&%20regs/pub002.pdf

PI 2.2.2	**There is a strategy in place for managing secondary species that is designed to maintain or to not hinder rebuilding of secondary species and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch**

jurisdictions, white perch does not have a quota, discards requirements or a management strategy. SG80 and 100 are likely met.

UoA 2 (Yellow perch small mesh gillnet in Ontario QZ2). White perch (not scored) is the only main secondary species in this UoA. SG80 and 100 are likely met.

UoA 3 (Yellow perch small mesh gillnet in Ontario QZ3W). White perch (not scored) is the only main secondary species in this UoA. SG80 and 100 are likely met.

UoA 4 (Yellow perch small mesh gillnet in Ontario QZ3E). No main secondary species in this UoA. SG80 and 100 are likely met.

UoA 5 (Yellow perch small mesh trapnet in Ohio MU1). White perch (not scored), **channel catfish** and **freshwater drum** are the main secondary species in this UoA.

Channel catfish and freshwater drum are not subject to active quota management. Several management measures relate to all retained species in the Yellow perch fishery: including limited entry, gear configuration and mesh size (57 mm minimum), closed seasons and areas (see ON License Condition Appendix B). All these measures control fishing effort, offer some protection to nursery areas and minimize catch of juveniles. In Ohio's waters there is an additional measure of minimum landing size for Channel catfish (14.5"), a similar measure has not been defined for Freshwater drum[152].
Channel catfish harvest rate in Ohio waters appear to be have been increasing since 2009, especially when seine gear is taken into account. Also, the biomass proportion of channel catfish in the Western Lake (MU1) appears to have been consistent in the from 2013 to 2017 and dominating the overall proportion of fish in the survey trawl.

Freshwater drum catches in Ohio waters have been increasing to some degree with a specific spike in catches in 2015. Also, the biomass proportion of freshwater drum in the Western Lake (MU1) appears to have been consistent in the from 2013 to 2017. Furthermore, the Ohio 2018 Fisheries Annual reported that young-of-year freshwater drum and all ages of trout-perch were well above their respective long-term means in 2018 in District 1 (roughly equivalent to MU1). Furthermore, Young-of-the-year freshwater drum in District 2 and yellow perch in district 3 where the only survey indices that were above the long term mean in 2018.

Based on the current PSA performed on these two fish species, the risk level is considered to be low. Also, the catch and survey indices appear to indicate that none of these species has been experiencing impaired productivity. The outcome PIs for the species have been met at the SG 80 level. Based on the above, there is **some evidence** that the partial strategy is being **implemented successfully**. However, it is not clear at this stage if this can be considered **clear evidence** that the partial strategy is being **implemented successfully.** SG80 is likely met but not SG100.

UoA 6 (Yellow perch small mesh trapnet in Ohio MU2). White perch (not scored) is the only main secondary species in this UoA. SG80 and 100 are likely met.

UoA 7 (Yellow perch small mesh trapnet in Ohio MU3). No main secondary species in this UoA. SG80 and 100 are likely met.

UoA 8 (Walleye large mesh gill net in Lake Erie). White perch (not scored) and **white bass** are the two main secondary species in this UoA.

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[152] https://wildlife.ohiodnr.gov/portals/wildlife/pdfs/publications/laws%20&%20regs/pub002.pdf

PI 2.2.2	**There is a strategy in place for managing secondary species that is designed to maintain or to not hinder rebuilding of secondary species and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch**

White bass is not subject to active quota management[153]. Several management measures relate to all retained species in the walleye fishery: including limited entry, gear configuration and mesh size (89 mm minimum size), closed seasons and areas (see ON License Condition Appendix B). All these measures control fishing effort, offer some protection to nursery areas and minimize catch of juveniles. In Ohio's waters there is an additional measure of minimum landing size for white bass (11")[154].
Based on the fact the stock appears to be well above the 40% Unfished SSB target level for over 10 years there is **some evidence** that the partial strategy is being **implemented successfully**. However, it is not clear at this stage if this can be considered **clear evidence** that the partial strategy is being **implemented successfully.** SG80 is likely met but not SG100.

d	**Shark finning**			
	Guide post	It is **likely** that shark finning is not taking place.	It is **highly likely** that shark finning is not taking place.	There is a **high degree of certainty** that shark finning is not taking place.
	Met?	**NA**	**NA**	**NA**

Rationale

There is a **high degree of certainty** that shark finning is not taking place. No shark species occur in Lake Erie.

<table>
<tr><td rowspan="3">e</td><td colspan="4">Review of alternative measures to minimise mortality of unwanted catch</td></tr>
<tr><td>Guide post</td><td>There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main secondary species.</td><td>There is a regular review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main secondary species and they are implemented as appropriate.</td><td>There is a biennial review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of all secondary species, and they are implemented, as appropriate.</td></tr>
<tr><td>Met?</td>
<td><table>
<tr><td>UoA</td><td>Scoring element</td><td>Met?</td></tr>
<tr><td>UoA 1</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 2</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 3</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 4</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 5</td><td>Channel catfish and
Freshwater drum</td><td>Yes
Yes</td></tr>
<tr><td>UoA 6</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 7</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 8</td><td>White bass</td><td>Yes</td></tr>
</table></td>
<td><table>
<tr><td>UoA</td><td>Scoring element</td><td>Met?</td></tr>
<tr><td>UoA 1</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 2</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 3</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 4</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 5</td><td>Channel catfish and
Freshwater drum</td><td>Yes
Yes</td></tr>
<tr><td>UoA 6</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 7</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 8</td><td>White bass</td><td>Yes</td></tr>
</table></td>
<td><table>
<tr><td>UoA</td><td>Scoring element</td><td>Met?</td></tr>
<tr><td>UoA 1</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 2</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 3</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 4</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 5</td><td>Channel catfish and
Freshwater drum</td><td>No
No</td></tr>
<tr><td>UoA 6</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 7</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 8</td><td>White bass</td><td>Yes</td></tr>
</table></td></tr>
</table>

Rationale

UoA 1 (Yellow perch small mesh gillnet in Ontario QZ1). White perch (not scored) is the only main secondary species in this UoA. SG80 and SG 100 could be met.

UoA 2 (Yellow perch small mesh gillnet in Ontario QZ2). White perch (not scored) is the only main secondary species in this UoA. SG80 and SG 100 could be met.

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[153] https://www.nrcresearchpress.com/doi/abs/10.1139/cjfas-2017-0217%40cjfas-cfr/issue01#.Xaxt7ehKg2x
[154] https://wildlife.ohiodnr.gov/portals/wildlife/pdfs/publications/laws%20&%20regs/pub002.pdf

PI 2.2.2	**There is a strategy in place for managing secondary species that is designed to maintain or to not hinder rebuilding of secondary species and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch**

UoA 3 (Yellow perch small mesh gillnet in Ontario QZ3W). White perch (not scored) is the only main secondary species in this UoA. SG80 and SG 100 could be met.

UoA 4 (Yellow perch small mesh gillnet in Ontario QZ3E). No main secondary species in this UoA. SG80 and SG 100 could be met.

UoA 5 (Yellow perch small mesh trapnet in Ohio MU1). White perch (not scored), **channel catfish** and **freshwater drum** are the main secondary species in this UoA.

Harvest data inclusive of released (i.e. unwanted) catch of channel catfish and freshwater drum is available in MU1 since 2017.

Estimated release of channel catfish was 4.15% in 2017 and 37% in 2018.
Estimated release of freshwater drum was 6.3% in 2017 and 13% in 2018.

Both fish have swim bladder that makes them potentially susceptible to barotrauma if fished at relatively deep depths. Although not easily comparable with other species, having a swim bladder certainly affects the potential for barotrauma. In a recent study by Knight at. al. 2019[155], barotrauma resulting from discard mortality for Lake Erie yellow perch was calculated as having a small effect and affecting < 1% of lake-wide population size estimates. In another study (Eberts et al. 2019) [156], mortality from angling catch and release caused barotrauma of Walleye was found to be as high as 50%. Such studies may offer some insight into the possible release related mortality of channel catfish and freshwater drum since both species have swim bladders and may be affected by barotrauma. These studies review the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality (e.g. non-invasive descending) of important species which are also potentially applicable (in terms of potential barotrauma issues) to channel catfish and freshwater drum.

There is not a biennial review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of all secondary species, and related implementation, as appropriate. SG80 could be met but not SG 100.

UoA 6 (Yellow perch small mesh trapnet in Ohio MU2). White perch (not scored) is the only main secondary species in this UoA. SG80 and SG 100 could be met.

UoA 7 (Yellow perch small mesh trapnet in Ohio MU3). No main secondary species in this UoA. SG80 and SG 100 could be met.

UoA 8 (Walleye large mesh gill net in Lake Erie). White perch (not scored) and **white bass** are the two main secondary species in this UoA.

Based on catch information from the DCRs, discarded/released white bass in the walleye large mesh (>89 mm) fishery appears to be negligible. SG80 and SG 100 could be met.

References

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[155] https://fwspubs.org/doi/pdf/10.3996/062018-JFWM-056
[156] https://fwspubs.org/doi/pdf/10.3996/112017-JFWM-096

PI 2.2.2	There is a strategy in place for managing secondary species that is designed to maintain or to not hinder rebuilding of secondary species and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch
See footnotes within text.	

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

<table>
<tr><td colspan="2" rowspan="2">Individual scoring elements (add rows as required; delete if not scoring by elements)</td><td colspan="3">Applicable SGs <u>likely</u> met per individual scoring element</td><td rowspan="2"><u>Likely</u> scoring element scores</td></tr>
<tr><td>SG60</td><td>SG80</td><td>SG100</td></tr>
<tr><td rowspan="2">UoA 5</td><td>Scoring element 1 (channel catfish)</td><td>3 out of 3</td><td>4 out of 4</td><td>0 out of 4</td><td>≥80</td></tr>
<tr><td>Scoring element 2 (freshwater drum)</td><td>3 out of 3</td><td>4 out of 4</td><td>0 out of 4</td><td>≥80</td></tr>
<tr><td>UoA 8</td><td>Scoring element 1 (white bass)</td><td>3 out of 3</td><td>4 out of 4</td><td>1 out of 4</td><td>≥80</td></tr>
<tr><td>Other UoAs</td><td>No main/minor secondary species (NA automatically meets SGXX)</td><td>NA</td><td>NA</td><td>3 out of 4</td><td>≥80</td></tr>
<tr><td colspan="2" rowspan="3">Draft scoring range</td><td colspan="3">Applicable SGs/elements <u>likely</u> met</td><td rowspan="2"><u>Likely</u> overall PI score</td></tr>
<tr><td>SG60</td><td>SG80</td><td>SG100</td></tr>
<tr><td><table>
<tr><td>UoA</td><td>Met?</td></tr>
<tr><td>UoA 1</td><td>Yes</td></tr>
<tr><td>UoA 2</td><td>Yes</td></tr>
<tr><td>UoA 3</td><td>Yes</td></tr>
<tr><td>UoA 4</td><td>Yes</td></tr>
<tr><td>UoA 5</td><td>3 of 3</td></tr>
<tr><td>UoA 6</td><td>Yes</td></tr>
<tr><td>UoA 7</td><td>Yes</td></tr>
<tr><td>UoA 8</td><td>3 of 3</td></tr>
</table></td><td><table>
<tr><td>UoA</td><td>Met?</td></tr>
<tr><td>UoA 1</td><td>Yes</td></tr>
<tr><td>UoA 2</td><td>Yes</td></tr>
<tr><td>UoA 3</td><td>Yes</td></tr>
<tr><td>UoA 4</td><td>Yes</td></tr>
<tr><td>UoA 5</td><td>4 of 4</td></tr>
<tr><td>UoA 6</td><td>Yes</td></tr>
<tr><td>UoA 7</td><td>Yes</td></tr>
<tr><td>UoA 8</td><td>4 of 4</td></tr>
</table></td><td><table>
<tr><td>UoA</td><td>Met?</td></tr>
<tr><td>UoA 1</td><td>3 of 4</td></tr>
<tr><td>UoA 2</td><td>3 of 4</td></tr>
<tr><td>UoA 3</td><td>3 of 4</td></tr>
<tr><td>UoA 4</td><td>3 of 4</td></tr>
<tr><td>UoA 5</td><td>0 of 4</td></tr>
<tr><td>UoA 6</td><td>3 of 4</td></tr>
<tr><td>UoA 7</td><td>3 of 4</td></tr>
<tr><td>UoA 8</td><td>1 of 4</td></tr>
</table></td><td>All UoAs
≥80</td></tr>
<tr><td colspan="2">Information gap indicator</td><td colspan="4">Information is sufficient to score PI.</td></tr>
</table>

Overall Performance Indicator scores added from Client and Peer Review Draft Report

<table>
<tr><td colspan="2" rowspan="2">Individual scoring elements (add rows as required; delete if not scoring by elements)</td><td colspan="3">Applicable SGs met per individual scoring element</td><td rowspan="2">Scoring element scores</td></tr>
<tr><td>SG60</td><td>SG80</td><td>SG100</td></tr>
<tr><td>1</td><td>Scoring element 1</td><td>X of x</td><td>X of x</td><td>X of x</td><td></td></tr>
<tr><td>2</td><td>Scoring element 2</td><td>X of x</td><td>X of x</td><td>X of x</td><td></td></tr>
<tr><td>3</td><td>Scoring element 3</td><td>X of x</td><td>X of x</td><td>X of x</td><td></td></tr>
<tr><td>4</td><td>Scoring element 4</td><td>X of x</td><td>X of x</td><td>X of x</td><td></td></tr>
<tr><td colspan="2" rowspan="3">Overall Performance Indicator score</td><td colspan="3">Applicable SGs/elements met</td><td rowspan="2">Overall score</td></tr>
<tr><td>SG60</td><td>SG80</td><td>SG100</td></tr>
<tr><td>X of x</td><td>X of x</td><td>X of x</td><td></td></tr>
<tr><td colspan="5">Condition number (if relevant)</td><td></td></tr>
</table>

PI 2.2.3 – Secondary species information

<table>
<tr><th colspan="2">PI 2.2.3</th><th colspan="3">Information on the nature and amount of secondary species taken is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage secondary species</th></tr>
<tr><td colspan="2">Scoring Issue</td><td>SG 60</td><td>SG 80</td><td>SG 100</td></tr>
<tr><td rowspan="3">a</td><td colspan="4">Information adequacy for assessment of impacts on main secondary species</td></tr>
<tr><td>Guide post</td><td>Qualitative information is adequate to estimate the impact of the UoA on the main secondary species with respect to status.

OR

If RBF is used to score PI 2.2.1 for the UoA:

Qualitative information is adequate to estimate productivity and susceptibility attributes for main secondary species.</td><td>Some quantitative information is available and adequate to assess the impact of the UoA on main secondary species with respect to status.

OR

If RBF is used to score PI 2.2.1 for the UoA:

Some quantitative information is adequate to assess productivity and susceptibility attributes for main secondary species.</td><td>Quantitative information is available and adequate to assess with a high degree of certainty the impact of the UoA on main secondary species with respect to status.</td></tr>
<tr><td>Met?</td><td><table>
<tr><td>UoA</td><td>Scoring element</td><td>Met?</td></tr>
<tr><td>UoA 1</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 2</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 3</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 4</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 5</td><td>Channel catfish and Freshwater drum</td><td>Yes
Yes</td></tr>
<tr><td>UoA 6</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 7</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 8</td><td>White bass</td><td>Yes</td></tr>
</table></td><td><table>
<tr><td>UoA</td><td>Scoring element</td><td>Met?</td></tr>
<tr><td>UoA 1</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 2</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 3</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 4</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 5</td><td>Channel catfish and Freshwater drum</td><td>Yes
Yes</td></tr>
<tr><td>UoA 6</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 7</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 8</td><td>White bass</td><td>Yes</td></tr>
</table></td><td><table>
<tr><td>UoA</td><td>Scoring element</td><td>Met?</td></tr>
<tr><td>UoA 1</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 2</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 3</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 4</td><td>None</td><td>Yes</td></tr>
<tr><td>UoA 5</td><td>Channel catfish and Freshwater drum</td><td>No
No</td></tr>
<tr><td>UoA 6</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 7</td><td>none</td><td>Yes</td></tr>
<tr><td>UoA 8</td><td>White bass</td><td>Yes</td></tr>
</table></td></tr>
</table>

Rationale

UoA 1 (Yellow perch small mesh gillnet in Ontario QZ1). White perch (not scored) is the only main secondary species in this UoA. SG 80 and SG 100 may be met.

UoA 2 (Yellow perch small mesh gillnet in Ontario QZ2). White perch (not scored) is the only main secondary species in this UoA. SG 80 and SG 100 may be met.

UoA 3 (Yellow perch small mesh gillnet in Ontario QZ3W). White perch (not scored) is the only main secondary species in this UoA. SG 80 and SG 100 may be met.

UoA 4 (Yellow perch small mesh gillnet in Ontario QZ3E). No main secondary species in this UoA. SG 80 and SG 100 may be met.

UoA 5 (Yellow perch small mesh trapnet in Ohio MU1). White perch (not scored), **channel catfish** and **freshwater drum** are the main secondary species in this UoA.

As per Ohio regulations in Lake Erie, trap net licensees are required to keep an accurate daily record of their catch (quota and non-quota species) on an electronic catch reporting system as established by the chief of the Division of Wildlife. The licensee shall pay the cost of the electronic equipment, operation, installation, and maintenances of these devices and any replacement thereof.
Sufficient quantitative information is adequate to assess productivity and susceptibility attributes for main secondary species channel catfish and freshwater drum. These species are also monitored through various surveys (e.g. western trawl survey). See the P2 background section for further information. SG 80 may be met but not SG 100.

PI 2.2.3	**Information on the nature and amount of secondary species taken is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage secondary species**

UoA 6 (Yellow perch small mesh trapnet in Ohio MU2). White perch (not scored) is the only main secondary species in this UoA. SG 80 and SG 100 may be met.

UoA 7 (Yellow perch small mesh trapnet in Ohio MU3). No main secondary species in this UoA. SG 80 and SG 100 may be met.

UoA 8 (Walleye large mesh gill net in Lake Erie). White perch (not scored) and **white bass** are the two main secondary species in this UoA.

The statistical catch-at-age model for white bass uses fisheries independent and dependent data from Ontario and Ohio. West and central basin data, and not east basin data, are included in the model because this is where the vast majority of white bass harvest takes place.

Fisheries independent data include:
- Ontario Partnership Gill Net Survey (catch rate, age composition)
- Ohio Gill Net Survey (catch rate, weight-at-age, and age composition)

Fisheries dependent data:
- Ontario Commercial Gill Net (catch, effort, age composition)
- Ohio Trap Net (catch, effort)
- Ohio Open-Water Creel (catch, effort, age composition)

There were several assumptions that were made for the purposes of data analysis.

Quantitative information is available and **adequate to assess with a high degree of certainty** the impact of the UoA on white bass with respect to status. SG 80 and 100 may be met.

<table>
<tr><td rowspan="3">b</td><td colspan="4">Information adequacy for assessment of impacts on minor secondary species</td></tr>
<tr><td>Guide post</td><td></td><td></td><td>Some quantitative information is adequate to estimate the impact of the UoA on minor secondary species with respect to status.</td></tr>
<tr><td>Met?</td><td></td><td></td><td><table><tr><td>UoA</td><td>Met?</td></tr><tr><td>UoA 1</td><td>No</td></tr><tr><td>UoA 2</td><td>No</td></tr><tr><td>UoA 3</td><td>No</td></tr><tr><td>UoA 4</td><td>No</td></tr><tr><td>UoA 5</td><td>No</td></tr><tr><td>UoA 6</td><td>No</td></tr><tr><td>UoA 7</td><td>No</td></tr><tr><td>UoA 8</td><td>No</td></tr></table></td></tr>
</table>

Rationale

All UoAs

For the most part, only catch information are currently available for the many minor species (most of which representing 0.1% of the overall UoA catch) associated with UoAs of this report.

Quantitative information is not adequate to estimate the impact of the UoAs on minor secondary species with respect to status.

PI 2.2.3	**Information on the nature and amount of secondary species taken is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage secondary species**		
c	**Information adequacy for management strategy**		
Guide post	Information is adequate to support **measures** to manage **main** secondary species.	Information is adequate to support a **partial strategy** to manage **main** secondary species.	Information is adequate to support a **strategy** to manage **all** secondary species, and **evaluate** with a **high degree of certainty** whether the strategy is **achieving its objective**.
Met?	see below	see below	see below

Met? (SG 60):

UoA	Scoring element	Met?
UoA 1	None	Yes
UoA 2	None	Yes
UoA 3	None	Yes
UoA 4	None	Yes
UoA 5	Channel catfish and Freshwater drum	Yes Yes
UoA 6	none	Yes
UoA 7	none	Yes
UoA 8	White bass	Yes

Met? (SG 80):

UoA	Scoring element	Met?
UoA 1	None	Yes
UoA 2	None	Yes
UoA 3	None	Yes
UoA 4	None	Yes
UoA 5	Channel catfish and Freshwater drum	Yes Yes
UoA 6	none	Yes
UoA 7	none	Yes
UoA 8	White bass	Yes

Met? (SG 100):

UoA	Met?
UoA 1	No
UoA 2	No
UoA 3	No
UoA 4	No
UoA 5	No
UoA 6	No
UoA 7	No
UoA 8	No

Rationale

UoA 1 (Yellow perch small mesh gillnet in Ontario QZ1). White perch (not scored) is the only main secondary species in this UoA. SG 80 may be met but not SG 100 since information to manage all (major + minor) secondary species in the UoA is missing.

UoA 2 (Yellow perch small mesh gillnet in Ontario QZ2). White perch (not scored) is the only main secondary species in this UoA. SG 80 may be met but not SG 100 since information to manage all (major + minor) secondary species in the UoA is missing.

UoA 3 (Yellow perch small mesh gillnet in Ontario QZ3W). White perch (not scored) is the only main secondary species in this UoA. SG 80 may be met but not SG 100 since information to manage all (major + minor) secondary species in the UoA is missing.

UoA 4 (Yellow perch small mesh gillnet in Ontario QZ3E). No main secondary species in this UoA. SG 80 may be met but not SG 100 since information to manage all (major + minor) secondary species in the UoA is missing.

UoA 5 (Yellow perch small mesh trapnet in Ohio MU1). White perch (not scored), **channel catfish** and **freshwater drum** are the main secondary species in this UoA.

Sufficient quantitative information is adequate to assess productivity and susceptibility attributes for main secondary species channel catfish and freshwater drum. These species are also monitored through various surveys (e.g. western trawl survey). See the P2 background section for further information. Catch data (e.g. catch monitoring system, DCRs, dockside monitoring, sampling) and survey information to monitor trends in abundance is available to support a partial strategy including the ability to detect any changes in risk level to channel catfish and freshwater drum, e.g., due to potential changes in the operation of the UoA or the effectiveness or implementation of the management system.

SG 80 may be met but not SG 100 since information to manage all (major + minor) secondary species in the UoA is missing.

PI 2.2.3	Information on the nature and amount of secondary species taken is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage secondary species

UoA 6 (Yellow perch small mesh trapnet in Ohio MU2). White perch (not scored) is the only main secondary species in this UoA. SG 80 may be met but not SG 100 since information to manage all (major + minor) secondary species in the UoA is missing.

UoA 7 (Yellow perch small mesh trapnet in Ohio MU3). No main secondary species in this UoA. SG 80 may be met but not SG 100 since information to manage all (major + minor) secondary species in the UoA is missing.

UoA 8 (Walleye large mesh gill net in Lake Erie). White perch (not scored) and **white bass** are the two main secondary species in this UoA.

The statistical catch-at-age model for white bass uses fisheries independent and dependent data from Ontario and Ohio. West and central basin data, and not east basin data, are included in the model because this is where the vast majority of white bass harvest takes place. Fisheries dependent (e.g. catch monitoring system, DCRs, dockside monitoring, sampling) together with abundance surveys provide the information necessary and independent data collected and used for the SCA model assessment of white bass are is considered sufficient to support a partial strategy including the ability to detect any changes in risk level to white bass, e.g., due to potential changes in the operation of the UoA or the effectiveness or implementation of the management system. SG 80 may be met but not SG 100 since information to manage all (major + minor) secondary species in the UoA is missing.

References

As referenced in the text.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

<table>
<tr><th colspan="2" rowspan="2">Individual scoring elements (add rows as required; delete if not scoring by elements)</th><th colspan="3">Applicable SGs likely met per individual scoring element</th><th rowspan="2">Likely scoring element scores</th></tr>
<tr><th>SG60</th><th>SG80</th><th>SG100</th></tr>
<tr><td rowspan="2">UoA 5</td><td>Scoring element 1 (channel catfish)</td><td>2 of 2</td><td>2 of 2</td><td>0 of 3</td><td>≥80</td></tr>
<tr><td>Scoring element 2 (freshwater drum)</td><td>2 of 2</td><td>2 of 2</td><td>0 of 3</td><td>≥80</td></tr>
<tr><td>UoA 8</td><td>Scoring element 1 (white bass)</td><td>2 of 2</td><td>2 of 2</td><td>1 of 3</td><td>≥80</td></tr>
<tr><td>Other UoAs</td><td>No main/minor secondary species (NA automatically meets SGXX)</td><td>NA</td><td>NA</td><td>1 of 3</td><td>≥80</td></tr>
<tr><td colspan="2" rowspan="3">Draft scoring range</td><td colspan="3">Applicable SGs/elements likely met</td><td rowspan="2">Likely overall PI score</td></tr>
<tr><td>SG60</td><td>SG80</td><td>SG100</td></tr>
<tr><td><table><tr><th>UoA</th><th>Met?</th></tr><tr><td>UoA 1</td><td>Yes</td></tr><tr><td>UoA 2</td><td>Yes</td></tr><tr><td>UoA 3</td><td>Yes</td></tr><tr><td>UoA 4</td><td>Yes</td></tr><tr><td>UoA 5</td><td>2 of 2</td></tr><tr><td>UoA 6</td><td>Yes</td></tr><tr><td>UoA 7</td><td>Yes</td></tr><tr><td>UoA 8</td><td>2 of 2</td></tr></table></td><td><table><tr><th>UoA</th><th>Met?</th></tr><tr><td>UoA 1</td><td>Yes</td></tr><tr><td>UoA 2</td><td>Yes</td></tr><tr><td>UoA 3</td><td>Yes</td></tr><tr><td>UoA 4</td><td>Yes</td></tr><tr><td>UoA 5</td><td>2 of 2</td></tr><tr><td>UoA 6</td><td>Yes</td></tr><tr><td>UoA 7</td><td>Yes</td></tr><tr><td>UoA 8</td><td>2 of 2</td></tr></table></td><td><table><tr><th>UoA</th><th>Met?</th></tr><tr><td>UoA 1</td><td>1 of 3</td></tr><tr><td>UoA 2</td><td>1 of 3</td></tr><tr><td>UoA 3</td><td>1 of 3</td></tr><tr><td>UoA 4</td><td>1 of 3</td></tr><tr><td>UoA 5</td><td>0 of 3</td></tr><tr><td>UoA 6</td><td>1 of 3</td></tr><tr><td>UoA 7</td><td>1 of 3</td></tr><tr><td>UoA 8</td><td>1 of 3</td></tr></table></td><td>All UoAs
≥80</td></tr>
</table>

PI 2.2.3	**Information on the nature and amount of secondary species taken is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage secondary species**
Information gap indicator	Information sufficient to score PI

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Individual scoring elements (add rows as required; delete if not scoring by elements)		Applicable SGs met per individual scoring element			Scoring element scores
		SG60	SG80	SG100	
1	Scoring element 1	X of x	X of x	X of x	
2	Scoring element 2	X of x	X of x	X of x	
3	Scoring element 3	X of x	X of x	X of x	
4	Scoring element 4	X of x	X of x	X of x	
Overall Performance Indicator score		Applicable SGs/elements met			Overall score
		SG60	SG80	SG100	
		X of x	X of x	X of x	
Condition number (if relevant)					

PI 2.3.1 – ETP species outcome

PI 2.3.1		**The UoA meets national and international requirements for the protection of ETP species** **The UoA does not hinder recovery of ETP species**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Effects of the UoA on population/stock within national or international limits, where applicable**			
	Guide post	Where national and/or international requirements set limits for ETP species, the **effects of the UoA** on the population/ stock are known and **likely** to be within these limits.	Where national and/or international requirements set limits for ETP species, the **combined effects of the MSC UoAs** on the population /stock are known and **highly likely** to be within these limits.	Where national and/or international requirements set limits for ETP species, there is a **high degree of certainty** that the **combined effects of the MSC UoAs** are within these limits.
	Met?	NA	NA	NA

Rationale

No national or international limits are set for ETP species. Accordingly, the team has scored PI 2.3.1 SI b. Please refer to the next scoring issue.

b	**Direct effects**			
	Guide post	Known direct effects of the UoA are likely to not **hinder recovery** of ETP species.	Direct effects of the UoA are **highly likely** to not **hinder recovery** of ETP species.	There is a **high degree of confidence** that there are no **significant detrimental direct effects** of the UoA on ETP species.
	Met?	UoA 1 Y UoA 2 Y UoA 3 Y UoA 4 Y UoA 5 Y UoA 6 Y UoA 7 Y UoA 8 Y	UoA 1 Y UoA 2 Y UoA 3 Y UoA 4 Y UoA 5 Y UoA 6 Y UoA 7 Y UoA 8 Y	UoA 1 N UoA 2 N UoA 3 N UoA 4 N UoA 5 Y UoA 6 Y UoA 7 Y UoA 8 N

Rationale

All ETP species overlapping with Lake Erie by virtue of their management jurisdiction and distribution have been described in the ETP Background section. Based on that, no detrimental effects on any specific ETP species have been identified and as such, no individual ETP species scoring element has been selected. Furthermore, management evidence and information were also found to be homogeneous across UoAs (e.g. those in Canada and Ohio) and species. For each UoA, ETP species are therefore assessed in PI 2.3.1, 2.3.2, and 2.3.3 as a group.

Canada, Ontario ETP Species in QZ1 - QZ3 (W&E) yellow perch small mesh gillnet fishery and the walleye commercial large mesh gillnet fishery operating in Ontario waters of Lake Erie.

Common Name	Scientific Name	SARO Classification
Fish		
Eastern Sand Darter	*Ammocrypta pellucida*	END
Lake chubsucker	*Erimyzon sucetta*	THR
Lake Sturgeon	*Acipenser fulvescens*	END
Northern Madtom	*Noturus stigmosus*	END
Pugnose Minnow	*Opsopoeodus emiliae*	THR
Pugnose shiner	*Notropis anogenus*	THR
River darter	*Percina shumardi*	END
Shortjaw cisco	*Coregonus zenithicus*	THR

Silver Chub	*Macrhybopsis storeriana*	THR
Spotted Gar	*Lepisosteus oculatus*	END
Warmouth	*Lepomis gulosus*	END
Mussels		
Round pigtoe	*Pleurobema sintoxia*	END
Turtles		
Spiny softshell	*Apalone spinifera*	END

None of the Species At Risk in Ontario (SARO) listed species under the 2007 Canadian Endangered Species Act (ESA) overlaps geographically and/or interacts with gillnet gear in so far as becoming significantly at risk of bycatch from the above-mentioned fishery. Mussels are not caught in gillnet gear. No catch of these species has been recorded in the DCRs in the past 5 years but there are two exceptions worth mentioning:

1. Some small catches of Lake Sturgeon have been recorded in the past 5 years in the yellow perch (released catch in the past 5 years average 81 pounds per year) and walleye fisheries (catch in 2016-2018 was virtually none, released catch in 2015 and 2014 averaged about 475 pounds each year). Based on available catch data Lake Sturgeon is always released back to the water alive, and was found to be marked as released in the DCR accordingly to regulation. Accordingly, the fishery is not considered to affect this species.
2. Lake chubsucker. It is unclear if Lake chubsucker interacts with the gill nets targeting Walleye and Yellow perch since suckers are reported in daily catch reports as one group, aside from white sucker which is reported separately. There is little potential, although size is > 26 cm, for interactions with the gill net gear targeting Walleye and Yellow perch because of the lack of evidence for overlapping distributions (i.e. lake chubsucker populations occur in definite bays and national Parks/National Wildlife Areas of Lake Erie). Accordingly, the fishery is not considered to affect this species due to limited overlap.

The Ontario Commercial Food Fishing License Conditions for 2019 (Appendix B) state that any no harvest permitted species, SARO species or wildlife species that are caught and are still alive must be released in a manner which causes the least harm to the fish or wildlife. Fish must be returned to the water immediately in accordance with the Ontario Fishery Regulations. Each released species must be recorded on the DCR in number of individuals released.

Furthermore, when no harvest permitted fish species, including invasive species and SARO species, are caught and are no longer alive, they must be separated from the catch and recorded on the DCR in number of individuals caught and turned over to a Port Observer or Conservation Officer at the time of inspection. If a Port Observer or Conservation Officer is not present, these fish shall NOT be landed until a Port Observer or Conservation Officer is contacted for direction on disposal.

Because the overlap with the mentioned ETP species is not considered significant in terms of causing mortality, the UoAs are highly likely to not hinder recovery of ETP species. These fisheries are not considered to negatively affect any of these ETP species or affect their rebuilding. **SG 80 is likely met.** However, it is not clear if the available DCR data is alone showing a **high degree of confidence** that there are no **significant detrimental direct effects** of the UoAs on ETP species. **SG 100 may not be met.**

US, Ohio ETP Species in yellow perch trapnet fishery, MU1 to MU3.

Species common and latin name	Status
Bean, rayed (*Villosa fabalis*)	END
Catspaw, white (pearlymussel) (*Epioblasma obliquata perobliqua*)	END
Clubshell (*Pleurobema clava*)	END
Fanshell (*Cyprogenia stegaria*)	END

PI 2.3.1	The UoA meets national and international requirements for the protection of ETP species The UoA does not hinder recovery of ETP species

Madtom, Scioto (*Noturus trautmani*)	END
Mucket, pink (pearlymussel) (*Lampsilis abrupta*)	END
Mussel, sheepnose (*Plethobasus cyphyus*)	END
Mussel, snuffbox (*Epioblasma triquetra*)	END
Purple Cat's paw (*Epioblasma obliquata obliquata*)	END
Rabbitsfoot (*Quadrula cylindrica cylindrica*)	THR
Riffleshell, northern (*Epioblasma torulosa rangiana*)	END

The ETP species listed above are protected under the US Endangered Species Act. The vast majority of these mussels occur in Ohio but do not have a distribution overlapping with Lake Erie (with the exception of northern riffleshell and clubshell). Even for those two species where there is some distribution we note that mussels are not caught in gillnet gear and there are no records in Daily Catch Reports. The only potential effect could be attributed to anchors used in gillnet gear and resting on the lakebed. However, even the extent of this effect is considered remote/negligible given the miniscule footprint of these anchors when compared to the size of Lake Erie. Gear footprint has been analysed in the Habitat background section.

Because the overlap with the mentioned ETP species is not considered significant in terms of its potential to cause mortality, the UoAs in questions are highly likely to not hinder recovery of ETP species. These fisheries are not considered to negatively affect these ETP species or affect their rebuilding. **SG 80 is likely met.**

Given that all the ETP species in these UoAs are mussels and mussels are not caught in gillnet, there is a **high degree of confidence** that there are no **significant detrimental direct effects** of the UoAs on ETP species. **SG 100 is likely met.**

c	**Indirect effects**			
	Guide post		Indirect effects have been considered for the UoA and are thought to be **highly likely** to not create unacceptable impacts.	There is a **high degree of confidence** that there are no **significant detrimental indirect effects** of the UoA on ETP species.
	Met?		UoA 1 Y, UoA 5 Y UoA 2 Y, UoA 6 Y UoA 3 Y, UoA 7 Y UoA 4 Y, UoA 8 Y	UoA 1 N, UoA 5 N UoA 2 N, UoA 6 N UoA 3 N, UoA 7 N UoA 4 N, UoA 8 N

Rationale

Canada, Ontario ETP Species in QZ 1- QZ3 (W&E) yellow perch small mesh gillnet fishery and the walleye commercial large mesh gillnet fishery operating in Ontario waters of Lake Erie.

Ghost fishing is not considered an issue for potential bycatch of ETP fish species. Gear footprint and the potential for gear related damage (through anchors deployed on the lakebed) is considered negligible on mussels. Indirect effects have been considered for the UoA and are thought to be **highly likely** to not create unacceptable impacts. **SG 80 is likely met.**

Since specific ETP impacts evaluations relating to these fisheries have not been carried out it is not clear if there is a **high degree of confidence** that there are no **significant detrimental indirect effects** of the UoA on ETP species. **SG 100 is not likely met.**

US, Ohio ETP Species in yellow perch trapnet fishery, MU1 to MU3.

PI 2.3.1	The UoA meets national and international requirements for the protection of ETP species The UoA does not hinder recovery of ETP species

Gear footprint and the potential for gear related damage (through anchors deployed on the lakebed) is considered negligible on mussels. Indirect effects have been considered for the UoA and are thought to be **highly likely** to not create unacceptable impacts. **SG 80 is likely met.**

Since specific ETP impacts evaluations relating to these fisheries have not been carried out it is not clear if there is a **high degree of confidence** that there are no **significant detrimental indirect effects** of the UoA on ETP species. **SG 100 is not likely met.**

References
As referenced in the text.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

	Applicable SGs/elements likely met			Likely overall PI score
	SG60	SG80	SG100	
Draft scoring range	UoA 1 1 of 1 UoA 5 1 of 1 UoA 2 1 of 1 UoA 6 1 of 1 UoA 3 1 of 1 UoA 7 1 of 1 UoA 4 1 of 1 UoA 8 1 of 1	UoA 1 2 of 2 UoA 5 2 of 2 UoA 2 2 of 2 UoA 6 2 of 2 UoA 3 2 of 2 UoA 7 2 of 2 UoA 4 2 of 2 UoA 8 2 of 2	UoA 1 0 of 2 UoA 5 1 of 2 UoA 2 0 of 2 UoA 6 1 of 2 UoA 3 0 of 2 UoA 7 1 of 2 UoA 4 0 of 2 UoA 8 0 of 2	**All UoAs** ≥80
Information gap indicator	Information is sufficient to score PI.			

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Individual scoring elements (add rows as required; delete if not scoring by elements)		Applicable SGs met per individual scoring element			Scoring element scores
		SG60	SG80	SG100	
1	Scoring element 1	X of x	X of x	X of x	
2	Scoring element 2	X of x	X of x	X of x	
3	Scoring element 3	X of x	X of x	X of x	
4	Scoring element 4	X of x	X of x	X of x	
Overall Performance Indicator score		Applicable SGs/elements met			Overall score
		SG60	SG80	SG100	
		X of x	X of x	X of x	
Condition number (if relevant)					

PI 2.3.2 – ETP species management strategy

PI 2.3.2		The UoA has in place precautionary management strategies designed to: - meet national and international requirements; - ensure the UoA does not hinder recovery of ETP species. Also, the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of ETP species		
Scoring Issue		SG 60	SG 80	SG 100
a	**Management strategy in place (national and international requirements)**			
	Guide post	There are **measures** in place that minimise the UoA-related mortality of ETP species, and are expected to be **highly likely to achieve** national and international requirements for the protection of ETP species.	There is a **strategy** in place for managing the UoA's impact on ETP species, including measures to minimise mortality, which is designed to be **highly likely to achieve** national and international requirements for the protection of ETP species.	There is a **comprehensive strategy** in place for managing the UoA's impact on ETP species, including measures to minimise mortality, which is designed to **achieve above** national and international requirements for the protection of ETP species.
	Met?	UoA 1 Y UoA 5 Y UoA 2 Y UoA 6 Y UoA 3 Y UoA 7 Y UoA 4 Y UoA 8 Y	UoA 1 Y UoA 5 Y UoA 2 Y UoA 6 Y UoA 3 Y UoA 7 Y UoA 4 Y UoA 8 Y	UoA 1 Y UoA 5 Y UoA 2 Y UoA 6 Y UoA 3 Y UoA 7 Y UoA 4 Y UoA 8 Y

Rationale

Canada, Ontario ETP Species in QZ 1- QZ3 (W&E) yellow perch small mesh gillnet fishery and the walleye commercial large mesh gillnet fishery operating in Ontario waters of Lake Erie.

The UoAs impacts on ETP species are considered negligible. ETP Species At Risk in Ontario are protected under the 2007 Canadian Endangered Species Act[157]. Once a species is listed on the SARO, prohibitions automatically apply such as prohibitions on killing the species or destroying its habitat.

Both in Ontario and federally, in addition to prohibitions on harming species or their habitats, recovery strategies must be established for species at risk. Under the ESA, recovery strategies must be prepared for threatened and endangered species. Section 11 of the ESA mandates the creation of a recovery strategy, which shall include:

1. Identification of the habitat needs of the species;
2. A description of the threats to the survival and recovery of the species;
3. Recommendations to the minister and other persons on:
    - objectives for the protection and recovery of the species,
    - approaches to achieve the objectives recommended under subparagraph I,b and
    - the area that should be considered in developing a regulation under clause 55(1)(a) that prescribes an area as the habitat of the species.

The recovery plans and strategies prepared for each ETP species form a comprehensive strategy for managing the UoAs impacts on these species. **SG 80 and 100 is likely met.**

US, Ohio ETP Species in yellow perch trapnet fishery, MU1 to MU3.

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[157] https://www.ontario.ca/laws/regulation/080230

PI 2.3.2	The UoA has in place precautionary management strategies designed to: - meet national and international requirements; - ensure the UoA does not hinder recovery of ETP species. Also, the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of ETP species

The UoAs impacts on ETP species are considered negligible. ETP Species in Ohio are protected under the US Endangered Species Act. There are over 1,300 species listed as either endangered or threatened in the United States under the ESA[158].

NMFS manages the marine species, and the FWS manages the remainder of the listed species, the terrestrial and freshwater species. Their responsibilities include:

- listing and delisting species,
- designating critical habitat,
- developing recovery plans, and
- evaluating the status of the species every 5 years in five-year reviews.

The recovery plans prepared for each ETP species form a comprehensive strategy for managing the UoAs impacts on these species. **SG 80 and 100 is likely met.**

b	**Management strategy in place (alternative)**			
	Guide post	There are **measures** in place that are expected to ensure the UoA does not hinder the recovery of ETP species.	There is a **strategy** in place that is expected to ensure the UoA does not hinder the recovery of ETP species.	There is a **comprehensive strategy** in place for managing ETP species, to ensure the UoA does not hinder the recovery of ETP species.
	Met?	**NA**	**NA**	**NA**

Rationale

NA

<table>
<tr><td>c</td><td colspan="4">Management strategy evaluation</td></tr>
<tr><td></td><td>Guide post</td><td>The measures are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/species).</td><td>There is an objective basis for confidence that the measures/strategy will work, based on information directly about the fishery and/or the species involved.</td><td>The strategy/comprehensive strategy is mainly based on information directly about the fishery and/or species involved, and a quantitative analysis supports high confidence that the strategy will work.</td></tr>
<tr><td></td><td>Met?</td>
<td><table><tr><td>UoA 1</td><td>Y</td><td>UoA 5</td><td>Y</td></tr><tr><td>UoA 2</td><td>Y</td><td>UoA 6</td><td>Y</td></tr><tr><td>UoA 3</td><td>Y</td><td>UoA 7</td><td>Y</td></tr><tr><td>UoA 4</td><td>Y</td><td>UoA 8</td><td>Y</td></tr></table></td>
<td><table><tr><td>UoA 1</td><td>Y</td><td>UoA 5</td><td>Y</td></tr><tr><td>UoA 2</td><td>Y</td><td>UoA 6</td><td>Y</td></tr><tr><td>UoA 3</td><td>Y</td><td>UoA 7</td><td>Y</td></tr><tr><td>UoA 4</td><td>Y</td><td>UoA 8</td><td>Y</td></tr></table></td>
<td><table><tr><td>UoA 1</td><td>N</td><td>UoA 5</td><td>N</td></tr><tr><td>UoA 2</td><td>N</td><td>UoA 6</td><td>N</td></tr><tr><td>UoA 3</td><td>N</td><td>UoA 7</td><td>N</td></tr><tr><td>UoA 4</td><td>N</td><td>UoA 8</td><td>N</td></tr></table></td>
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Rationale

Canada, Ontario ETP Species in QZ 1- QZ3 (W&E) yellow perch small mesh gillnet fishery and the walleye commercial large mesh gillnet fishery operating in Ontario waters of Lake Erie.

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[158] https://www.epa.gov/endangered-species/endangered-species-species-information-factsheets

PI 2.3.2	The UoA has in place precautionary management strategies designed to: - meet national and international requirements; - ensure the UoA does not hinder recovery of ETP species. Also, the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of ETP species

None of the Species At Risk in Ontario (SARO) listed species under the 2007 Canadian Endangered Species Act (ESA) overlaps geographically and/or interacts with gillnet gear in so far as becoming significantly at risk of bycatch from the above mentioned fisheries. ETP species accidentally taken must be recorded and released alive. Daily Catch Reports have catch information on ETP species (e.g. data is available on released lake sturgeon). Mussels are not caught in gillnet gear. There is an objective basis for confidence that the strategy will work, based on information directly about the species involved. **SG 80 would be met.** However, the lack of a quantitative analysis on the potential impact of the fisheries means that SG100 may not be met.

US, Ohio ETP Species in yellow perch trapnet fishery, MU1 to MU3

The vast majority of these mussels occur in Ohio but do not have a distribution overlapping with Lake Erie (with the exception of northern riffleshell and clubshell). Even for those two species where there is some distribution we note that mussels are not caught in gillnet gear and there are no records in Daily Catch Reports. The only potential effect could be attributed to anchors used in gillnet gear and resting on the lakebed. However, the extent of this effect is considered negligible given the miniscule footprint of these anchors when compared to the size of Lake Erie. Gear footprint has been analysed in the Habitat background section. There is an objective basis for confidence that the strategy will work, based on information directly about the species involved. **SG 80 would be met.** However, the lack of a quantitative analysis on the potential impact of the fisheries means that SG100 may not be met.

d	**Management strategy implementation**			
	Guide post		There is some **evidence** that the measures/strategy is being implemented successfully.	There is **clear evidence** that the strategy/comprehensive strategy is being implemented successfully and **is achieving its objective as set out in scoring issue (a) or (b).**
	Met?		UoA 1 Y, UoA 5 Y UoA 2 Y, UoA 6 Y UoA 3 Y, UoA 7 Y UoA 4 Y, UoA 8 Y	UoA 1 N, UoA 5 N UoA 2 N, UoA 6 N UoA 3 N, UoA 7 N UoA 4 N, UoA 8 N

Rationale

Canada, Ontario ETP Species in QZ 1- QZ3 (W&E) yellow perch small mesh gillnet fishery and the walleye commercial large mesh gillnet fishery operating in Ontario waters of Lake Erie.

Recovery plans/strategies required under the Canadian ESA are being implemented and published and there are assessments and evaluations reports for ETP species. While ETP species caught are to be recorded in DCRs and vessel logbooks, this is not confirmed by observers, since there is not a dedicated observer or equivalent (on the water) verification scheme. There is some **evidence** that the measures/strategy is being implemented successfully. **SG 80 would be met.** SG100 may not be met.

US, Ohio ETP Species in yellow perch trapnet fishery, MU1 to MU3

The strategies defined under US ESA recovery plans are being implemented and there is ongoing monitoring, assessments and evaluations. The lack of concern about the potential impact of fishing gear on ETP mussel species indicates that the strategy is being implemented successfully; although there is no clear evidence that this is the case. **SG 80 would be met.** SG100 may not be met.

PI 2.3.2	**The UoA has in place precautionary management strategies designed to:** **- meet national and international requirements;** **- ensure the UoA does not hinder recovery of ETP species.** **Also, the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of ETP species**			
e	**Review of alternative measures to minimize mortality of ETP species**			
	Guide post	There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of ETP species.	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of ETP species and they are implemented as appropriate.	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of ETP species, and they are implemented, as appropriate.
	Met?	UoA 1 Y, UoA 5 Y UoA 2 Y, UoA 6 Y UoA 3 Y, UoA 7 Y UoA 4 Y, UoA 8 Y	UoA 1 Y, UoA 5 Y UoA 2 Y, UoA 6 Y UoA 3 Y, UoA 7 Y UoA 4 Y, UoA 8 Y	UoA 1 N, UoA 5 N UoA 2 N, UoA 6 N UoA 3 N, UoA 7 N UoA 4 N, UoA 8 N

Rationale

Canada, Ontario ETP Species in QZ 1- QZ3 (W&E) yellow perch small mesh gillnet fishery and the walleye commercial large mesh gillnet fishery operating in Ontario waters of Lake Erie.

The UoAs impacts on ETP species is considered negligible. The Act currently requires the minister to produce a recovery strategy for every species newly listed as endangered or threatened and nine months later, implement a policy setting out the actions the minister will take to work towards the objectives of the recovery strategy. The Minister has the right to determine the relative priority to be given to the implementation of actions referred to in those statements, and no later than 5 years after a statement is published the Minister shall ensure that a review is conducted of progress towards the protection and recovery of the species[159]. There is a regular review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of ETP species and they are implemented as appropriate. However it cannot be said that there is a biennial review. **SG 80 would be met.** SG100 may not be met.

US, Ohio ETP Species in yellow perch trapnet fishery, MU1 to MU3.

The UoAs impacts on ETP species is considered negligible. As part of the US ESA, NMFS manages the marine species, and the FWS manages the remainder of the listed species, the terrestrial and freshwater species. Among other, their responsibilities include the evaluation of the status of listed species every 5 years in formal five-year reviews. There is a regular review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of ETP species and they are implemented as appropriate. However it cannot be said that there is a biennial review. **SG 80 would be met.** SG100 may not be met.

References

As referenced in the text.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	Applicable SGs/elements likely met			Likely overall PI score
	SG60	SG80	SG100	

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[159] https://www.ilercampbell.com/blog/wp-content/uploads/Species-at-Risk-6-Minute-Environmental-Lawer-Paula-Boutis.pdf

PI 2.3.2	**The UoA has in place precautionary management strategies designed to:** **- meet national and international requirements;** **- ensure the UoA does not hinder recovery of ETP species.** **Also, the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of ETP species**

	UoA 1	3 of 3	UoA 5	3 of 3	UoA 1	4 of 4	UoA 5	4 of 4	UoA 1	1 of 4	UoA 5	1 of 4	**All UoAs** ≥80
	UoA 2	3 of 3	UoA 6	3 of 3	UoA 2	4 of 4	UoA 6	4 of 4	UoA 2	1 of 4	UoA 6	1 of 4	
	UoA 3	3 of 3	UoA 7	3 of 3	UoA 3	4 of 4	UoA 7	4 of 4	UoA 3	1 of 4	UoA 7	1 of 4	
	UoA 4	3 of 3	UoA 8	3 of 3	UoA 4	4 of 4	UoA 8	4 of 4	UoA 4	1 of 4	UoA 8	1 of 4	

Information gap indicator	Information sufficient to score PI

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Individual scoring elements (add rows as required; delete if not scoring by elements)		Applicable SGs met per individual scoring element			Scoring element scores
		SG60	SG80	SG100	
1	Scoring element 1	X of x	X of x	X of x	
2	Scoring element 2	X of x	X of x	X of x	
3	Scoring element 3	X of x	X of x	X of x	
4	Scoring element 4	X of x	X of x	X of x	

Overall Performance Indicator score	Applicable SGs/elements met			Overall score
	SG60	SG80	SG100	
	X of x	X of x	X of x	
Condition number (if relevant)				

PI 2.3.3 – ETP species information

PI 2.3.3	**Relevant information is collected to support the management of UoA impacts on ETP species, including:** **- Information for the development of the management strategy;** **- Information to assess the effectiveness of the management strategy; and** **- Information to determine the outcome status of ETP species**			
Scoring Issue		SG 60	SG 80	SG 100
a	**Information adequacy for assessment of impacts**			
	Guide post	Qualitative information is **adequate to estimate** the UoA related mortality on ETP species. **OR** **If RBF is used to score PI 2.3.1 for the UoA:** Qualitative information is **adequate to estimate productivity and susceptibility** attributes for ETP species.	Some quantitative information is **adequate to assess** the UoA related mortality and impact and to determine whether the UoA may be a threat to protection and recovery of the ETP species. **OR** **If RBF is used to score PI 2.3.1 for the UoA:** Some quantitative information is **adequate to assess productivity and susceptibility attributes** for ETP species.	Quantitative information is available to assess with a high degree of certainty the **magnitude of UoA-related impacts, mortalities and injuries and the consequences for the status** of ETP species.
	Met?	UoA 1 Y, UoA 5 Y UoA 2 Y, UoA 6 Y UoA 3 Y, UoA 7 Y UoA 4 Y, UoA 8 Y	UoA 1 Y, UoA 5 Y UoA 2 Y, UoA 6 Y UoA 3 Y, UoA 7 Y UoA 4 Y, UoA 8 Y	UoA 1 N, UoA 5 N UoA 2 N, UoA 6 N UoA 3 N, UoA 7 N UoA 4 N, UoA 8 N

Rationale

Canada, Ontario ETP Species in QZ 1- QZ3 (W&E) yellow perch small mesh gillnet fishery and the walleye commercial large mesh gillnet fishery operating in Ontario waters of Lake Erie.

The Ontario Commercial Food Fishing License Conditions for 2019 (Appendix B) state that any no harvest permitted species, SARO species or wildlife species that are caught and are still alive must be released in a manner which causes the least harm to the fish or wildlife. Fish must be returned to the water immediately in accordance with the Ontario Fishery Regulations. Each released species must be recorded on the DCR in number of individuals released.

When no harvest permitted fish species, including invasive species and SARO species, are caught and are no longer alive, they must be separated from the catch and recorded on the DCR in number of individuals caught and turned over to a Port Observer or Conservation Officer at the time of inspection. If a Port Observer or Conservation Officer is not present, these fish shall NOT be landed until a Port Observer or Conservation Officer is contacted for direction on disposal.

Furthermore, there are routine assessments (every 5 years)[160] to assess ETP species status. This information allows to understand the overlap of the ETP species with the UoA.

ETP species are recorded in DCRs. Some quantitative information is **adequate to assess** the UoA related mortality and impact and to determine whether the UoA may be a threat to protection and recovery of the ETP species. **SG 80 could be met.**

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[160] https://www.ontario.ca/page/species-risk-ontario

PI 2.3.3	Relevant information is collected to support the management of UoA impacts on ETP species, including: - Information for the development of the management strategy; - Information to assess the effectiveness of the management strategy; and - Information to determine the outcome status of ETP species

However, it is not clear if quantitative information is available to assess with a high degree of certainty the magnitude of UoA-related impacts, mortalities and injuries and the consequences for the status of ETP species. **SG 100 may not be met.**

US, Ohio ETP Species in yellow perch trapnet fishery, MU1 to MU3

As per Ohio regulations in Lake Erie, trap net licensees are required to keep an accurate daily record of their catch (quota and non-quota species) on an electronic catch reporting system as established by the chief of the Division of Wildlife. The licensee shall pay the cost of the electronic equipment, operation, installation, and maintenances of these devices and any replacement thereof.

Each species listed under the US ESA is assessed with information[161] that include, as appropriate and available, information on current range, candidate information, federal Register documentation (e.g. notice of 5-year reviews, determination of Endangered/Threatened status, proposal to list), recovery plans, 5-year status reviews, biological opinions, critical habitats and conservation plans. This information allows to understand the overlap of the ETP species with the UoA. As part of the ESA, endangered species cannot be retained and must be released to their environment with the least possible harm.

Some quantitative information is **adequate to assess** the UoA related mortality and impact and to determine whether the UoA may be a threat to protection and recovery of the ETP species. **SG 80 is likely met.**

However, it is not clear if quantitative information is available to assess with a high degree of certainty the magnitude of UoA-related impacts, mortalities and injuries and the consequences for the status of ETP species. **SG 100 may not be met.**

b	**Information adequacy for management strategy**			
	Guide post	Information is adequate to support **measures** to manage the impacts on ETP species.	Information is adequate to measure trends and support a **strategy** to manage impacts on ETP species.	Information is adequate to support a **comprehensive strategy** to manage impacts, minimize mortality and injury of ETP species, and evaluate with a **high degree of certainty** whether a strategy is achieving its objectives.
	Met?	UoA 1 Y, UoA 5 Y UoA 2 Y, UoA 6 Y UoA 3 Y, UoA 7 Y UoA 4 Y, UoA 8 Y	UoA 1 Y, UoA 5 Y UoA 2 Y, UoA 6 Y UoA 3 Y, UoA 7 Y UoA 4 Y, UoA 8 Y	UoA 1 N, UoA 5 N UoA 2 N, UoA 6 N UoA 3 N, UoA 7 N UoA 4 N, UoA 8 N

Rationale

Canada, Ontario ETP Species in QZ 1- QZ3 (W&E) yellow perch small mesh gillnet fishery and the walleye commercial large mesh gillnet fishery operating in Ontario waters of Lake Erie.

There are routine assessments (every 5 years) to assess ETP species status. This information allows to understand the overlap of the ETP species with the UoA. ETP species are recorded in DCRs.

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[161] https://ecos.fws.gov/ecp/species-reports

PI 2.3.3	**Relevant information is collected to support the management of UoA impacts on ETP species, including:** **- Information for the development of the management strategy;** **- Information to assess the effectiveness of the management strategy; and** **- Information to determine the outcome status of ETP species**

Information is adequate to measure trends and support a **strategy** to manage impacts on ETP species. **SG 80 is likely met.**

However, it is not clear if information is adequate to support a comprehensive strategy to manage impacts, minimize mortality and injury of ETP species, and evaluate with a high degree of certainty whether a strategy is achieving its objectives. SG 100 is not likely met.

US, Ohio ETP Species in yellow perch trapnet fishery, MU1 to MU3

Each species listed under the US ESA is assessed with information that include, as appropriate and available, information on current range, candidate information, federal Register documentation (e.g. notice of 5-year reviews, determination of Endangered/Threatened status, proposal to list), recovery plans, 5-year status reviews, biological opinions, critical habitats and conservation plans. This information allows to understand the overlap of the ETP species with the UoA. As part of the ESA, endangered species cannot be retained and must be released to their environment with the least possible harm.

Information is adequate to measure trends and support a **strategy** to manage impacts on ETP species. **SG 80 is likely met.**

However, it is not clear if information is adequate to support a comprehensive strategy to manage impacts, minimize mortality and injury of ETP species, and evaluate with a high degree of certainty whether a strategy is achieving its objectives. SG 100 is not likely met.

References

As referenced in the text.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

	Applicable SGs/elements likely met												Likely overall PI score
	SG60				SG80				SG100				
Draft scoring range	UoA 1	2 of 2	UoA 5	2 of 2	UoA 1	2 of 2	UoA 5	2 of 2	UoA 1	0 of 2	UoA 5	0 of 2	**All UoAs** ≥80
	UoA 2	2 of 2	UoA 6	2 of 2	UoA 2	2 of 2	UoA 6	2 of 2	UoA 2	0 of 2	UoA 6	0 of 2	
	UoA 3	2 of 2	UoA 7	2 of 2	UoA 3	2 of 2	UoA 7	2 of 2	UoA 3	0 of 2	UoA 7	0 of 2	
	UoA 4	2 of 2	UoA 8	2 of 2	UoA 4	2 of 2	UoA 8	2 of 2	UoA 4	0 of 2	UoA 8	0 of 2	
Information gap indicator	Information is sufficient to score PI.												

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Individual scoring elements (add rows as required; delete if not scoring by elements)		Applicable SGs met per individual scoring element			Scoring element scores
		SG60	SG80	SG100	
1	Scoring element 1	X of x	X of x	X of x	
2	Scoring element 2	X of x	X of x	X of x	

PI 2.3.3		**Relevant information is collected to support the management of UoA impacts on ETP species, including:** **- Information for the development of the management strategy;** **- Information to assess the effectiveness of the management strategy; and** **- Information to determine the outcome status of ETP species**			
3	Scoring element 3	X of x	X of x	X of x	
4	Scoring element 4	X of x	X of x	X of x	
Overall Performance Indicator score		Applicable SGs/elements met			Overall score
		SG60	SG80	SG100	
		X of x	X of x	X of x	
Condition number (if relevant)					

PI 2.4.1 – Habitats outcome

PI 2.4.1		**The UoA does not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area covered by the governance body(s) responsible for fisheries management in the area(s) where the UoA operates**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Commonly encountered habitat status**			
	Guide post	The UoA is **unlikely** to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.	The UoA is **highly unlikely** to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.	There is **evidence** that the UoA is highly unlikely to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.
	Met?	Commonly encountered habitat = muddy / sandy lake substrate **Yes All UoAs**	Commonly encountered habitat = muddy / sandy lake substrate **Yes All UoAs**	Commonly encountered habitat = muddy / sandy lake substrate **No All UoAs**

Rationale

All UoAs in Lake Erie

Lake Erie’s habitat is divided in Aquatic Ecological Units that divide the lake as Coastal Margin (eastern and southern edges of Western Basin), Shallow nearshore (first 4-5 miles of the nearshore area around the rest of the lake including the entirety of the Western basin), Shallow offshore (rest of the waters after the Shallow nearshore) and the Deep offshore (deep water area in the Eastern basin). The U.S. EPA Great Lakes National Program Office (GLNPO) Biology Monitoring Program assesses the long-term status and trends of the lower food web in the open waters of the Great Lakes. The Program's annual monitoring of the Great Lakes began in 1983 for lakes Michigan, Huron, and Erie, in 1986 for Ontario, and in 1992 for Superior initially focused on chemical eutrophication in response to phosphorus load[162]. Recognizing the importance of the benthic community in the evaluation and management of the Great Lakes, GLNPO added a benthic invertebrate monitoring program in 1997. A unique aspect of GLNPO's benthic monitoring program is the extent of coverage, which includes all five lakes and collects data from 58 permanent stations on an annual basis.

In terms of geomorphology, most of the lake substrate is muddy, with an area of sand dividing the Eastern and Central basin, clay cover in the Northern nearshore area of the Central basin, and mixed patches of rock, clay and sand substrate in the central Western basin. The western basin is separated from the rest of the lake by a series of islands and shoals running from west of Huron, Ohio, to Point Pelee, Ontario.

A 2018 research study by Burkalova et al.[163] analysed the benthic community of the Laurentian Great Lakes, including Lake Erie in terms of spatial gradients and temporal trends from 1998 to 2014. In Lake Erie, across the study time series, total Oligochaeta (aquatic worms) density increased at most stations, with the strongest trends observed in western and central basins. Densities of Turbellaria (a class of worms, most of which are not parasitic) increased as well. Mysis (a freshwater crustacean know as opossum shrimp) was last recorded in the eastern basin in 2006, and no Diporeia (a borrowing crustacean) have been found in the lake since the beginning of the monitoring program (1997). The total benthic density increased lake-wide, with largest increases observed in the western and eastern basins. This was due in part to the increase in Dreissena (invasive zebra / quagga mussels) density, however the trend was also positive without inclusion of Dreissena in the analyses. Tubificidae are a family of clitellate oligochaete worms and were most abundant in depths > 70 in Lake Erie over the study timeframe.

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[162] https://www.sciencedirect.com/science/article/pii/S0380133018300510
[163] https://www.sciencedirect.com/science/article/pii/S0380133018300510

PI 2.4.1	The UoA does not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area covered by the governance body(s) responsible for fisheries management in the area(s) where the UoA operates

Fishery managers stated that fishing gear's anchors generally end up in muddy sediment with little biodiversity aside from the invertebrates living in it, and because of that, habitat impacts were thought to be quite minimal. From an Ohio perspective, near shore and reef zones (i.e. an elevation of rock shown to be above the surrounding bottom area of the lake) are all close to fishing (pers. comm. Brian Locke, Manager, Lake Erie Management Unit - Ontario Ministry of Natural Resources and Forestry; Travis Hartman, Lake Erie Program Administrator, Ohio Department of Natural Resources, off-site conference call meeting, October 10th 2019).

Gillnets and trapnets are stationary gear but there might be limited dragging in current. Potential impacts of gillnet and trapnet gear used in these UoAs would be derived by the deployment of anchors and lead line on the lake bed. Given the limited intensity (and footprint) of the fishery, along with the nature of the Lake substrate which is mostly mud with associated invertebrate communities, impacts are considered to be negligible. The footprint of impacts resulting from anchors deployment has been calculated.

Ontario small mesh gillnet yellow perch fishery. Given that Lake Erie has an area of 25,744 km^2 and half of this would roughly be Canadian jurisdiction (i.e. 12,872 km^2), and assuming effort is more or less even across this area, the impacted area each year would be 0.00006% , which is considered negligible.

Lake Erie large mesh walleye fishery. Considering that MU1-MU3 represent about 70% of the Lake Erie Area of 25,744 km^2, and assuming effort is more or less even across the area, the impacted area each year would be 0.0003108%, which is considered negligible.

Ohio Yellow perch small mesh trapnet fishery. Considering that MU1 to MU3 would occupy about 70% of the overall area of Lake Erie within Ohio's jurisdiction (assumed to be approximately 50% of the total Lake Erie area) and total approx. 9,010 km^2, and assuming the effort is more or less even across the area, the impacted area each year would be 0.000022%, which is considered negligible.

The (weight) impact of the lead lines used in these gears has not been calculated but is considered to be quite limited because although the lead line would lie on the lake bed across a distance, its weight would be distributed very widely across the line, and would almost certainly not exert the same weight and pressure on potential vulnerable sea bed biota (e.g. certain mussel species) as an anchor would (i.e. 20 lbs per 0.5 m^2 communicated by client group).

The UoAs are highly unlikely to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm. **SG 80 is likely met.**

However, since there have not been specific studies to evaluate the effects of the gear on habitat it is not clear if the fisheries can meet SG 100.

b	**VME habitat status**			
	Guide post	The UoA is **unlikely** to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm.	The UoA is **highly unlikely** to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm.	There is **evidence** that the UoA is highly unlikely to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm.
	Met?	**Yes All UoAs**	**Yes All UoAs**	**No All UoAs**

PI 2.4.1	The UoA does not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area covered by the governance body(s) responsible for fisheries management in the area(s) where the UoA operates

Rationale

All UoAs in Lake Erie

Vulnerable habitats /ecosystems in Lake Erie

Based on available information, there does not appear to be vulnerable habitats or ecosystems in Lake Erie as would be found in marine ecosystems (e.g. seamounts, hydrothermal vents, cold water corals and sponge fields). However, some records of freshwater sponges have shown to exist in the Great Lakes area, where 4 species of Porifera sponges were found in Southern Lake Michigan, on the hull of a permanently moored long ship[164]. Save for a few isolated reports, very little is known of the diversity or distribution of freshwater sponges across the Great Lakes region[165].

However, as explained earlier, the potential for negative effects of gillnet and trapnet anchors used in the yellow perch and walleye fisheries of Lake Erie appear to be extremely limited in scale. Due to their likely absence, the UoAs are highly unlikely to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm. SG 80 may be met but not likely SG 100.

c	**Minor habitat status**			
	Guide post			There is **evidence** that the UoA is highly unlikely to reduce structure and function of the minor habitats to a point where there would be serious or irreversible harm.
	Met?			Minor habitat = rocky reef zones **No All UoAs**

Rationale

All UoAs in Lake Erie

Although the potential for negative effects of gillnet and trapnet anchors used in the yellow perch and walleye fisheries of Lake Erie appear to be extremely limited in scale, there does not appear to be specific evidence that the UoAs in question are highly unlikely to reduce structure and function of the minor habitats (e.g. rocky reef zones) of Lake Erie to a point where there would be serious or irreversible harm. **SG 100 is not likely met.**

References

As referenced in text.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Applicable SGs likely met per individual	Likely scoring element scores			Likely overall PI score
	SG60	SG100	SG100	

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[164] https://www.sciencedirect.com/science/article/pii/S038013309670936X

[165] https://glsponges.lab.uic.edu/wp-content/uploads/2016/02/great-lakes-freshwater-sponge-study-overview.pdf

PI 2.4.1	**The UoA does not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area covered by the governance body(s) responsible for fisheries management in the area(s) where the UoA operates**			
All UoAs - Scoring element 1 (Commonly encountered habitat = muddy / sandy lake substrate)	2 of 2	2 of 2	0 of 2	≥80
All UoAs - Scoring element 2 (Minor habitat = rocky reef zones)	NA	NA	0 of 1	≥80
Information gap indicator	Information is sufficient to score PI.			
Overall Performance Indicator score	Applicable SGs/elements met			Overall Score
	SG60	SG80	SG100	
	UoA Met? All 2 of 2	UoA Met? All 2 of 2	UoA Met? All 0 of 3	**All UoAs** ≥80

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Individual scoring elements (add rows as required; delete if not scoring by elements)	Applicable SGs met per individual scoring element			Scoring element scores
	SG60	SG80	SG100	
1 Scoring element 1	X of x	X of x	X of x	
2 Scoring element 2	X of x	X of x	X of x	
3 Scoring element 3	X of x	X of x	X of x	
4 Scoring element 4	X of x	X of x	X of x	
Overall Performance Indicator score	Applicable SGs/elements met			Overall score
	SG60	SG80	SG100	
	X of x	X of x	X of x	
Condition number (if relevant)				

PI 2.4.2 – Habitats management strategy

PI 2.4.2		**There is a strategy in place that is designed to ensure the UoA does not pose a risk of serious or irreversible harm to the habitats**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Management strategy in place**			
	Guide post	There are **measures** in place, if necessary, that are expected to achieve the Habitat Outcome 80 level of performance.	There is a **partial strategy** in place, if necessary, that is expected to achieve the Habitat Outcome 80 level of performance or above.	There is a **strategy** in place for managing the impact of all MSC UoAs/non-MSC fisheries on habitats.
	Met?	**Yes All UoAs**	**Yes All UoAs**	**No All UoAs**

Rationale

All UoAs

The potential for negative effects of gillnet and trapnet anchors used in the yellow perch and walleye fisheries of Lake Erie appear to be extremely limited in scale. As it is considered that the gear does not damage habitat, neither measures nor a partial strategy are needed. Closed seasons/areas are also in place. Additionally, maintenance of the current fishing regime in terms of scale, practice and intensity is considered to be a relevant partial strategy. Closed areas/season further reduce the potential impact on benthic habitat.

Further to the above in relation to habitat research/management, the LEC has a dedicated Habitat Working Group (HTG), which publishes activity reports every year. The Lake Erie HTG published their 2019 annual report in March 2019[166] in which they discuss recent work that entailed a three-step approach to systematically derive Priority Management Areas (PMAs) important to Lake Erie. The PMAs is set to guide fisheries value in strategic plans such as the lake wide action plan and is being used in the development of the 2019-2023 Lake Erie-Lakewide Action Management Plan (LAMP)[167], which itself was up for public review and comment until the 26th of August 2019.[168]

The HTG and Great Lakes Aquatic Habitat Framework (GLAHF) will collaboratively explore ways to transition the PMA dataset into a geospatial framework. This will increase the power of the approach by minimizing effects the weighting of information in well studied Functional Habitats and improve the accessibility of the data for fisheries biologist, managers and other environmental organizations by enabling better data visualization. **SG 80 would be met.**

At the same time, a strategy to manage the impact of all fisheries on habitat has not been defined and implemented. SG 100 may not be met.

b	**Management strategy evaluation**			
	Guide post	The measures are **considered likely** to work, based on plausible argument (e.g. general experience, theory or comparison with similar UoAs/habitats).	There is some **objective basis for confidence** that the measures/partial strategy will work, based on **information directly about the UoA and/or habitats** involved.	**Testing** supports **high confidence** that the partial strategy/strategy will work, based on **information directly about the UoA and/or habitats** involved.

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[166] http://www.glfc.org/pubs/lake_committees/erie/HTG_docs/annual_reports/HTG_AnnualReport2018.pdf

[167] https://binational.net/wp-content/uploads/2019/06/Draft-Lake-Erie-LAMP-061819-English.pdf

[168] https://binational.net/2019/06/27/2019-erie-lamp-paap/

PI 2.4.2	**There is a strategy in place that is designed to ensure the UoA does not pose a risk of serious or irreversible harm to the habitats**			
	Met?	**Yes All UoAs**	**Yes All UoAs**	**No All UoAs**

Rationale

All UoAs

Information on the fishing operations and their habitat footprint in the walleye and yellow perch commercial fisheries in Lake Erie, continuous habitat research and monitoring activities, VMS, DCRs and log books provide the information for the fishery to satisfy SG60. Such information is sufficient to inform managers on the nature of impacts, the spatial extent of interaction and the timing and location relating to the setting, soaking and lifting of the gillnets. Accordingly, there is some objective basis for confidence that the current partial strategy will work, based on information directly about the UoA and habitats involved. The fisheries may meet SG80.

Since no specific testing has been carried out the fishery may not meet SG 100.

c	**Management strategy implementation**			
	Guide post		There is **some quantitative evidence** that the measures/partial strategy is being implemented successfully.	There is **clear quantitative evidence** that the partial strategy/strategy is being implemented successfully and is achieving its objective, as outlined in scoring issue (a).
	Met?		**Yes All UoAs**	**No All UoAs**

Rationale

All UoAs

The potential for negative effects of gillnet and trapnet anchors used in the yellow perch and walleye fisheries of Lake Erie appear to be extremely limited in scale. There is some quantitative evidence on gear characteristics and use, fishery footprint, the type of habitat and the limited scale and intensity if the fisheries that indicate the partial strategy is being implemented successfully. **The fisheries may meet SG80.**

Lack of a clear quantitative evidence indicates that the fishery may not meet the SG100.

d	**Compliance with management requirements and other MSC UoAs'/non-MSC fisheries' measures to protect VMEs**			
	Guide post	There is **qualitative evidence** that the UoA complies with its management requirements to protect VMEs.	There is **some quantitative evidence** that the UoA complies with both its management requirements and with protection measures afforded to VMEs by other MSC UoAs/non-MSC fisheries, where relevant.	There is **clear quantitative evidence** that the UoA complies with both its management requirements and with protection measures afforded to VMEs by other MSC UoAs/non-MSC fisheries, where relevant.
	Met?	**Yes All UoAs**	**Yes All UoAs**	**No All UoAs**

Rationale

All UoAs in Lake Erie

Vulnerable habitats /ecosystems in Lake Erie

PI 2.4.2	**There is a strategy in place that is designed to ensure the UoA does not pose a risk of serious or irreversible harm to the habitats**
Based on available information, there does not appear to be vulnerable habitats or ecosystems in Lake Erie as would be found in marine ecosystems (e.g. seamounts, hydrothermal vents, cold water corals and sponge fields). However, some records of freshwater sponges have shown to exist in the Great Lakes area, where 4 species of Porifera sponges were found in Southern Lake Michigan, on the hull of a permanently moored long ship[169]. Save for a few isolated reports, very little is known of the diversity or distribution of freshwater sponges across the Great Lakes region[170]. As explained earlier, the potential for negative effects of gillnet and trapnet anchors used in the yellow perch and walleye fisheries of Lake Erie appear to be extremely limited in scale. SG 80 may be met but not likely SG 100.	
References	
As referenced in the text.	

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	Applicable SGs/elements likely met			Likely overall PI score
	SG60	SG80	SG100	
	Yes All UoAs	**Yes All UoAs**	**No All UoAs**	**All UoAs ≥80**
Information gap indicator	Information sufficient to score PI			

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Individual scoring elements (add rows as required; delete if not scoring by elements)		Applicable SGs met per individual scoring element			Scoring element scores
		SG60	SG80	SG100	
1	Scoring element 1	X of x	X of x	X of x	
2	Scoring element 2	X of x	X of x	X of x	
3	Scoring element 3	X of x	X of x	X of x	
4	Scoring element 4	X of x	X of x	X of x	
Overall Performance Indicator score		Applicable SGs/elements met			Overall score
		SG60	SG80	SG100	
		X of x	X of x	X of x	
Condition number (if relevant)					

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[169] https://www.sciencedirect.com/science/article/pii/S038013309670936X

[170] https://glsponges.lab.uic.edu/wp-content/uploads/2016/02/great-lakes-freshwater-sponge-study-overview.pdf

PI 2.4.3 – Habitats information

PI 2.4.3		**Information is adequate to determine the risk posed to the habitat by the UoA and the effectiveness of the strategy to manage impacts on the habitat**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Information quality**			
	Guide post	The types and distribution of the main habitats are **broadly understood**. **OR** **If CSA is used to score PI 2.4.1 for the UoA:** Qualitative information is adequate to estimate the types and distribution of the main habitats.	The nature, distribution and **vulnerability** of the main habitats in the UoA area are known at a level of detail relevant to the scale and intensity of the UoA. **OR** **If CSA is used to score PI 2.4.1 for the UoA:** Some quantitative information is available and is adequate to estimate the types and distribution of the main habitats.	The distribution of all habitats is known over their range, with particular attention to the occurrence of vulnerable habitats.
	Met?	All UoAs - Scoring element 1 (Commonly encountered habitat = muddy / sandy lake substrate) **Yes All UoAs**	All UoAs - Scoring element 1 (Commonly encountered habitat = muddy / sandy lake substrate) **Yes All UoAs**	All UoAs - Scoring element 1 (Commonly encountered habitat = muddy / sandy lake substrate) **No All UoAs** All UoAs - Scoring element 2 (Minor habitat = rocky reef zones) **No All UoAs**

Rationale

All UoAs

The types and distribution of main habitats in Lake Erie are broadly understood. These are mainly mud softbottom with associated invertebrate communities. A large number of surveys has mapped the distribution of these habitats[171]. Data to classify the geomorphology of Lake Erie was compiled by many sources over years ranging from 1968-present. The majority of sources are published journal articles with maps that were heads-up digitized. Lake Erie Habitat Task Group data was collected by side scan sonar and proofed with grab samples and underwater video. The shoreline material was extended from the shoreline to the nearshore areas (0 - 30 m of depth) areas of all the Great Lakes except Erie. The shoreline material information is from the U.S. Army Corps of Engineers (2012) and the shoreline classification from Environment Canada Environmental Sensitivity Atlas (1990s).

Vulnerable habitats such as nursery areas are protected from commercial operations.

The nature, distribution and vulnerability of the main habitats in the UoAs area of Lake Erie are known at a level of detail relevant to the scale and intensity of the UoAs. **SG80 is likely met.**

It is not clear if the distribution of all habitats is known over their range, with particular attention to the occurrence of vulnerable habitats. SG 100 is not likely met.

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[171] https://www.glahf.org/explorer/

PI 2.4.3	Information is adequate to determine the risk posed to the habitat by the UoA and the effectiveness of the strategy to manage impacts on the habitat			
b	**Information adequacy for assessment of impacts**			
	Guide post	Information is adequate to broadly understand the nature of the main impacts of gear use on the main habitats, including spatial overlap of habitat with fishing gear. OR **If CSA is used to score PI 2.4.1 for the UoA:** Qualitative information is adequate to estimate the consequence and spatial attributes of the main habitats.	Information is adequate to allow for identification of the main impacts of the UoA on the main habitats, and there is reliable information on the spatial extent of interaction and on the timing and location of use of the fishing gear. OR **If CSA is used to score PI 2.4.1 for the UoA:** Some quantitative information is available and is adequate to estimate the consequence and spatial attributes of the main habitats.	The physical impacts of the gear on all habitats have been quantified fully.
	Met?	All UoAs - Scoring element 1 (Commonly encountered habitat = muddy / sandy lake substrate) **Yes All UoAs**	All UoAs - Scoring element 1 (Commonly encountered habitat = muddy / sandy lake substrate) **Yes All UoAs**	All UoAs - Scoring element 1 (Commonly encountered habitat = muddy / sandy lake substrate) **No All UoAs** All UoAs - Scoring element 2 (Minor habitat = rocky reef zones) **No All UoAs**

Rationale

All UoAs

Information is adequate to allow for identification of the main impacts of the yellow perch and walleye UoAs on the main habitats of Lake Erie. These are mainly mud softbottom with associated invertebrate communities. A large number of surveys has mapped the distribution of these habitats[172]. Data to classify the geomorphology of Lake Erie was compiled by many sources over years ranging from 1968-present. There is reliable information on the spatial extent of interaction (e.g. effort in the yellow perch and walleye fisheries) and on the timing and location of use of the fishing gear. Given the limited intensity (and footprint) of the fishery, along with the nature of the Lake substrate which is mostly mud with associated invertebrate communities, impacts are considered to be negligible. The footprint of impacts resulting from anchors deployment has been calculated.

Ontario small mesh gillnet yellow perch fishery. Given that Lake Erie has an area of 25,744 km^2 and half of this would roughly be Canadian jurisdiction (i.e. 12,872 km^2), and assuming effort is more or less even across this area, the impacted area each year would be 0.00006% , which is considered negligible.

Lake Erie large mesh walleye fishery. Considering that MU1-MU3 represent about 70% of the Lake Erie Area of 25,744 km^2, and assuming effort is more or less even across the area, the impacted area each year would be 0.0003108%, which is considered negligible.

Ohio Yellow perch small mesh trapnet fishery. Considering that MU1 to MU3 would occupy about 70% of the overall area of Lake Erie within Ohio's jurisdiction (assumed to be approximately 50% of the total Lake Erie area) and total

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[172] https://www.glahf.org/explorer/

PI 2.4.3	Information is adequate to determine the risk posed to the habitat by the UoA and the effectiveness of the strategy to manage impacts on the habitat

approx. 9,010 km2, and assuming the effort is more or less even across the area, the impacted area each year would be 0.000022%, which is considered negligible.

SG 80 is likely met.

There is no clear information to substantiate that the physical impacts of the gear on all habitats have been quantified fully. SG 100 is not likely met.

c	**Monitoring**			
	Guide post		Adequate information continues to be collected to detect any increase in risk to the main habitats.	Changes in all habitat distributions over time are measured.
	Met?		All UoAs - Scoring element 1 (Commonly encountered habitat = muddy / sandy lake substrate) **Yes All UoAs**	All UoAs - Scoring element 1 (Commonly encountered habitat = muddy / sandy lake substrate) **No All UoAs** All UoAs - Scoring element 2 (Minor habitat = rocky reef zones) **No All UoAs**

Rationale

All UoAs

Adequate information continues to be collected to detect any increase in risk to the main habitats. There are routine assessments that take part under the U.S. EPA Great Lakes National Program Office (GLNPO) Biology Monitoring Program[173] to assess the long-term status and trends of the lower food web in the open waters of the Great Lakes. One of their key functions is to identify, protect, and restore important habitats, and monitor and report on environmental status and trends[174]. The Program's annual monitoring of the Great Lakes began in 1983 for lakes Michigan, Huron, and Erie, in 1986 for Ontario, and in 1992 for Superior initially focused on chemical eutrophication in response to phosphorus load. Recognizing the importance of the benthic community in the evaluation and management of the Great Lakes, GLNPO added a benthic invertebrate monitoring program in 1997. A unique aspect of GLNPO's benthic monitoring program is the extent of coverage, which includes all five lakes and collects data from 58 permanent stations on an annual basis.

The LEC Habitat Task Group is quite central for of any habitat related research for Lake Erie. They had three charges in 2018-2019[175]. The main charge related to:

1) Develop and maintain a list of functional habitats and impediments for species specified by the LEC Fish Community Objectives (FCOs). Accordingly, the HTG and other technical experts identified 116 Functional Habitats used by 139 distinct fish stocks of the 13 species identified in the FCOs. Of these Functional Habitats (FHs), 12 were identified as very high and, and 15 high PMAs. Within the top 10 PMAs, the highest ranked habitat actions range from site specific actions such as dam removal, fish passageways, shoreline softening/naturalization, to broad scale regional actions such as conservation of local stocks and watershed management to reduce of nutrient and sediment loading into Lake Erie. This first list of PMAs now provides a tool to the HTG and LEC which will aid in the development of lake specific EPs and communication of fisheries priorities to align activities with other environmental

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[173] https://www.sciencedirect.com/science/article/pii/S0380133018300510

[174] https://www.epa.gov/aboutepa/about-great-lakes-national-program-office-glnpo

[175] http://www.glfc.org/pubs/lake_committees/erie/HTG_docs/annual_reports/HTG_ExecutiveSummary2019.pdf

PI 2.4.3	Information is adequate to determine the risk posed to the habitat by the UoA and the effectiveness of the strategy to manage impacts on the habitat

management groups in Lake Erie. The 2019 HTG report includes project overviews for 9 different habitat and research projects underway or completed in medium to high PMAs across the Lake Erie basin.

Furthermore, the U.S.-Canada Great Lakes Water Quality Agreement (Annex 1 of the 2012 Protocol) defines AOCs as "geographic areas designated by the Parties where significant impairment of beneficial uses has occurred as a result of human activities at the local level." An AOC is a location that has experienced environmental degradation. EPA and other federal and state agencies are working to restore the 27 remaining U.S. AOCs in the Great Lakes basin[176]. 10 of these AOCs directly impact Lake Erie. 1 AOC has been delisted recently (Presque Isle Bay) and two rivers have management actions completed[177]. The majority of these are rivers connected to Lake Erie and influencing the habitats and ecosystems of the Basin. These areas are routinely monitored.

Adequate information continues to be collected to detect any increase in risk to the main habitats. **SG 80 is likely met.** However, it is not clear at this point if changes in all habitat distributions over time are measured. SG 100 is not likely met.

References
As referenced within the text.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Individual scoring elements (add rows as required; delete if not scoring by elements)	Applicable SGs met per individual scoring element			Scoring element scores
	SG60	SG80	SG100	
All UoAs - Scoring element 1 (Commonly encountered habitat = muddy / sandy lake substrate)	2 of 2	3 of 3	0 of 3	≥80
All UoAs - Scoring element 2 (Minor habitat = rocky reef zones). NA automatically scores SGXX.	NA	NA	0 of 3	≥80
Draft scoring range	Applicable SGs/elements likely met			Likely overall PI score
	SG60	SG80	SG100	
	UoA Met? All 2 of 2	UoA Met? All 3 of 3	UoA Met? All 0 of 3	**All UoAs** ≥80
Information gap indicator	Information is sufficient to score PI.			

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Individual scoring elements (add rows as required; delete if not scoring by elements)		Applicable SGs met per individual scoring element			Scoring element scores
		SG60	SG80	SG100	
1	Scoring element 1	X of x	X of x	X of x	

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[176] https://www.epa.gov/great-lakes-aocs/progress-aocs

[177] https://www.epa.gov/sites/production/files/2019-06/documents/aoc_map_b3_text_002.pdf

PI 2.4.3	Information is adequate to determine the risk posed to the habitat by the UoA and the effectiveness of the strategy to manage impacts on the habitat				
2	Scoring element 2	X of x	X of x	X of x	
3	Scoring element 3	X of x	X of x	X of x	
4	Scoring element 4	X of x	X of x	X of x	
Overall Performance Indicator score		Applicable SGs/elements met			Overall score
		SG60	SG80	SG100	
		X of x	X of x	X of x	
Condition number (if relevant)					

PI 2.5.1 – Ecosystem outcome

PI 2.5.1		**The UoA does not cause serious or irreversible harm to the key elements of ecosystem structure and function**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Ecosystem status**			
	Guide post	The UoA is **unlikely** to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	The UoA is **highly unlikely** to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	There is **evidence** that the UoA is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.
	Met?	Scoring element = Trophic size/structure **Yes All UoAs**	Scoring element = Trophic size/structure **Yes All UoAs**	Scoring element = Trophic size/structure **No All UoAs**

Rationale

All UoAs

Although the use of foodweb models has been utilised recently to assess the risk of invasive species in Lake Erie (see Zhang at al. 2016[178], Zhang et. al. 2019[179]), there does not appear to be a direct consideration of the effects of the walleye and yellow perch fisheries on other foodweb components. The stock assessments for walleye and yellow perch, for example do not make reference to explicit consideration relating to the harvest of these species that would benefit or limit the effects on other species in the ecosystem. Having said that, we note that conservative harvest exploitation rates of target stock such as walleye and yellow perch may by themselves implicitly account for such considerations.

Due to the above, explicitly scoring the MSC ecosystem status requirement (PI 2.5.1) has remained somewhat challenging. Accordingly, to score this PI, **the Audit Team defaulted to using the Scale Intensity Consequence Analysis (SICA)** which is part of the MSC Risk Based Framework (RBF). The fisheries under assessment received the following scores (specific to the SICA trophic size/structure subcomponent).

Ontario yellow perch small mesh gillnet fishery: Consequence Score of 80
Ohio yellow perch small trapnet fishery in MU1 to MU3: Consequence Score of 80
Lake Erie walleye (large mesh gillnet) fishery: Consequence Score of 80

Please refer to the SICA tables in the Ecosystem Background Section for further detail.

References

As referenced.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Individual scoring elements (add rows as required; delete if not scoring by elements)	Applicable SGs met per individual scoring element			Scoring element scores
	SG60	SG80	SG100	

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[178] https://www.tandfonline.com/doi/full/10.1080/00028487.2015.1069211
[179] https://link.springer.com/article/10.1007/s10530-019-01929-7

<table>
<tr><th colspan="2">PI 2.5.1</th><th colspan="4">The UoA does not cause serious or irreversible harm to the key elements of ecosystem structure and function</th></tr>
<tr><td>All UoAs</td><td>Scoring element 1 (trophic size/structure)</td><td>1 of 1</td><td>1 of 1</td><td>0 of 1</td><td>≥80</td></tr>
<tr><td colspan="2" rowspan="3">Draft scoring range</td><td colspan="3">Applicable SGs/elements <u>likely</u> met</td><td rowspan="2"><u>Likely</u> overall PI score</td></tr>
<tr><td>SG60</td><td>SG80</td><td>SG100</td></tr>
<tr><td><table><tr><td>UoA</td><td>Met?</td></tr><tr><td>All</td><td>1 of 1</td></tr></table></td><td><table><tr><td>UoA</td><td>Met?</td></tr><tr><td>All</td><td>1 of 1</td></tr></table></td><td><table><tr><td>UoA</td><td>Met?</td></tr><tr><td>All</td><td>0 of 1</td></tr></table></td><td>All UoAs
≥80</td></tr>
<tr><td colspan="2">Information gap indicator</td><td colspan="4">Information sufficient to score PI</td></tr>
</table>

Overall Performance Indicator scores added from Client and Peer Review Draft Report

<table>
<tr><td colspan="2" rowspan="2">Individual scoring elements (add rows as required; delete if not scoring by elements)</td><td colspan="3">Applicable SGs met per individual scoring element</td><td rowspan="2">Scoring element scores</td></tr>
<tr><td>SG60</td><td>SG80</td><td>SG100</td></tr>
<tr><td>1</td><td>Scoring element 1</td><td>X of x</td><td>X of x</td><td>X of x</td><td></td></tr>
<tr><td>2</td><td>Scoring element 2</td><td>X of x</td><td>X of x</td><td>X of x</td><td></td></tr>
<tr><td>3</td><td>Scoring element 3</td><td>X of x</td><td>X of x</td><td>X of x</td><td></td></tr>
<tr><td>4</td><td>Scoring element 4</td><td>X of x</td><td>X of x</td><td>X of x</td><td></td></tr>
<tr><td colspan="2" rowspan="3">Overall Performance Indicator score</td><td colspan="3">Applicable SGs/elements met</td><td rowspan="2">Overall score</td></tr>
<tr><td>SG60</td><td>SG80</td><td>SG100</td></tr>
<tr><td>X of x</td><td>X of x</td><td>X of x</td><td></td></tr>
<tr><td colspan="5">Condition number (if relevant)</td><td></td></tr>
</table>

PI 2.5.2 – Ecosystem management strategy

PI 2.5.2		There are measures in place to ensure the UoA does not pose a risk of serious or irreversible harm to ecosystem structure and function		
Scoring Issue		SG 60	SG 80	SG 100
a	**Management strategy in place**			
	Guide post	There are **measures** in place, if necessary which take into account the **potential impacts** of the UoA on key elements of the ecosystem.	There is a **partial strategy** in place, if necessary, which takes into account **available information and is expected to restrain impacts** of the UoA on the ecosystem so as to achieve the Ecosystem Outcome 80 level of performance.	There is a **strategy** that consists of a **plan**, in place which contains measures to **address all main impacts of the UoA** on the ecosystem, and at least some of these measures are in place.
	Met?	**Yes All UoAs**	**Yes All UoAs**	**No All UoAs**
Rationale				

Yellow perch small mesh gillnet (Ontario) and trapnet (Ohio) fishery

The fishery is a limited entry fishery with TAC and relatively limited bycatch, ETP species and habitat effects. As part of the yellow perch HCR in 2019, the overall fishing pressure in MU1-3 is set at 31.5% of FMSY indicating that fishing pressure is relatively low and conservative on the stock**.** This may be considered, implicitly, as being part of a partial strategy to avoid the disruption of key elements of underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.

Lake Erie walleye (large mesh gillnet) fisheries

The fishery is a limited entry fishery with TAC and relatively limited bycatch, ETP species and habitat effects. The fishery is currently managed by having a target Fishing Mortality of 60% of the Maximum Sustainable Yield (60%FMSY) , which indicates a relatively conservative exploitation regime. The walleye stock is in a very healthy condition in Lake Erie. This may be considered, implicitly, as being part of a partial strategy to avoid the disruption of key elements of underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.

Lake Erie Biodiversity Conservation Strategy

The 2012 Lake Erie Biodiversity Conservation Strategy (LEBCS)[180] is a binational initiative designed to support the efforts of the Lake Erie LaMP by identifying specific strategies and actions to protect and conserve the native biodiversity of Lake Erie. It is the product of a two year planning process involving over 190 experts from 87 agencies and organizations around the basin. Engaging numerous experts and employing recognized Key Ecological Attributes (KEAs) and indicators of health, the current viability status of each of the eight targets was identified by assessment unit, reporting unit and lake wide. These assessments provide a snapshot of the status of biodiversity in Lake Erie and their desired state, shown below.

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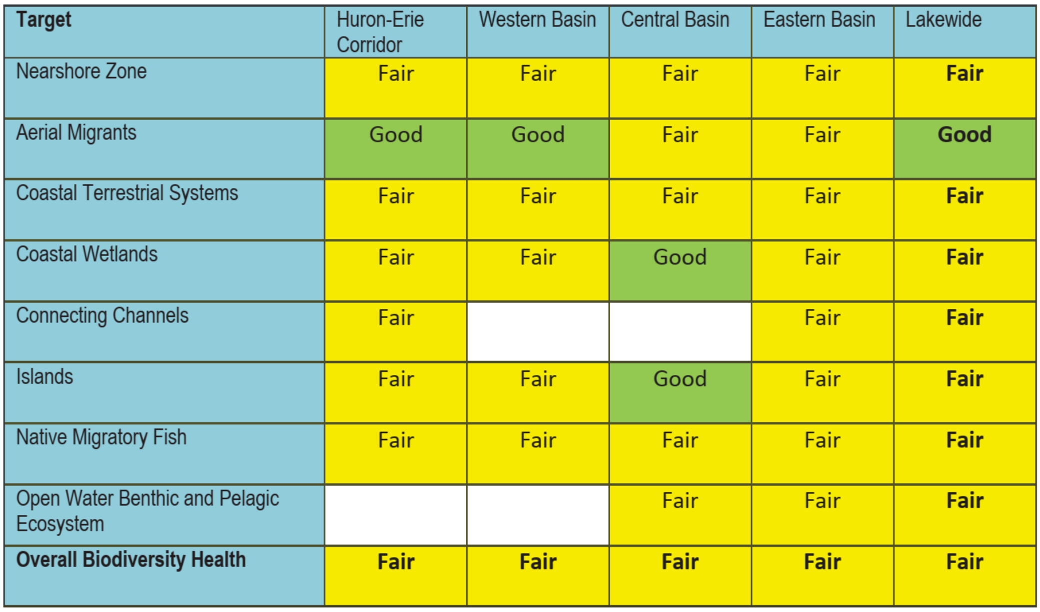
[180] https://binational.net//wp-content/uploads/2015/02/LakeErieBCSen.pdf

PI 2.5.2 | **There are measures in place to ensure the UoA does not pose a risk of serious or irreversible harm to ecosystem structure and function**



Target	Huron-Erie Corridor	Western Basin	Central Basin	Eastern Basin	Lakewide
Nearshore Zone	Fair	Fair	Fair	Fair	**Fair**
Aerial Migrants	Good	Good	Fair	Fair	**Good**
Coastal Terrestrial Systems	Fair	Fair	Fair	Fair	**Fair**
Coastal Wetlands	Fair	Fair	Good	Fair	**Fair**
Connecting Channels	Fair			Fair	**Fair**
Islands	Fair	Fair	Good	Fair	**Fair**
Native Migratory Fish	Fair	Fair	Fair	Fair	**Fair**
Open Water Benthic and Pelagic Ecosystem			Fair	Fair	**Fair**
Overall Biodiversity Health	**Fair**	**Fair**	**Fair**	**Fair**	**Fair**

Summary Goals were set for 2030 to assure long-term viability. Some of these are relevant to the walleye and yellow perch fisheries under consideration, and included the following:

Open Water Benthic and Pelagic Ecosystem Goals. By 2030, to assure that the Open Water Benthic and Pelagic zone of Lake Erie is characterized by a more stable food web that supports a diverse fishery and is resilient to invasive species:

- Native fish will comprise 50% of the prey biomass;
- Lake trout will maintain self-sustaining populations in each major area of the offshore;
- Self sustaining populations of native predators (such as yellow perch, walleye, lake whitefish and lake trout) maintain relatively stable populations consistent with Fish Community Objectives.

Nearshore Zone targets. By 2030, to assure adequate water quality for sustaining native plants, fish, and invertebrates:

- Based on multi year averages, reduce the load of dissolved phosphorus by 50% by 2030 in at least the priority watersheds. HAB toxin measures will be reduced to the point that no HAB advisories at public beaches will be recorded and issued. The native fish community will have abundant populations of smallmouth bass, walleye, yellow perch, northern pike, muskellunge, rock bass, emerald shiners, white sucker and cyprinids.

Native Migratory Fish. By 2030, to provide adequate access to spawning habitat:

- At least 50% of the total length of each type of stream is connected to the lake;
- Each river-spawning Lake Erie fish species is represented by at least two viable populations in each applicable region (i.e. assessment unit) of the lake.
- Tributary connectivity is maximized for Lake Erie migratory fish, while increased risk of aquatic invasive species spread and proliferation is minimized.

For further detail please see the Lake Erie Biodiversity Conservation Strategy at https://binational.net//wp-content/uploads/2015/02/LakeErieBCSen.pdf.

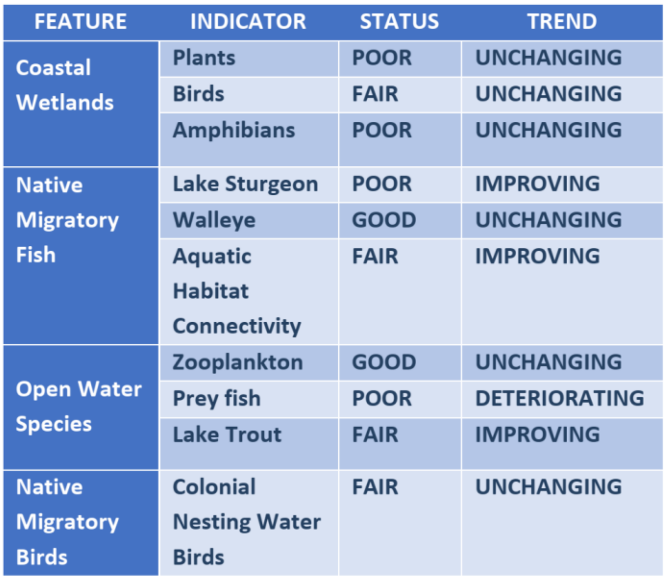
PI 2.5.2	There are measures in place to ensure the UoA does not pose a risk of serious or irreversible harm to ecosystem structure and function

In the Lake Erie Status report in 2009 (2004-2008 reporting period) , published in 2017[181], seven ecosystem related goals were rated as Partially Achieved while six were rated as Mostly Achieved. Two of these, directly related to the health of the food web in Lake Erie, included:

- **Forage fish.** Maintain a diversity of forage fishes to support terminal predators and to sustain human use. *Mostly achieved* .
- **Food-web structure.** Manage the food-web structure of Lake Erie to optimize production of highly valued fish species; recognize the importance of Diporeia and Hexagenia as key species in the food web and as important indicators of habitat suitability. *Mostly achieved.*

Lake Erie Lakewide Action and Management Plan (LAMP) 2019-2023

The LAMP is a binational, five-year ecosystem-based strategy for restoring and protecting the water quality of Lake Erie and the St. Clair-Detroit River System. The latest LAMP was published in 2019 and has objective for the Lake until 2023[182]. Objective 5 fulfills the Great Lakes Water Quality Agreement by setting a goal to support healthy and productive wetlands and other habitat to sustain resilient populations of native species. More recently, a summary of the Lake Erie status and trends for habitat and species making up the ecosystem was provided by the State of Great Lake indicator (ECCC and U.S. EPA 2019). The condition of Lake Erie's habitats and species indicators is variable, ranging from "poor" to "good", with varying trends from "deteriorating" to "improving", are shown below.



FEATURE	INDICATOR	STATUS	TREND
Coastal Wetlands	Plants	POOR	UNCHANGING
	Birds	FAIR	UNCHANGING
	Amphibians	POOR	UNCHANGING
Native Migratory Fish	Lake Sturgeon	POOR	IMPROVING
	Walleye	GOOD	UNCHANGING
	Aquatic Habitat Connectivity	FAIR	IMPROVING
Open Water Species	Zooplankton	GOOD	UNCHANGING
	Prey fish	POOR	DETERIORATING
	Lake Trout	FAIR	IMPROVING
Native Migratory Birds	Colonial Nesting Water Birds	FAIR	UNCHANGING

There is a partial strategy in place, which takes into account available information and is expected to restrain impacts of the UoAs on the ecosystem so as to achieve the Ecosystem Outcome 80 level of performance. **SG 80 would be met.**

However, it is not clear is that there is a strategy that consists of a plan, in place which contains measures to address all main impacts of the UoAs on the ecosystem, and at least some of these measures are in place. SG 100 may not be met.

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[181] http://www.glfc.org/pubs/SpecialPubs/Sp17_01.pdf

[182] https://binational.net/wp-content/uploads/2019/06/Draft-Lake-Erie-LAMP-061819-English.pdf

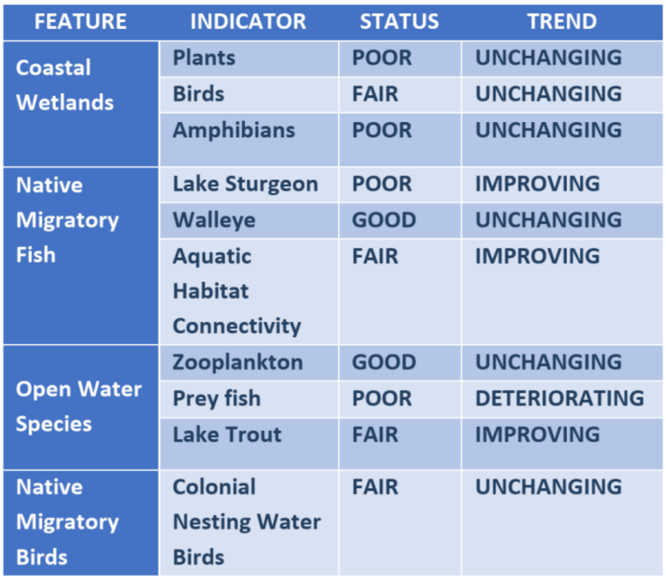
PI 2.5.2	**There are measures in place to ensure the UoA does not pose a risk of serious or irreversible harm to ecosystem structure and function**			
b	**Management strategy evaluation**			
	Guide post	The **measures** are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar UoAs/ ecosystems).	There is **some objective basis for confidence** that the measures/ partial strategy will work, based on some information directly about the UoA and/or the ecosystem involved.	**Testing** supports **high confidence** that the partial strategy/ strategy will work, based on information directly about the UoA and/or ecosystem involved.
	Met?	**Yes All UoAs**	**Yes All UoAs**	**No All UoAs**

Rationale

All UoAs

The partial strategy highlighted above has several components among others, including the LAMP, a binational, five-year ecosystem-based strategy for restoring and protecting the water quality of Lake Erie and the St. Clair-Detroit River System running from 2019-2023, the LEC Ecosystem Goals recently rated as partially to mostly achieved (reporting year 2004-2008), the Lake Erie Biodiversity Conservation Strategy, another binational initiative designed to support the efforts of the Lake Erie LAMP by identifying specific strategies and actions to protect and conserve the native biodiversity of Lake Erie, as well as the current effort to manage key ecosystem components/drivers of Lake Erie which include the important fisheries for walleye and yellow perch, management and restoration of coldwater and forage species, management of invasive species, as well as the many efforts going towards water quality improvement which have a large effect on the dynamics, structure, productivity and biodiversity of the Lake Erie ecosystem.

The condition of Lake Erie's habitats and species indicators is variable, ranging from "poor" to "good", with varying trends from "deteriorating" to "improving", are shown below (source Lake Erie Lakewide Action and Management Plan (LAMP) 2019-2023) .



FEATURE	INDICATOR	STATUS	TREND
Coastal Wetlands	Plants	POOR	UNCHANGING
	Birds	FAIR	UNCHANGING
	Amphibians	POOR	UNCHANGING
Native Migratory Fish	Lake Sturgeon	POOR	IMPROVING
	Walleye	GOOD	UNCHANGING
	Aquatic Habitat Connectivity	FAIR	IMPROVING
Open Water Species	Zooplankton	GOOD	UNCHANGING
	Prey fish	POOR	DETERIORATING
	Lake Trout	FAIR	IMPROVING
Native Migratory Birds	Colonial Nesting Water Birds	FAIR	UNCHANGING

According to the above, there is **some objective basis for confidence** that the partial strategy will work, based on some information directly about the UoAs and the ecosystem involved. **SG 80 would be met**. There does not appears to be testing of the strategy, SG 100 may not be met.

PI 2.5.2		**There are measures in place to ensure the UoA does not pose a risk of serious or irreversible harm to ecosystem structure and function**		
c	**Management strategy implementation**			
	Guide post		There is **some evidence** that the measures/partial strategy is being **implemented successfully**.	There is **clear evidence** that the partial strategy/strategy is being **implemented successfully and is achieving its objective as set out in scoring issue (a).**
	Met?		**Yes All UoAs**	**No All UoAs**

Rationale

Yellow perch small mesh gillnet (Ontario) and trapnet (Ohio) fishery

The fishery is a limited entry fishery with TAC and relatively limited bycatch, ETP species and habitat effects. As part of the yellow perch HCR in 2019, the overall fishing pressure in MU1-3 is set at 31.5% of FMSY indicating that fishing pressure is quite low and conservative on the stock**.** This may be considered, implicitly, as being part of a partial strategy to avoid the disruption of key elements of underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.

Lake Erie walleye (large mesh gillnet) fisheries

The fishery is a limited entry fishery with TAC and relatively limited bycatch, ETP species and habitat effects. The fishery is currently managed by having a target Fishing Mortality of 60% of the Maximum Sustainable Yield (60%FMSY), which indicates a relatively conservative exploitation regime. The walleye stock is in a very healthy condition in Lake Erie. This may be considered, implicitly, as being part of a partial strategy to avoid the disruption of key elements of underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.

Implementation of Lake Erie Wider Ecosystem Management

Ives et al. 2018[183] described an ecosystem conceptual framework through a synthesis of food-web structure and ecosystem function in the Laurentian Great Lakes (including Lake Erie), with emphasis on the upper trophic levels (i.e., fishes). Their synthesis showed evidence of notable adaptive capacity. For example, fishes increased benthic coupling in response to invasion by mussels and round gobies. However, they also found evidence of loss of adaptive capacity through species extirpations (e.g., widespread collapse in the abundance and diversity of ciscoes, Coregonus spp., except in Lake Superior). In Lake Erie, as in other Great Laurentian Lakes, fishery managers have traditionally taken a top-down approach, focusing on stocking and harvest policy (e.g. quota management of walleye and yellow perch). By contrast, water quality managers have focused on a bottom up approach where nutrients affect the chemical composition and lower trophic levels of the ecosystem. Their synthesised conceptual ecosystem structure and function model provides resource managers a tool to more systematically interpret how lower food-web dynamics influence harvestable fish populations, and vice versa, and to act accordingly such that sustainable resource practices can be achieved in amore holistic ecosystem level manner.

The 2012 Lake Erie Biodiversity Conservation Strategy (LEBCS)[184] assessments provide a snapshot of the status of biodiversity in Lake Erie and their desired state, shown below.

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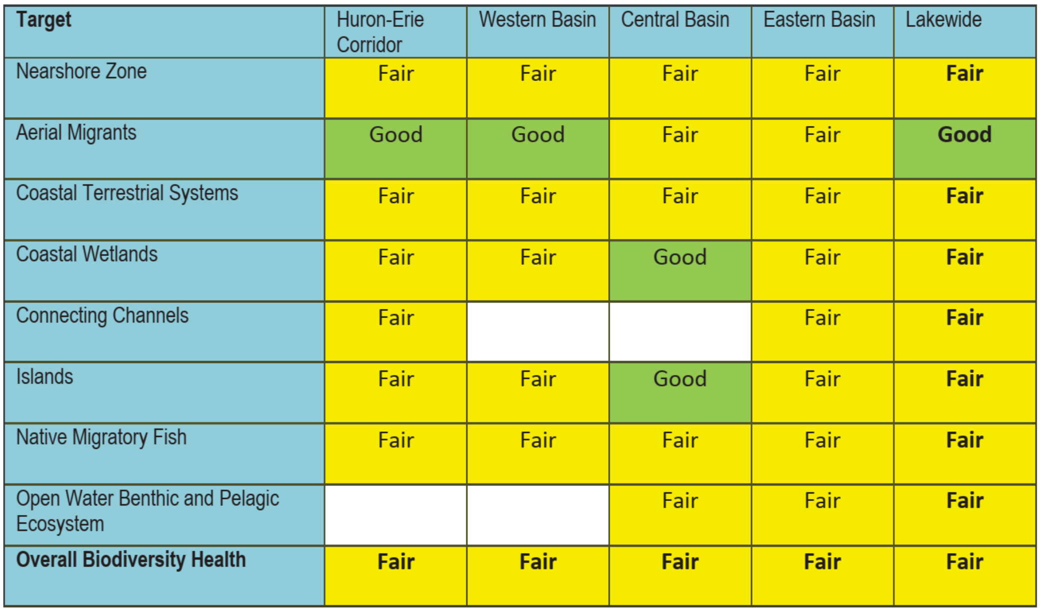
[183] https://onlinelibrary.wiley.com/doi/full/10.1111/fwb.13203

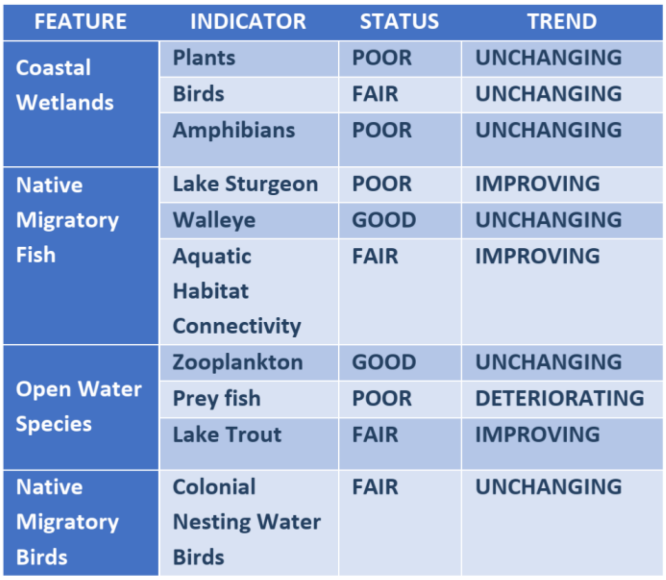
[184] https://binational.net//wp-content/uploads/2015/02/LakeErieBCSen.pdf

PI 2.5.2	There are measures in place to ensure the UoA does not pose a risk of serious or irreversible harm to ecosystem structure and function



Target	Huron-Erie Corridor	Western Basin	Central Basin	Eastern Basin	Lakewide
Nearshore Zone	Fair	Fair	Fair	Fair	**Fair**
Aerial Migrants	Good	Good	Fair	Fair	**Good**
Coastal Terrestrial Systems	Fair	Fair	Fair	Fair	**Fair**
Coastal Wetlands	Fair	Fair	Good	Fair	**Fair**
Connecting Channels	Fair			Fair	**Fair**
Islands	Fair	Fair	Good	Fair	**Fair**
Native Migratory Fish	Fair	Fair	Fair	Fair	**Fair**
Open Water Benthic and Pelagic Ecosystem			Fair	Fair	**Fair**
Overall Biodiversity Health	**Fair**	**Fair**	**Fair**	**Fair**	**Fair**

More recently, a different summary of the Lake Erie status and trends for habitat and species making up the ecosystem was provided by the State of Great Lake indicator (ECCC and U.S. EPA 2019) . The condition of Lake Erie's habitats and species indicators is variable, ranging from "poor" to "good", with varying trends from "deteriorating" to "improving", are shown below.



FEATURE	INDICATOR	STATUS	TREND
Coastal Wetlands	Plants	POOR	UNCHANGING
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	Aquatic Habitat Connectivity	FAIR	IMPROVING
Open Water Species	Zooplankton	GOOD	UNCHANGING
	Prey fish	POOR	DETERIORATING
	Lake Trout	FAIR	IMPROVING
Native Migratory Birds	Colonial Nesting Water Birds	FAIR	UNCHANGING

In summary, there is some evidence that the partial strategy is being implemented successfully. **SG 80 is likely met**, but SG 100 may not be.

References

As referenced in the text.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

PI 2.5.2	**There are measures in place to ensure the UoA does not pose a risk of serious or irreversible harm to ecosystem structure and function**			
Draft scoring range	Applicable SGs/elements likely met			Likely overall PI score
	SG60	SG80	SG100	
	UoA Met? All 2 of 2	UoA Met? All 3 of 3	UoA Met? All 0 of 3	**All UoAs** ≥80
Information gap indicator	Information sufficient to score PI			
Overall Performance Indicator scores added from Client and Peer Review Draft Report				
Individual scoring elements (add rows as required; delete if not scoring by elements)	Applicable SGs met per individual scoring element			Scoring element scores
	SG60	SG80	SG100	
1 Scoring element 1	X of x	X of x	X of x	
2 Scoring element 2	X of x	X of x	X of x	
3 Scoring element 3	X of x	X of x	X of x	
4 Scoring element 4	X of x	X of x	X of x	
Overall Performance Indicator score	Applicable SGs/elements met			Overall score
	SG60	SG80	SG100	
	X of x	X of x	X of x	
Condition number (if relevant)				

PI 2.5.3 – Ecosystem information

PI 2.5.3		There is adequate knowledge of the impacts of the UoA on the ecosystem		
Scoring Issue		SG 60	SG 80	SG 100
a	**Information quality**			
	Guide post	Information is adequate to **identify** the key elements of the ecosystem.	Information is adequate to **broadly understand** the key elements of the ecosystem.	
	Met?	**Yes All UoAs**	**Yes All UoAs**	
Rationale				

All UoAs

There is abundant information available to broadly understand the key element of the ecosystem. Long-term, basin-wide monitoring programs for water quality conditions, habitats and species are conducted by federal, state, provincial agencies and their partners. The Lake Erie Biodiversity Conservation Strategy provided a health assessment of eight conservation features that represent the lake's biological health (Pearsall et al. 2012). State of the Great Lakes ecosystem indicator reports provide recent information on status and trends (ECCC and U.S. EPA 2019). Recent survey indexes from the Report of the Lake Erie Forage Task Group, 2019 [185] provided:

- Trophic State Indices, a combination of phosphorus levels, water transparency, and Chl a measures, indicating that the western basin is slightly above the targeted mesotrophic status, the central basin is within targeted mesotrophic status, which favors percid production, and both the nearshore and offshore waters of the eastern basin are oligotrophic. Trends across Lake Erie in recent years indicate that overall productivity has slowly declined since 2010. Low hypolimnetic dissolved oxygen continues to be an issue in the central basin during the summer months.
- Zooplankton biomass. In the west basin, the 2018 average biomass was 190.8 mg/m3, which was the third highest value in the time series and well above the long-term mean of 105.9 mg/m3. Cladocerans (small crustaceans commonly called water fleas) provide the bulk of the biomass of zooplankton in the west basin although increases in both calanoid and cyclopoid copepods have been observed in recent years. In the central basin, the 2018 mean zooplankton biomass was 94.6 mg/m3, which was less than the long-term mean biomass (129.4 mg/m3). From 2009 through 2013, zooplankton biomass increased in the central and east basins, but shifted back to the west basin in 2015 with declines observed in the central and east basins. Cladocerans are typically more dominant in the west basin zooplankton community and decline to the east while calanoid and cyclopoid copepods tend to be higher in biomass in the central and east basins.
- Status of Forage Fish in the West, Central and Eastern Basin. See Background section for further details.

Furthermore, additional information is collected from Lake Erie Committee Coldwater Task Group (CWTG). The following charges were addressed by the CWTG during 2018-2019[186]: (1) Report on the status of the coldwater fish community; (2) Lake Whitefish fishery assessment and population biology; (3) Participation in Sea Lamprey assessment and control in the Lake Erie watershed; (4) Maintenance of an electronic database of Lake Erie salmonid stocking information, and (5) Status of Steelhead and development of a mass marking study.

Specific information and status of walleye and yellow perch is available through the yearly stock assessment reports[187].

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[185] http://www.glfc.org/pubs/lake_committees/erie/FTG_docs/annual_reports/FTG_report_2019.pdf

[186] http://www.glfc.org/pubs/lake_committees/erie/CWTG_docs/annual_reports/CWTG_report_2019.pdf

[187] http://www.glfc.org/annual-reports.php

PI 2.5.3	There is adequate knowledge of the impacts of the UoA on the ecosystem

Information on the abundance and distribution of invasive species is also routinely assessed.

Information is adequate to **broadly understand** the key elements of the ecosystem. SG 80 would be met.

b	**Investigation of UoA impacts**			
	Guide post	Main impacts of the UoA on these key ecosystem elements can be inferred from existing information, but **have not been investigated** in detail.	Main impacts of the UoA on these key ecosystem elements can be inferred from existing information, and **some have been investigated in detail**.	Main interactions between the UoA and these ecosystem elements can be inferred from existing information, and **have been investigated in detail**.
	Met?	**Yes All UoAs**	**Yes All UoAs**	**No All UoAs**

Rationale

All UoAs

There are foodweb models for Laker Erie. Recently, Zhang at al. 2016[188], developed an Ecopath with Ecosim (EwE) food web model forecasting the impacts of Silver and Bighead Carp on the Lake Erie foodweb, two invasive species that threaten to invade and disrupt food webs and fisheries in the Laurentian Great Lakes through their high consumption of plankton. The study suggested that that these Asian carps would affect Lake Erie's foodweb by competing with other planktivorous fishes and by providing additional prey for piscivores.

Even more recently, Zhang et. al. 2019[189], modified the 2016 EwE model to assess the impacts of another three aquatic invasive species on the Lake Erie foodweb, Eurasian ruffe *Gymnocephalus cernua*, killer shrimp *Dikerogammarus villosus*, and golden mussel *Limnoperna fortune* where they found that while all three species may induce negative effects if introduced to Lake Erie, golden mussels may pose the highest risk of impact for Lake Erie’s food web.

Ives et al. 2018[190] highlighted that traditionally, Laurentian Great Lakes fishery management issues and associated levers have often been evaluated and implemented from a top-down perspective, focusing on stocking and harvest policy. By contrast, from a water quality perspective, the reverse is true; water quality managers often focused on nutrient input effects on chemical composition of the lakes. These top-down and bottom-up approaches have yet to merge to form a more holistic view of the health of the Great Lakes ecosystem. Ives et al. 2018 explains that for example, during the early 2000s, the Lake Erie Committee explored establishing a harvest strategy for yellow perch using a suite of ecosystem-state indicators. This effort ultimately was not adopted by the Committee due to a lack of explicit linkage between lower food-web dynamics, ecosystem state indicators, and fishery production, and difficulties in easily communicating these linkages to stakeholders. The Ives et al. 2018 synthesised conceptual model provides resource managers a tool to more systematically interpret how lower food-web dynamics influence harvestable fish populations, and vice versa, and to act accordingly such that sustainable resource practices can be achieved[191].

Although the use of foodweb models has been utilised recently to assess the risk of invasive species in Lake Erie, there does not appear to be a direct consideration of the effects of the walleye and yellow perch fisheries on other foodweb components.

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[188] https://www.tandfonline.com/doi/full/10.1080/00028487.2015.1069211
[189] https://link.springer.com/article/10.1007/s10530-019-01929-7
[190] https://onlinelibrary.wiley.com/doi/full/10.1111/fwb.13203
[191] https://onlinelibrary.wiley.com/doi/full/10.1111/fwb.13203

PI 2.5.3	**There is adequate knowledge of the impacts of the UoA on the ecosystem**

Main impacts of the UoA on these key ecosystem elements can be inferred from existing information, and some have been investigated in detail. **The UoAs may meet SG60 & SG80 but not SG100.**

c	**Understanding of component functions**			
	Guide post		The main functions of the components (i.e., P1 target species, primary, secondary and ETP species and Habitats) in the ecosystem are **known**.	The impacts of the UoA on P1 target species, primary, secondary and ETP species and Habitats are identified and the main functions of these components in the ecosystem are **understood**.
	Met?		**Yes All UoAs**	**No All UoAs**

Rationale

All UoAs

There is abundant information available to broadly understand the main functions of the Lake Erie ecosystem components. Long-term, basin-wide monitoring programs for water quality conditions, habitats and species are conducted by federal, state, provincial agencies and their partners. The Lake Erie Biodiversity Conservation Strategy provided a health assessment of eight conservation features that represent the lake's biological health (Pearsall et al. 2012). State of the Great Lakes ecosystem indicator reports provide recent information on status and trends (ECCC and U.S. EPA 2019). Abundant information is available from the Report of the Lake Erie Forage Task Group. Furthermore, additional information is collected from Lake Erie Committee Coldwater Task Group (CWTG). Specific information and status of walleye and yellow perch is available through the yearly stock assessment reports[192]. Information on the abundance and distribution of invasive species is also routinely assessed.

The main function of Lake Erie's habitat components are known and have most recently been explored in one function or another (e.g. effects of invasive species on Lake Erie Ecosystem, interpret how lower food-web dynamics influence harvestable fish populations, and vice versa) by Zhang at al. 2016[193], Zhang et. al. 2019[194], and Ives et al. 2018[195] . **SG 80 may be met.**

However, it is not clear at this point if the impacts of the UoAs on P1 target species, primary, secondary and ETP species and Habitats are identified and the main functions of these components in the ecosystem are clearly **understood,** due to a lack of specific information linking walleye and yellow perch harvest and population dynamics to the rest of Lake Erie's ecosystem components. SG 100 may not be met.

d	**Information relevance**			
	Guide post		Adequate information is available on the impacts of the UoA on these components to allow some of the main	Adequate information is available on the impacts of the UoA on the components **and elements** to allow the main

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[192] http://www.glfc.org/annual-reports.php

[193] https://www.tandfonline.com/doi/full/10.1080/00028487.2015.1069211

[194] https://link.springer.com/article/10.1007/s10530-019-01929-7

[195] https://onlinelibrary.wiley.com/doi/full/10.1111/fwb.13203

PI 2.5.3	**There is adequate knowledge of the impacts of the UoA on the ecosystem**			
			consequences for the ecosystem to be inferred.	consequences for the ecosystem to be inferred.
	Met?		**Yes All UoAs**	**No All UoAs**

Rationale

All UoAs

Long-term, basin-wide monitoring programs for water quality conditions, habitats and species status are conducted by federal, state, provincial agencies and their partners. Adequate information is available on the impacts of the walleye and yellow perch fisheries on these components to allow some of the main consequences for the ecosystem to be inferred. This is true for the limited effects of these fisheries on primary and secondary species enabled to the large datasets on catch and bycatch, ETP species interactions (which are considered limited in Ontario and Ohio's jurisdiction), habitats (footprint considered negligible) and ecosystem structure and function (through various binational monitoring programs and ecosystem studies). **SG 80 is likely met. However,** it is not clear if adequate information is available on the impacts of the UoAs on the components **and elements** to allow the main consequences for the ecosystem to be inferred. SG 100 may not be met.

e	**Monitoring**			
	Guide post		Adequate data continue to be collected to detect any increase in risk level.	Information is adequate to support the development of strategies to manage ecosystem impacts.
	Met?		**Yes All UoAs**	**No All UoAs**

Rationale

All UoAs

Information on the scale, intensity, status and effects of the walleye and yellow perch fisheries in Lake Erie, together with routine catch data collected through DCRs is considered adequate to detect any increase in the level of risk. **SG 80 is likely met.** However, due to a lack of specific information linking walleye and yellow perch harvest and population dynamics to the rest of Lake Erie's ecosystem components it's not clear if the information is currently adequate to support the development of strategies to manage ecosystem impacts. SG 100 may not be met.

References

As referenced in the text.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	Applicable SGs/elements likely met						Likely overall PI score
	SG60		SG80		SG100		
	UoA	Met?	UoA	Met?	UoA	Met?	**All UoAs** ≥80
	All	2 of 2	All	5 of 5	All	0 of 4	
Information gap indicator	Information sufficient to score PI						

Overall Performance Indicator scores added from Client and Peer Review Draft Report

PI 2.5.3	**There is adequate knowledge of the impacts of the UoA on the ecosystem**				
Individual scoring elements (add rows as required; delete if not scoring by elements)		Applicable SGs met per individual scoring element			Scoring element scores
		SG60	SG80	SG100	
1	Scoring element 1	X of x	X of x	X of x	
2	Scoring element 2	X of x	X of x	X of x	
3	Scoring element 3	X of x	X of x	X of x	
4	Scoring element 4	X of x	X of x	X of x	
Overall Performance Indicator score		Applicable SGs/elements met			Overall score
		SG60	SG80	SG100	
		X of x	X of x	X of x	
Condition number (if relevant)					

P2 References

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7.8 Principle 3

7.8.1 Principle 3 background

The focus of Principle 3 (P3) of the MSC's Fisheries Certification Requirements (FCR, v2.0, 1st October 2014) is ''to ensure that there is an institutional and operational framework appropriate to the size and scale of the UoA for implementing Principles 1 and 2, and that this framework is capable of delivering sustainable fisheries in accordance with the outcomes articulated in these Principles.''

The P3 default tree structure divides the Performance Indicators (PIs) into two Components - Governance and Policy, and Fishery-Specific Management System. The former ''captures the broad, high-level context of the fishery management system within which the UoA is found''; it consists of three PIs:

- Legal and/or Customary framework (PI 3.1.1);
- Consultation, roles and responsibilities (PI 3.1.2); and
- Long-term objectives (PI 3.1.3)

The latter component '' focuses on the management system directly applied to the fishery'' and is informed by four PIs:

- Fishery-specific objectives (PI 3.2.1);
- Decision-making processes (PI 3.2.2);
- Compliance and enforcement (PI 3.2.3); and
- Monitoring and management performance evaluation (PI 3.2.4)

As is the case for Principles 1 and 2, MSC-certified assessors evaluate, analyze and score P3-specific parameters using publically-available information and data from various sources, with interpretive guidance from the MSC's FCR and other relevant scheme documents.

7.4.1.1 Legal Framework

Management of Lake Erie's Yellow perch and Walleye commercial fisheries is supported by a comprehensive suite of national (Canadian and U.S.), provincial (Ontario) and state (Ohio) statutes, regulations and policies in the context of an overarching Great Lakes inter-jurisdictional framework for bi-national cooperation between agencies and stakeholders. The framework's principle instruments for cooperation are set out in the mandates and roles of the *International Joint Commission*[196] and the *Canada/U.S. Convention on Great Lakes Fisheries.*[197]

This inter-jurisdictional legal framework is further defined by a number of Great Lakes bi-national agreements including:

- Boundary Waters Treaty (1909)
- Great Lakes Water Quality Agreement (2012)
- Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement (2005)
- Great Lakes Toxic Substances Control Agreement

Within Canada, federal-provincial agreements are in place that serve to promote cooperation and collaboration between governments in the implementation of environmental plans and strategies for one or more of the Great Lakes. They include:

- Canada-Ontario Agreement on Great Lakes Water Quality and Ecosystem Health (2014)[198]

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[196] https://www.ijc.org/en/who/role

[197] http://www.glfc.org/pubs/conv.htm

[198] https://www.canada.ca/en/environment-climate-change/services/canadian-environmental-protection-act-registry/publications/canada-ontario-agreement-great-lakes.html

- Canada-Ontario Lake Erie Action Plan[199]
- Western Basin of Lake Erie Collaborative Agreement (Ontario, Michigan and Ohio)[200]
- Ontario's Great Lakes Strategy[201]

Canada

The federal *Fisheries Act*[202] serves as the primary statute for the management of ''sea coast and inland fisheries'' in Canada as set out in the *Constitution Act*[203] as amended. In the early years of the 20th century, the Federal Government entered into a number of agreements that effectively transferred to many provincial governments, including Ontario, the administrative authorities needed to manage the commercial fisheries within their boundaries. To facilitate Ontario's new role, the then *Ontario Fishery Regulations* were extended to cover many areas of former federal responsibility.

Other federal statutes that regulate some aspects of the commercial fisheries of the Great Lakes include the *Shipping Act* (2001)[204] and the *Navigable Waters Protection Act* [205]and associated regulations.

The *Canadian Code of Conduct for Responsible Fishing Operations (1998)*[206]outlines nine Principles and seven Guidelines for all commercial fishing operations that take place in Canadian waters. The principles relate to the need for fish harvesters to take appropriate measures to ensure fisheries are harvested and managed responsibly to safeguard sustainable use of Canada's freshwater and marine resources and their habitats for present and future generations of Canadians; the importance of ecological sustainability and shared responsibility for stewardship; the need to implement and comply with regulations; the promotion of public awareness of the need for responsible fishing; the use of fishers' knowledge in generating scientific advice and developing fishery management policies and regulations.

Ontario

The Ontario Ministry of Natural Resources and Forestry (MNRF) is the lead agency charged with managing the commercial (and recreational) fisheries within the Canadian zone of Lake Erie. Its authorities are desribed in the *Ministry of Natural Resources Act, R.S.O. 1990, c. M.31.*[207] The Province's *Fish and Wildlife Conservation Act, 1997, S.O. 1997, c. 41*[208] serves as the principle legislation for the management of the province's commercial fisheries. Specifically,

- Sections 60 - 79 cover the administration of the province's Commercial fishing licencing activities including: (i) issuance, (ii) conditions on issuance and fishing, (iii) transfers, (iv) refusals to issue, (v) cancellation, and (vi) appeal hearing.
- Sections 86 - 96 cover the appointment of Conservation Officers and their assigned powers including: (i) powers of inspection of conveyance and places, and entry, (ii) search, (iii) seizure and forfeiture, and (iv) arrest without warrant, and
- Sections 96 - 110 deal with offences and penalties for unauthorized commercial fishing and are to be interpreted in conjunction with the *Provincial Offences Act* in the case of court-ordered licence suspension and/or cancellation.

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[199] https://www.ontario.ca/page/canada-ontario-lake-erie-action-plan

[200] https://www.michigan.gov/documents/snyder/Western_Basin_of_Lake_Erie_Collaborative_Agreement--Lieutenant_Governor_491709_7.pdf

[201] https://www.ontario.ca/page/ontarios-great-lakes-strategy

[202] https://laws-lois.justice.gc.ca/eng/acts/f-14/page-1.html

[203] https://laws-lois.justice.gc.ca/eng/const/index.html

[204] https://laws-lois.justice.gc.ca/eng/acts/C-10.15/FullText.html

[205] https://laws-lois.justice.gc.ca/eng/acts/n-22/page-1.html

[206] http://www.dfo-mpo.gc.ca/fisheries-peches/policies-politiques/cccrfo-cccppr-eng.html#annex1

[207] https://www.ontario.ca/laws/statute/90m31

[208] https://www.ontario.ca/laws/statute/97f41#BK100

Part III of the *Ontario Regulation 664/98*[209] further regulates the Province's commercial licensing program in respect of: fishing licences (Sections 31.1 - 31.2); bait licences (Sections 31.3 - 31.5); buying or selling fish (Sections 32 - 33); and commercial fishing royalties (Section 34).

Section 4(1) of the *Ontario Fishery Regulations, 2017*[210] stipulates that the provincial Minister may, for the proper management and control of fisheries and the conservation and protection of fish, specify in a licence any term or condition that is not inconsistent with these Regulations respecting one or more of the following matters:

- the species, quantity, size, weight, age, sex or stage of development of fish that may be caught, retained, possessed, held, loaded, landed, transported, transferred or released;
- the waters or locations where fishing is permitted or from which fish may be caught;
- the persons who may carry out activities under the licence;
- the waters or locations where fish may be held, loaded, landed, transferred or released;
- the period during which fishing is permitted or fish may be transferred or released;
- the type, size, quantity or marking of fishing gear or equipment;
- the locations or manner in which fishing gear or equipment may be used;
- the fishing vessel that may be used and the persons who may operate it;
- the weighing, marking, tagging, loading, landing, handling, separation or transportation of fish;
- the type and marking of containers used to hold or transport fish;
- the information that shall be recorded, kept or reported and the manner and form in which and the period for which the information shall be recorded, kept or reported;
- the disposing of water, containers or anything used to hold or transport fish;
- the monitoring of fishing activities, verification or examination of fishing gear, equipment, fish or records relating to fishing activities and the taking of fish samples;
- the health of fish including the monitoring and reporting of water quality, diseases, pathogens or fish escapes;
- the possession, destruction or prevention of the spread of a fish or other aquatic organism that is or may be harmful to fish;
- the method of movement, transfer, release, disposal or preservation of fish to ensure their protection; or
- the information that the master of a fishing vessel shall report from the water, including the method by which, the period in which and the person to whom the report is to be made.

The MNRF also administers the *Endangered Species Act, 2007*, S.O. 2007, c. 6[211] whose purpose is to: (i) identify species at risk based on the best available scientific information, including information obtained from community knowledge and aboriginal traditional knowledge; (ii) protect species that are at risk and their habitats, and to promote the recovery of species that are at risk; and (iii) promote stewardship activities to assist in the protection and recovery of species that are at risk. The *Act* sets out (i) timelines in the law for producing strategies and plans to recover at-risk species; (ii) tools to help reduce the impact of human activity on species and their habitats; and (iii) tools to encourage protection and recovery activities.

Aboriginal communal commercial fishing in the Canadian portion of Lake Erie is administered by the Province on behalf of the federal Department of Fisheries and Oceans (DFO) pursuant to the Fisheries Act's *Aboriginal Communal Fishing Licences Regulations*[212] (licence issuances) and the *Fishery (General) Regulations*[213] (conservation, management and licence conditions).

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[209] https://www.ontario.ca/laws/regulation/980664

[210] https://laws-lois.justice.gc.ca/eng/regulations/SOR-2007-237/

[211] https://www.ontario.ca/laws/statute/07e06

[212] https://laws-lois.justice.gc.ca/eng/regulations/SOR-93-332/page-1.html#h-953176

[213] https://laws.justice.gc.ca/eng/regulations/SOR-93-53/index.html

An appeal process is available to Ontario commercial licence holders to challenge a MNRF decision in respect of the status of their commercial licence(s). Under the *Fish and Wildlife Conservation Act, 1997, ''If a commercial fishing licence is issued subject to conditions, the applicant may, not later than 10 days after the licence is issued, give the Minister written notice of disagreement with the conditions (Section 74(1)).*

Following a notice of receipt by the Minister to the licensee, the licensee can request a hearing provided the request is made within 15 days following the receipt of the notice. The Act requires that the Minister designate a person to act as a hearing officer to hold the hearing (Section 77(2)).The hearing's administrative procedures are stipulated under the *Statutory Powers Procedure Act*.[214] After the hearing, the hearing officer issues a report to the Minister, that contains *(a) a summary of the evidence presented at the hearing; (b) the hearing officer's opinion, having regard to what is reasonably necessary for the conservation and management of wildlife or fish, on the merits of refusing or cancelling the licence or on the merits of the conditions imposed on the licence, as the case may be; and (c) the reasons for the hearing officer's opinion.*

Thereafter, Section 77(7) stipulates that after considering the hearing officer's report, the Minister may, as the case may be, *(a) confirm the refusal to issue the licence or decide to issue the licence; (b) confirm the conditions imposed on the licence or decide to remove or amend the conditions; or (c) carry out or refrain from carrying out the proposal to cancel the licence.*

While of no immediate relevance to the current regulatory system for the commercial fisheries managed by Ontario, the Reassessment team is aware that the *Fisheries Act* was modernized and received royal assent in June 2019. As stated previously, the *Act* has general application to all inland and coastal waters (including the Canadian portion of the Great Lakes) where the management of the commercial fisheries has been formally delegated to provincial governments including Ontario. The amended *Act* includes a number of new provisions aimed at strengthening the protection of fish and fish habitat, enhancing marine protection and habitat restoration, and strengthening the role of Indigenous people in project reviews, monitoring and policy development.

<u>United States</u>

The Fish and Wildlife Service of the Department of the Interior is the primary U.S. agency concerned with the management of fish, wildlife, and natural habitats. Its stated mission is "*working with others to conserve, protect, and enhance fish, wildlife, plants and their habitats for the continuing benefit of the American people*."[215] The Bureau works to protect the interests of endangered species, migratory birds, and interjurisdictional fishery resources in support of States and other Federal agencies.

The *Fish and Wildlife Coordination Act (1934)*[216] protects fish and wildlife when federal actions result in the control or modification of a natural stream or body of water. The Act provides the basic authority for the Service's involvement in evaluating impacts to fish and wildlife from proposed water resource development projects.

The *Endangered Species Act (1973)*[217] protects and recovers imperiled species and the ecosystems upon which they depend. It is administered by the Service and the Commerce Department's National Marine Fisheries Service (NMFS). The Service has primary responsibility for terrestrial and freshwater organisms, while the responsibilities of NMFS are mainly marine wildlife.

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[214] https://www.canlii.org/en/on/laws/stat/rso-1990-c-s22/latest/rso-1990-c-s22.html

[215] https://www.fws.gov/help/about_us.html.

[216] https://en.wikipedia.org/wiki/Fish_and_Wildlife_Coordination_Act

[217] https://www.fws.gov/endangered/laws-policies/

The *Lacey Act (1900)*[218] protects plants and wildlife by creating civil and criminal penalties for those who violate the rules and regulations. It prohibits trade in wildlife, fish, plants and their parts or products that have been illegally taken, possessed, transported or sold.

The *Coastal Zone Management Act* (1972)[219] is administered by NOAA, and provides for the management of the nation's coastal resources, including the Great Lakes. The goal is to "preserve, protect, develop, and where possible, to restore or enhance the resources of the nation's coastal zone."

Ohio

The management of the State's commercial fisheries in the U.S. portion of Lake Erie is assigned by statutes to the Ohio Department of Natural Resources (ODNR)[220] which also manages *inter alia* the state's programs for hunting and trapping; parks, nature reserves and recreation; protection of wildlife species and habitats; forestry; mineral resources; oil and gas; and environmental reviews. Its fish and wildlife responsibilities include to :

- Regulate the taking of fish and wildlife;
- Protect all wildlife including nongame and endangered species;
- Investigate water pollution, fish kills and stream litter; and
- Protect fish habitat

The Department's legislated programs and activities are set out in several state laws, including:

- Ohio Coastal Management Law (1988)
- Ohio Administrative Code (OAC)[221]
- Ohio Revised Code (ORC)[222]

The Ohio Codes contain the details of the State's Regulations. Regulations may be changed by the legislature and/or the Chief of the Department's Division of Wildlife with the approval of the Ohio Wildlife Council[223], an eight-member board created in 1994 whose responsibilities and authorities are described at Chapter 1531.03 of the ORC. A useful summary of the state's commercial fisheries is published in a ODNR document entitled Commercial Fishing Law Digest.[224]

The Division of Wildlife coordinates closely with Canada, Michigan, Pennsylvania and New York by working in conjunction with the Great Lakes Fishery Commission, the IJC, the Great Lakes Commission, U.S. Fish and Wildlife Service and other groups concerned with Lake Erie fishery management and rehabilitation.

The Coastal Management Program (CMP)[225] sets forth management goals for Ohio's portion of Lake Erie, the coast and watershed in order to preserve, protect, develop, restore, enhance and balance the use of the state's coastal resources. The program's forty-one (41) management policies are organized into nine (9) issue areas that outline state laws, regulations, and initiatives that are related to Lake Erie. The issue areas of the commercial fisheries include:

- Fish and Wildlife Management[226]
- Fisheries Management (Policy 27)[227]

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[218] https://www.fws.gov/international/laws-treaties-agreements/us-conservation-laws/lacey-act.html

[219] https://coast.noaa.gov/czm/act/

[220] http://ohiodnr.gov/

[221] http://codes.ohio.gov/oac/

[222] http://codes.ohio.gov/orc/1506

[223] http://wildlife.ohiodnr.gov/about-contacts/wildlife-council

[224] https://wildlife.ohiodnr.gov/portals/wildlife/pdfs/publications/laws%20&%20regs/pub002.pdf

[225] http://coastal.ohiodnr.gov/ocmp

[226] http://coastal.ohiodnr.gov/portals/coastal/pdfs/about/OCMP/Policies/Issue6.pdf

[227] http://coastal.ohiodnr.gov/portals/coastal/pdfs/about/OCMP/Policies/Policy27-Fisheries-Management.pdf

- Fisheries Research and Interstate Cooperation (Policy 28)[228]
- Wildlife Management (Policy 29)[229]

Besides using the policies and authorities embodied in the state coastal management law (ORC. Chapter 1506), the CMP integrates other state rules, regulations and policies to protect uses and resources of the coastal area. These are the enforceable[230] policies to be addressed by federal agencies and federal permit applicants in their consistency determinations and certifications. Federal agencies must review proposed actions, whether within or outside the coastal area, affecting any land or water use or natural resource of the coastal area, to determine that they are consistent with the CMP. The consistency process also helps to maintain the necessary communication and coordination between all levels of government to ensure the wise management of coastal resources.[231]

Aboriginal Fishing

In Canada, recognized members of various First Nation communities hold inherent and treaty rights to fish for food, social and ceremonial (FSC) purposes. The nature and scope of the right was affirmed in the *R v. Sparrow* Decision (1990) by the Supreme Court in which members have first access to the resource over all other uses after conservation requirements have been satisfied. In Ontario, access is managed through annual or multi-year Agreements negotiated between the Province and First Nations.

The Supreme Court's decision in *R v. Marshall* (1999) further affirmed that various First Nation communities held rights to access commercial fisheries on a communal basis in pursuit of a moderate livelihood. The Court did not define what it meant by a moderate livelihood. As with the FSC fisheries, the aboriginal communal commercial fisheries are managed by Ontario on behalf of the Federal Government under agreements negotiated with specific First Nations. Fishing is regulated pursuant to the federal Fisheries Act's *Aboriginal Communal Fishing Licences Regulations* and the management measures are for all intent and purpose identical to those in place for the management of the non-indigenous commercial fisheries.

In the U.S., similar treaty rights by Native American tribes located along the Great Lakes have been affirmed by the Supreme Court in respect of fishing, hunting and trapping activities (e.g. *Gurnoe, 1972*; *Voigt, 1983*; and *Mille Lacs, 1997*). Eleven tribes located in Michigan, Wisconsin and Minnesota practice their rights in some of the Great Lakes; however, the Reassessment team is not aware of any legal decisions that may have been rendered involving Ohio-based tribes located on Lake Erie.

7.4.1.2 Fisheries Management Framework

Lake Erie's fisheries management framework for the commercial fisheries consists of a combination of bi-national, state and provincial laws, regulations and agreements; program strategic objectives and policies; decision-making processes; stakeholder and public consultation; and enforcement mechanisms. These instruments, methods and practices have evolved over time and are considered by the Reassessment team to be effective, inclusive and transparent.

Great Lakes

To coordinate the maintenance of Great Lakes fisheries, *the Great Lakes Fishery Commission*[232] was established in 1955 by the Convention. Management of Great Lakes fisheries occurs cooperatively for fish populations that support recreational, commercial, or subsistence fisheries. Fishery management agencies agreed in 1981 to cooperate through a non-binding agreement called *A Joint Strategic Plan for Management*

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[228] http://coastal.ohiodnr.gov/portals/coastal/pdfs/about/OCMP/Policies/Policy28-Fisheries-Research-Interstate-Cooperation.pdf
[229] http://coastal.ohiodnr.gov/portals/coastal/pdfs/about/OCMP/Policies/Policy29-Wildlife-Management.pdf
[230] Enforceable means regulatory and legally binding.
[231] http://coastal.ohiodnr.gov/portals/coastal/pdfs/about/OCMP/II_Chapter7.pdf
[232] http://glfc.org/

of Great Lakes Fisheries.[233] The JSP was signed by each of the state, provincial, federal, and tribal natural resource agencies in the Great Lakes basin. The agencies collectively and cooperatively manage the Great Lakes fisheries with support from the Canadian and U.S. governments.

Four important principles guide this cooperative fishery management process: consensus, accountability, information sharing, and ecosystem-based management. Fishery management happens for each lake through "lake committees" comprised of state, provincial, and U.S. tribal agencies with primary management jurisdiction on each lake, supported by federal agencies. Lake committees develop strategic fishery management goals for each lake, called Fish Community Objectives (FCOs) and set agreed-upon harvest levels for key fish species of common interest. More detailed management guidance is provided through rehabilitation plans and other management plans for each lake. Lake committees also provide a "state-of-the-lake" report every five years to summarize recent trends in fish populations and progress toward FCOs. Mutually agreed-upon management actions are implemented by individual agencies.

Lake Erie

For Lake Erie, the Lake Erie Committee (LEC)[234] is mandated to:

- consider issues pertinent to, or referred by, the commission;
- consider issues and problems of common concern to member agencies;
- develop and coordinate joint programs and research projects; and
- serve as a forum for state, provincial, tribal, and federal agencies.

Consisting of senior staff members from Michigan's Department of Natural Resources, New York State's Department of Environmental Conservation, Ohio's Department of Natural Resources, Ontario's Ministry of Natural Resources and Forestry, and Pennsylvania's Fish and Boat Commission, the LEC's mandate is supported by a Standing Technical Committee (STC) of fishery biologists whose members are the senior scientific advisory group for the LEC. The work of the STC[235] is supported by five Task Groups, namely: (i) Coldwater Task Group[236], (ii) Forage Task Group [237], (iii) Habitat Task Group[238], (iv) Walleye Task Group[239], and the (v) Yellow Perch Task Group[240]. Detailed descriptions of the mandates and processes of the STC and its Task Groups can be found in the references cited below.

The Lake Erie Percid Management Advisory Group (LEPMAG) was created in 2010 by the LEC to allow science and data to be presented in a structured format and to give stakeholders, such as commercial and recreational fishers, the opportunity to provide input on the quotas prior to being set.

Lake Erie - Ohio

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[233] http://www.glfc.org/joint-strategic-plan-committees.php

[234] http://www.glfc.org/lake-erie-committee.php

[235] Terms of Reference: http://www.glfc.org/pubs/lake_committees/Lake%20Erie%20Committee%20Standing%20Technical%20Committee%20TOR.pdf

[236] Terms of Reference: http://www.glfc.org/pubs/lake_committees/Lake%20Erie%20Committee%20Coldwater%20Task%20Group%20TOR.pdf

[237] Terms of Reference: http://www.glfc.org/pubs/lake_committees/Lake%20Erie%20Committee%20Forage%20Task%20Group%20TOR.pdf

[238] Terms of Reference: http://www.glfc.org/pubs/lake_committees/Lake%20Erie%20Committee%20Habitat%20Task%20Group%20TOR.pdf

[239] Terms of Reference: http://www.glfc.org/pubs/lake_committees/Lake%20Erie%20Committee%20Walley%20Task%20Group%20TOR.pdf

[240] Terms of Reference: http://www.glfc.org/pubs/lake_committees/Lake%20Erie%20Committee%20Yellow%20Perch%20Task%20Group%20TOR.pdf

The preambular statement of Policy 27 of the Ohio Coastal Management Program (referenced previously) states:
'' It is the policy of the State of Ohio to assure the continual enjoyment of the benefits received from the fisheries of Lake Erie and to maintain and improve these fisheries by:
A. Regulating the taking of fish (ORC. 1531.08 and OAC. 1501:31);
B. Prosecuting persons responsible for stream litter and for water pollution resulting in fish kills (ORC. 1531.29 and 1531.02);
C. Protecting fish habitat through Ohio EPA's section 401 water quality certification authority (ORC. 6111.03(O) and 6111.03(P) and OAC. 3745-1 and 3745-32);
D. Considering the protection of fish habitat through the review of State and Federal permit applications;
E. Establishing State wildlife areas for fish and wildlife habitat (ORC. 1531.06);
F. Surveying fish populations and trends and conducting other fishery research studies;
G. Providing access to the fishery; and
H. Providing technical and general information about the Lake Erie fisheries.''

The ORC assigns to the Chief of the Division of Wildlife of the ODNR, the authority and control in all matters pertaining to the protection, preservation, propagation, possession and management of the state's fisheries. Pursuant to ORC 1531.08, the Chief may regulate the taking, possession, transportation, buying, selling, offering for sale and exposing for sale fish or any part thereof.

Furthermore, all orders of the Division relating to the establishment of seasons, limits, size, species, method of taking and possession shall be adopted only upon approval of the OWC (ORC. 1531.03).

Lastly, the State protects habitat for fish and aquatic life through Ohio's Environmental Protection Agency's (EPA's) authority to issue or deny Section 401 water quality certifications for activities that discharge dredged or fill material to waters of the state or create any obstruction or attraction in waters of the state.

Lake Erie - Ontario

In addition to its participation in the deliberations of the aforementioned Great Lakes and Lake Erie committees, the approach to the management of Ontario's commercial fisheries by the MNRF, as lead provincial agency, is guided by the province's Fish Strategy (2015).[241] The main purposes of the strategy are to improve the conservation and management of Ontario's fisheries resources; and to promote, facilitate and encourage fishing as an activity that contributes to the nutritional needs, and the social, cultural and economic well-being of individuals and communities in Ontario.

For a number of years, MNRF has used adaptive management for commercial fisheries on the Great Lakes. Information provided by commercial fishers through mandatory reporting, combined with independent monitoring data where risks are higher, provides basic information that is analyzed on an annual basis. Fishing quotas are adjusted annually, based on the results of data analyses and input from interested parties, with whom the data and results are shared i.e., commercial fishers, FMZ advisory councils, First Nations and Métis fishers. This adaptive approach allows managers to assess the impacts of changing harvest levels on fish stocks each year, consider socio-economic factors that sometimes come into play, and adapt management approaches accordingly.[242]

Moreover, fisheries management operates at a number of spatial and temporal scales depending on the type of fishery (e.g., recreational or commercial) and the nature of any stresses impacting the fishery. In January 2008, 20 Fisheries Management Zones (FMZs) replaced the former 37 Fishing Divisions as the spatial unit for management; this change to landscape-scale management was a key component of the Province's *Ecological Framework for Fisheries Management* and its four basis pillars*:* (i) streamlined fisheries regulations; (ii)

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[241] https://docs.ontario.ca/documents/4538/ontarios-provincial-fish-strategy.pdf
[242] https://dr6j45jk9xcmk.cloudfront.net/documents/4538/ontarios-provincial-fish-strategy.pdf, p.27

creation of new Fisheries Management Zones; (iii) increased public involvement through creation of FMZ Councils; and (iv) development and implementation of a new state of the resource monitoring program.

The Fish Strategy is also intended to inform MNRF fisheries policy development, decision-making and science priorities and to provide input into other natural resources management policy and planning. It is intended to further assist MNRF in prioritizing its efforts and coordinating its activities for addressing new and emerging issues that impact Ontario's fisheries resources.

The strategy is consistent with the description of MNRF's core mandate " to conserve biodiversity and manage natural resources in a sustainable manner " and adopts a landscape approach to fisheries management by seeking to understand how natural systems work and how they are affected by human activities (e.g. ecosystem approach).
Its principles of ecology and conduct are expressed as values that will be used to guide fisheries management planning and decision-making. Descriptions are provided here.

Principles of Ecology
Natural Capacity: Self-sustaining populations can provide long-term benefits when harvested at levels below Maximum Sustainable Yield.

Naturally Reproducing Fish Communities: Self-sustaining fish communities based on native fish populations will be the priority for management. Non-indigenous fish species that have become naturalized are managed as part of the fish community, consistent with established fisheries management objectives.

Ecosystem Approach: Fisheries will be managed within the context of an ecosystem approach where all ecosystem components including humans and their interactions will be considered at appropriate scales. The application of the ecosystem approach includes the consideration of cumulative effects.

Protect: Maintaining the composition, structure and function of ecosystems, including fish habitat, is the first priority for management, as it is a lower-risk and more cost effective approach than recovering or rehabilitating ecosystems that have become degraded.

Restore, Recover, Rehabilitate: Where native fish species have declined or aquatic ecosystems have been degraded, stewardship activities such as restoration, recovery and rehabilitation will be undertaken.

Fish and Aquatic Ecosystems are Valued: Fisheries, fish communities, and their supporting ecosystems provide important ecological, social, cultural, and economic services that will be considered when making resource management decisions.

Principles of Conduct
Aboriginal and Treaty Rights: Aboriginal rights and interests in fisheries resources will be recognized and will help guide MNRF's plans and activities. MNRF is committed to meeting the province's constitutional and other obligations in respect of Aboriginal peoples, including the duty to consult.

Informed Transparent Decision Making: Resource management decisions will be made in the context of existing management objectives and policies, using the best available science and knowledge in an open, accountable way through a structured decision making process. The sharing of scientific, technical, cultural, and traditional knowledge will be fostered to support the management of fish, fisheries and their supporting ecosystems.

Collaboration: While MNRF has a clear mandate for the management of fisheries in Ontario, successful delivery of this mandate requires collaboration with other responsible management agencies, First Nations and Métis communities, and others who have a shared interest in the stewardship of natural resources.

Note: The Strategy's Goals, Objectives and Tactics are presented at Section 7.4.1.5 of this report.

7.4.1.3 Management Plan - Yellow Perch

Lake Erie's Yellow perch management plan continues to undergo revisions to several of its constituent parts. Updated catch-at-age models were implemented in 2018, and new harvest control rules were developed using the MSE process in 2019. An updated plan with a final draft is expected to be provided for Lake Erie Percid Management Advisory Group (LEPMAG) review by late October 2019. The Lake Erie Committee (LEC) has proposed to schedule a webinar in mid-December with LEPMAG members that is intended to result in the adoption and implementation of the plan for the 2020 fishing season.

TAC decisions are reflective of the status of Lake Erie's fish populations and take into account the goal of consistent and sustainable harvest each year. The allocations are determined by the LEC after extensive, lake-wide biological assessments, analyses, discussions, and consultations with stakeholders, including advice provided by the LEPMAG. The individual state and provincial governments implement the Total Allowable Catch (TAC) in their jurisdiction under an area-based formula of jurisdictional surface area of waters within each Management Unit (MU).

7.4.1.4 Management Plan – Walleye

Lake Erie's current management plan for Walleye (2015-2019) was recently extended for another five years (2020-2024) in recognition of the fishery's performance.[243] In so doing, the evaluation of the plan's performance was also deferred to 2024 based on the following factors:

- The current WMP is working well with harvest policy adapting to annual fluctuations in Walleye abundance;
- Recruitment of strong year classes in 2014 and 2015 and moderate recruitment in 2017, minimize the risk to the Walleye fishery;
- The Walleye sport and commercial fisheries are performing very well;
- To allow LEC agencies to continue to shift effort towards completion of the development of a Yellow Perch Management Plan; and
- To allow for the completion of current research over the next 4 years that will contribute new information for incorporation into the next WMP including:
  - the extent of the east basin stock contribution;
  - migration rates from west to east basin;
  - composition of mixed stock fisheries; and
  - refinement of estimates of natural mortality (M).

The Lake's 2019 TAC is 20% higher than the 2018 TAC, a reflection of positive recruitment during the previous few years and increases in population biomass. Ontario, Ohio and Michigan continue to share the TAC based on a formula of walleye habitat within each jurisdiction in the western and central basins of the lake, while jurisdictions in the eastern end of the lake are outside of the TAC area; harvest limits there are set consistent with lakewide objectives.

7.4.1.5 Long-term Objectives

This section examines whether the management policy has clear long-term objectives to guide decision-making that are consistent with the MSC Fisheries Standard, and incorporates the precautionary approach. SA4.5.1 of the Standard (v 2.01) stipulates that 'management policy' is to be interpreted to mean outside the specific UoA (i.e. at a higher level or within a broader context than the fishery-specific management system).

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[243] http://www.glfc.org/pubs/lake_committees/erie/LEC_docs/other_docs/2018%20LEC%20Announcement%20WMP%205%20year_final.pdf

The management policy considered here involves UoAs that are under dual control; that is, they are managed internationally where management falls to both a national agency and a bilateral/multinational agreement or organization).

Bilateral/multinational

Within the GLFC's Joint Strategic Plan (as revised 10 June, 1997), the following common goal has been established:

- To secure fish communities, based on foundations of stable self-sustaining stocks, supplemented by judicious plantings of hatchery-reared fish, and provide from these communities an optimum contribution of fish, fishing opportunities and associated benefits to meet needs identified by society for: wholesome food, recreation, cultural heritage, employment and income, and a healthy aquatic ecosystem (GLFC 1980, 1997).

A. Fish Community Goals and Objectives – Lake Erie[244]

The LEC, representing five fisheries management agencies, developed a set of goals and objectives in accordance with the JSP. The two goals and thirteen objectives are framed in relation to nine principles. The latter include:

- **Self-sustaining stocks** - naturally reproducing indigenous species provide the most predictable, sustainable, and cost-effective benefits to society;
- **The stock concept** - stocks (or populations) are the basic unit for conservation and management and should, where feasible, be identified, monitored, and appropriately managed;
- **Indigenous species** - where competitive interactions between indigenous and non-indigenous species are limiting, priority will be given to indigenous species;
- **Introductions** - no non-native animals or plants will be intentionally introduced into Lake Erie; although each member agency has its own review mechanisms for proposed introductions and the conduct of aquaculture within the Lake Erie watershed, no agency will approve such proposals without review by all other agencies on the LEC, a procedure consistent with the Joint Plan;
- **Preservation and restoration of habitat** - maintenance of quality habitat is fundamental to fish and fish-community conservation; preservation and restoration of habitat must be the foremost concern for achieving these objectives;
- **Preservation of rare and endangered species** - rare and endangered indigenous fish species add to the richness of a fish community through biodiversity and should be safeguarded in recognition of their ecological significance and intrinsic value;
- **Recognition of naturalized species** - a number of non-indigenous species such as rainbow trout, brown trout, coho salmon, rainbow smelt, alewife, carp, white perch, round goby, and sea lamprey have become established and must be considered part of the fish community; the sea lamprey, although naturalized, is considered a pest species requiring control;
- **Harvest** - species of value to sport and commercial fishermen should be harvested on a sustainable basis; and
- **Recognition of the limit on productivity** - a biological limit exists to ecological productivity and fishery sustainable yield; managers must be guided by the best approximation of that limit to maintain a healthy fish community; fish yields are ultimately limited by lake productivity and the efficiency of trophic transfer, which is a function of the composition and structure of the fish.

The two Fish Community goals are:

- To secure a balanced, predominantly cool-water fish community with walleye as a key predator in the western basin, central basin, and the near-shore waters of the eastern basin, characterized by self-

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[244] Ryan, P.A., R. Knight, R. MacGregor, G. Towns, R. Hoopes, and W. Culligan. 2003. Fish-community goals and objectives for Lake Erie. Great Lakes Fish. Comm. Spec. Publ. 03-02. 56 p.

sustaining indigenous and naturalized species that occupy diverse habitats, provide valuable fisheries, and reflect a healthy ecosystem; and

- To secure a predominately cold-water fish community in the deep, offshore waters of the eastern basin with lake trout and burbot as key predators e responsible agencies are aware of their significance to the Lake Erie fish community.

The nine Fish Community objectives are interrelated, and include:

- **Ecosystem conditions** - maintain mesotrophic conditions (10-20 µg·L-1 phosphorus) that favor a dominance of cool-water organisms in the western, central, and nearshore waters of the eastern basins; summer water transparencies should range from 3-5 m (9.75-16.25 ft) in mesotrophic areas;
- **Productivity and yield** - secure a potential annual sustainable harvest of 13.6-27.3 million kg (30-60 million lb) of highly valued fish;
- **Nearshore habitat** - maintain nearshore habitats that can support high quality fisheries for smallmouth bass, northern pike, muskellunge, yellow perch, and walleye;
- **Riverine and estuarine habitat** - protect and restore self-sustaining, stream-spawning stocks of walleye, white bass, lake sturgeon, and rainbow trout;
- **Western basin** - provide sustainable harvests of walleye, yellow perch, smallmouth bass, and other desired fishes;
- **Central basin** - provide sustainable harvests of walleye, yellow perch, smallmouth bass, rainbow smelt, rainbow trout, and other desired fishes;
- **Eastern basin** - provide sustainable harvests of walleye, smallmouth bass, yellow perch, whitefish, rainbow smelt, lake trout, rainbow trout, and other salmonids; restore a self-sustaining population of lake trout to historical levels of abundance;
- **Contaminants** - reduce contaminants in all fish species to levels that require no advisory for human consumption and that cause no detrimental effects on fish-eating wildlife, fish behavior, fish productivity, and fish reproduction;
- **Fish habitat** - protect, enhance, and restore fish habitat throughout the watershed to prevent degradation and foster restoration of the fish community;
- **Genetic diversity** - maintain and promote genetic diversity by identifying, rehabilitating, conserving, and/or protecting locally adapted stocks;
- **Rare, threatened, and endangered species** - prevent extinction by protecting rare, threatened, and endangered fish species (for example, lake sturgeon and lake herring) and their habitats;
- **Forage fish** - maintain a diversity of forage fishes to support terminal predators and to sustain human use; and
- **Food web structure** - manage the food web structure of Lake Erie to optimize production of highly valued fish species; recognize the importance of Diporeia and Hexagenia as key species in the food web and as important indicators of habitat suitability.

The Fish Community Objectives are operationalized based upon a number of general implementation strategies that are overseen by the STC and its’ permanent Task Groups (Yellow Perch, Walleye, Forage, Habitat, Cold Water) or ad hoc Working Groups (Statistics and Modeling, Index Fishing).

The implementation strategies include:

- **Coordination** - continue participation in the STC; ensure continued sharing of information generated by all agencies and coordinated evaluation of the status of resources;
- Advocacy and cooperation- work closely with agencies responsible for environmental and water-quality issues to ensure fish and wildlife concerns are a priority;
- **Assessment** - improve coordinated assessment capabilities and techniques, use improved modeling techniques, and report findings in a timely fashion; further refine measurement criteria to better assess whether goals and objectives have been met;

- **Enforcement** - effectively enforce existing legislation, recommend legislative changes, and continue cooperative enforcement through combined enforcement teams; and
- **Exploitation** - ensure that harvest policies for fish species are consistent with restoration and sustainability objectives.

B. Great Lakes Water Quality Agreement - U.S. and Canada[245]

The amending protocol to this Agreement contains a number of preambular clauses that frame the contextual backdrop to the agreement, including concluding that '' the best means to preserve the Great Lakes Basin Ecosystem and to improve the quality of the Waters of the Great Lakes is to adopt common objectives, develop and implement cooperative programs and other compatible measures, and assign special responsibilities and functions to the International Joint Commission.''

Purpose

The purpose of this Agreement is to restore and maintain the chemical, physical, and biological integrity of the Waters of the Great Lakes. To achieve this purpose, the Parties have agreed to maximize their efforts to: (a) cooperate and collaborate; (b) develop programs, practices and technology necessary for a better understanding of the Great Lakes Basin Ecosystem; and (c) eliminate or reduce, to the maximum extent practicable, environmental threats to the Waters of the Great Lakes.

Principles and Approaches

The Parties shall be guided by the following principles and approaches in order to achieve the purpose of this Agreement:

- **Accountability** - establishing clear objectives, regular reporting made available to the Public on progress, and transparently evaluating the effectiveness of work undertaken to achieve the objectives of this Agreement;
- **Adaptive management** - implementing a systematic process by which the Parties assess effectiveness of actions and adjust future actions to achieve the objectives of this Agreement, as outcomes and ecosystem processes become better understood;
- **Adequate treatment** - treating wastewater without relying on flow augmentation to achieve applicable water quality standards;
- **Anti-degradation** - implementing all reasonable and practicable measures to maintain or improve the existing water quality in the areas of the Waters of the Great Lakes that meet or exceed the General Objectives or Specific Objectives of this Agreement, as well as in areas that have outstanding natural resource value;
- **Coordination** - developing and implementing coordinated planning processes and best management practices by the Parties, as well as among State and Provincial Governments, Tribal Governments, First Nations, Métis, Municipal Governments, watershed management agencies, and local public agencies;
- **Ecosystem approach** - taking management actions that integrate the interacting components of air, land, water, and living organisms, including humans;
- **Innovation** - considering and applying advanced and environmentally-friendly ideas, methods and efforts;
- **"Polluter pays"** - incorporating the "polluter pays" principle, as set forth in the Rio Declaration on Environment and Development, "that the polluter should, in principle, bear the cost of pollution";
- **Precaution** - incorporating the precautionary approach, as set forth in the Rio Declaration on Environment and Development, the Parties intend that, "Where there are threats of serious or

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[245] Protocol Amending the Agreement Between Canada and the United States of America on Great Lakes Water Quality, 1978, as Amended on October 16, 1983, and on November 18, 1987; Signed September 7, 2012; Entered into force February 12, 2013; http://www.ec.gc.ca/grandslacs-greatlakes/A1C62826-72BE-40DB-A545-65AD6FCEAE92/1094_Canada-USA%20GLWQA%20_e.pdf

irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation";

- **Prevention** - anticipating and preventing pollution and other threats to the quality of the Waters of the Great Lakes to reduce overall risks to the environment and human health;
- **Public engagement** - incorporating public opinion and advice, as appropriate, and providing information and opportunities for the public to participate in activities that contribute to the achievement of the objectives of this Agreement;
- **Science-based management** - implementing management decisions, policies and programs that are based on best available science, research and knowledge, as well as traditional ecological knowledge, when available;
- **Sustainability** - considering social, economic and environmental factors and incorporating a multi-generational standard of care to address current needs, while enhancing the ability of future generations to meet their needs;
- **Tributary management** - restoring and maintaining surface waters that flow into and impact the quality of the Waters of the Great Lakes;
- **Virtual elimination** - adopting the principle of virtual elimination for elimination of releases of chemicals of mutual concern, as appropriate; and
- **Zero discharge** - adopting the philosophy of zero discharge for control of releases of chemicals of mutual concern, as appropriate.

General Objectives

The waters of the Great Lakes should:

- be a source of safe, high-quality drinking water;
- allow for swimming and other recreational use, unrestricted by environmental quality concerns;
- allow for human consumption of fish and wildlife unrestricted by concerns due to harmful pollutants;
- be free from pollutants in quantities or concentrations that could be harmful to human health, wildlife, or aquatic organisms, through direct exposure or indirect exposure through the food chain;
- support healthy and productive wetlands and other habitats to sustain resilient populations of native species;
- be free from nutrients that directly or indirectly enter the water as a result of human activity, in amounts that promote growth of algae and cyanobacteria that interfere with aquatic ecosystem health, or human use of the ecosystem;
- be free from the introduction and spread of aquatic invasive species and free from the introduction and spread of terrestrial invasive species that adversely impact the quality of the Waters of the Great Lakes;
- be free from the harmful impact of contaminated groundwater; and
- be free from other substances, materials or conditions that may negatively impact the chemical, physical or biological integrity of the Waters of the Great Lakes.

Specific Objectives

The Parties, to help achieve the General Objectives, shall, in cooperation and consultation with State and Provincial Governments, Tribal Governments, First Nations, Métis, Municipal Governments, watershed management agencies, other local public agencies, downstream jurisdictions, and the Public, identify and work to attain Specific Objectives for the Waters of the Great Lakes, including:

A. Lake Ecosystem Objectives:

Lake Ecosystem Objectives shall be established for each Great Lake, including its' connecting river systems, that:

- are binational, except for Lake Michigan, where the Government of the United States shall have sole responsibility;

- specify interim or long term ecological conditions necessary to achieve the General Objectives of this Agreement;
- may be narrative or numeric in nature;
- will be developed in recognition of the complexities of large, dynamic ecosystems; and
- may be developed for temperature, pH, total dissolved solids, dissolved oxygen, settleable, and suspended solids, light transmission, and other physical parameters; and levels of plankton, benthos, microbial organisms, aquatic plants, fish or other biota; or other parameters, as appropriate.

B. Substance Objectives:
Substance Objectives are numeric targets that may be established binationally by the Parties, where deemed essential to achieve the General Objectives and Lake Ecosystem Objectives of this Agreement. The Parties shall develop the Substance Objectives:

- using approaches appropriate to the substance or combination of substances;
- using binational processes established by the Parties, domestic programs implemented by the Parties, or programs developed and implemented by other entities having relevant jurisdiction coordinated binationally as appropriate.

C. Other Matters:
The amended Agreement also addresses other requirements, including:

- Implementation - Article 4
- Consultation, Management and Review - Article 5
- Notification and Response (to threats) - Article 6

<u>Provincial and State</u>

Ontario

The Provincial Fish Strategy's[246] goals and objectives are presented here in point form.

Goal 1: Healthy ecosystems that support self-sustaining native fish communities.
Objectives:
1.1 Protect and maintain aquatic ecosystem diversity, connectivity, structure, and function, including fish habitat.
1.2 Protect the composition of native fish communities.
1.3 Restore, recover or rehabilitate degraded fish populations and their supporting ecosystems, including fish habitat.
1.4 Prevent unauthorized introductions and slow the spread of invasive fish and other aquatic species, including pathogens.
1.5 Anticipate and mitigate or adapt to large scale environmental changes and minimize cumulative environmental effects.

Goal 2: Sustainable fisheries that provide benefits for Ontarians.
Objectives:
2.1 Harvest fish within safe biological limits.
2.2 Allocate fish resources considering the needs and interests of all users.
2.3 Increase economic, social and cultural benefits derived from fish resources.
2.4 Promote the development and use of responsible fishing practices.
2.5 Reduce the risks to human health associated with contaminants and pathogens.

Goal 3: An effective and efficient fish management program.
Objectives:

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[246] https://docs.ontario.ca/documents/4538/ontarios-provincial-fish-strategy.pdf

3.1 Sound governance to successfully achieve fish management objectives and continually improve the efficiency and effectiveness of fisheries management.
3.2 Effective regulations, policies and practices to guide present and future actions and decisions.
3.3 Maintain a competent, well-trained and educated workforce.
3.4 Provide services that are accessible, responsive to needs, consistent and fair.
3.5 Achieve a high level of compliance with legislation, regulations and policy.

Goal 4: Fisheries policy development and management decisions that are informed by sound science and information.
Objectives:
4.1 Monitor at the appropriate spatial and temporal scale.
4.2 Develop and use fisheries and aquatic sciences and social science.
4.3 A coordinated and standardized approach to information management and sharing of knowledge.

Goal 5: Informed and engaged stakeholders, partners, First Nations, Métis communities and general public.
Objectives:
5.1 Manage fisheries using an inclusive and participatory approach.
5.2 Develop effective partnerships among government agencies, industry, academics, First Nations and Métis communities and stakeholders.
5.3 Encourage individuals, stakeholders and communities to act as effective stewards.
5.4 Increase public awareness and understanding.

Ohio

The long-term objectives that inform the State's management policy and guide its' decision-making processes are reflected in three principle documents.

ODNR Strategic Plan 2011-2030[247]

The multi-year strategic plan of the Department's Division of Wildlife is informed by various Values which recognize that: (i) input from constituents and open lines of communication with the public are essential, (ii) fish and wildlife recreation is socially and economically important to Ohio, (iii) sustainable consumptive use of fish and wildlife through hunting, fishing, and trapping is at the heart of effective conservation, (iv) fish and wildlife management must be based on the best available science, and (v) partnerships are necessary for effective fish and wildlife conservation.

The Department's plan is based on five core principles, each of which is supported by a number of long-term objectives.

Stewardship - Foster healthy ecosystems for the benefit of fish and wildlife.
Objectives
- Diverse and sustainable fish and wildlife populations and habitats representative of healthy ecosystems and sustainable use;
- Minimized impacts from habitat loss, invasive and nuisance species, pollution, disease, climate change, and other challenges;
- Balance the needs of fish and wildlife with the needs of people by mitigating incompatible ecosystem uses;
- Manage and evaluate fish and wildlife populations and their habitats through the best available science;
- Reintroduce and restore species and habitat where appropriate;
- Protect and sustain fish and wildlife resources through regulations, enforcement, partnerships, and education;
- Protect land and water resources through strategic acquisitions, easements, and partnerships

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[247] https://wildlife.ohiodnr.gov/portals/wildlife/pdfs/dowstrategicplan.pdf

- Identify ecosystem or population-level threats through research, surveillance, monitoring, and inventory; and
- Strive to prevent the introduction of and control spread of harmful species through legislation, regulation, policy, management practices, education, and partnerships.

Opportunities - Improve opportunities for fish and wildlife recreation.

Objectives

- Sufficient fish and wildlife populations to accommodate sustainable recreational opportunities
- Minimized barriers to participation in fishing, hunting, trapping, bird watching, wildlife viewing, and other related pursuits;
- Increased participation in fishing, hunting, trapping, bird watching, and other fish and wildlife pursuits;
- Increase and promote "close to home" opportunities for fish and wildlife recreation;
- Increase and promote urban opportunities for fish and wildlife recreation;
- Provide timely, up-to-date, and accurate information about recreational opportunities;
- Conduct research to better understand how and why people value wildlife;
- Increase access to land and water through purchases, easements, agreements, and partnerships;
- Increase, improve, and maintain public access areas;
- Use special events to provide unique opportunities and improve wildlife recreation skills;
- Implement clear and concise regulations that are easily understood and effectively enforced;
- Stock fish and wildlife where appropriate to create, enhance, and diversify recreational opportunities; and
- Use science-based management to maintain and enhance fish and wildlife populations for public use and recreation.

Connections - Create, expand, and improve public awareness, understanding and appreciation of Ohio's fish and wildlife.

Objectives

- Increased public knowledge and understanding of the relationship between people, wildlife, and habitat;
- Increased public appreciation of Ohio's fish and wildlife;
- Expand the Division of Wildlife's role as the source of fish and wildlife information and education;
- Provide a variety of fish and wildlife exhibits, programs, and experiences;
- Develop and maintain partnerships to better deliver the Division of Wildlife's conservation message and promote opportunities to experience fish and wildlife;
- Maintain a corps of Division of Wildlife-trained partners and volunteers to assist, lead, and promote special programs;
- Develop and promote educational materials that address fish and wildlife management principles, outdoor skills, and other conservation concepts;
- Provide accurate fish and wildlife information using current communication technologies; and
- Provide information and guidance to reduce conflicts and improve human interactions with fish and wildlife Identify and address customers' evolving information needs.

Traditions - Preserve and promote Ohio's tradition of conservation.

Objectives

- Consistent recruitment of fish and wildlife enthusiasts;
- Devoted participants and conservation organizations that are the critical link to passing on fish and wildlife traditions;
- Promote youth- and family-oriented events to recruit and retain participants in fish and wildlife recreation;
- Partner with fish and wildlife clubs and organizations to develop conservation recruitment programs;

- Create skill-building opportunities through mentoring, hands-on participation, and memorable outdoor experiences, and
- Encourage participation in shooting sports to improve hunter recruitment.

Excellence - Maintain an effective and professional agency.
Objectives

- Expand sources of funding dedicated to fish and wildlife conservation;
- Outstanding services provided by a high-performance staff;
- Business practices that are efficient, responsible, and accountable to the public;
- Protect Division of Wildlife revenue generated from the sale of hunting and fishing licenses and equipment, while continually seeking new sources of revenue;
- Recruit and retain a broad range of fish and wildlife enthusiasts to enhance support for the Division of Wildlife's mission;
- Use partnerships to leverage fish and wildlife conservation funding;
- Recruit, train, and retain a highly-qualified staff;
- Continually improve our business practices to ensure the most efficient use of funds; and
- Report allocation of fiscal resources annually to provide accountability to the public.

Coastal Management Plan (CMP)

As previously described, the State's CMP sets forth management goals for Ohio's portion of Lake Erie, the coast and watershed in order to preserve, protect, develop, restore, enhance and balance the use of the state's coastal resources. The state's overarching goal is ''sustaining a healthy coast.'' In the planning process that led to the adoption of the CMP (and subsequent approval by the Federal Government), six priority coastal management issues were identified: (i) Water resources and watersheds; (ii) Coastal land use and development; (iii) Coastal habitat, wetlands and natural areas; (iv) Coastal flooding and erosion; (v) Recreational opportunities; and (vi) Fisheries and wildlife resources.

Policy 27 of the CMP addresses the State's approach to Fisheries Management (as reported previously); Policy 28 addresses Fisheries Research and Interstate Cooperation; and Policy 29 concerns Wildlife Management.

7.1.4.6 Fishery-specific Objectives[248]

These objectives are intended to support the harvest and management strategies in place for Ontario's commercial Yellow perch and Walleye fisheries, and Ohio's commercial Yellow perch fishery. The Reassessment team's examination of the objectives for these fisheries was focussed on three primary documents, namely: (i) Lake Erie's Fish Community Objectives; (ii) Lake Erie's current Yellow perch Management Plan and Task Group Reports; and (iii) Lake Erie's current Walleye Management Plan and Task Group Reports. The team's chosen sources of secondary information included the objectives cited previously for Ontario's Fish Strategy and Ohio's Coastal Management Plan.

Lake Erie Fish Community Objectives (FCOs)

As previously reported, the Lake's FCOs consist of nine (9) guiding principles, two (2) goals, and thirteen (13) fishery-specific objectives. The objectives are focussed on the protection and restoration of fish habitats; sustaining healthy fish populations; reducing the levels of contaminents; maintaing genetic diversity of stocks; protecting rare, threatened and endangered species; maintaining forage fish diversity; and managing the food web structure. Implementation strategies are described but, as stated in the footnote, were not considered under MSC's Principle 3.

Lake Erie Yellow perch Management Plan

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[248] MSC Fisheries Standard (v 2.01; SA4.7.1.1) stipulates that the fishery-specific objectives shall be assessed under PI 3.2.1, and the strategies that implement the objectives shall be assessed under P1 and P2.

As reported at the 4th annual surveillance audit, the STC is continuing to meet to develop an updated Management Plan with a final draft expected to be provided for LEPMAG review by late October 2019. The LEC has proposed to schedule a webinar in mid-December with LEPMAG members that is intended to result in the adoption and implementation of the plan for the 2020 fishing season. Further details are available at Charge 3 of the 29th March 2019 Report of the Lake Erie Yellow perch Task Group.[249]

At this juncture, the fishery-specific objectives associated with Principle 1 outcomes – stock status, harvest strategy, harvest control rules, information and monitoring – of the interim plan are reported here for provisional scoring purposes. As for the Principle 2 outcomes, the team has taken a similar provisional approach by using the information from the 2015 initial assessment in which the Lake Erie Fish Community objectives were assessed and scored.

Should the revisions to the Yellow perch plan be finalized within the timeframes as laid out for this reassessment, the scoring of the fishery's objectives will be reevaluated.

Lake Erie Walleye Management Plan

Walleye are managed under the Walleye Management Plan, which was developed through the LEPMAG and formally adopted by the LEC in December, 2015. The approach that was pursued by the LEPMAG in developing the Plan's components are detailed in the plan itself. As for the fishery-specific objectives, LEPMAG developed candidate objectives (see below) for discussion with stakeholder groups; they were subsequently recommended to, and approved by, the LEC.

- sustainability and stabilization of the fishery;
- economic viability of commercial industry;
- reversal of the recent downward trend in abundance;
- explicit and balanced handling of risk and uncertainty;
- defined performance measures;
- a broad distribution of population benefits lake-wide; and
- a more transparent management process.

Ontario

FMZ Plans for each FMZ document the desired future state of the fisheries resources, and interpret provincial goals and objectives in the establishment of zone-level and local fisheries objectives and actions.

7.4.1.7 Consultations and Engagement

The need to strategically manage the natural resources, wildlife and supporting environments of the Great Lakes was first recognized with the adoption of the Boundary Waters Treaty (1909) by the U.S and Canada. Over the ensuing decades, bi-national and federal-state-provincial statutes were enacted, specific agreements and protocols were developed, and governance systems created that collectively allowed for the Great Lakes' overarching management systems to evolve in a structured way that allowed the parties to intervene collectively in addressing the requirements of each of the Great Lakes.

Galen *et al* (2009)[250] commented that ''Despite the large number of jurisdictions, the role of each type of jurisdiction is defined, accepted, and respected, and the management authorities tend to complement, not contradict or duplicate, each other.''

This section of the report examines the degree to which Lake Erie's management system has effective consultation and engagement processes that are open to interested and affected parties, and whether the

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[249] http://www.glfc.org/pubs/lake_committees/erie/YPTG_docs/annual_reports/YPTG_report_2019.pdf

[250] http://www.glfc.org/aboutus/brief.php#mission

roles and responsibilities of organizations and individuals who are involved in the management process are clear and understood by all relevant parties.

A logical starting point is to situate Lake Erie's management system within the broader Great Lakes system as represented by the various Councils and Committees that define the organizational structure of the GLFC (Figure 46).

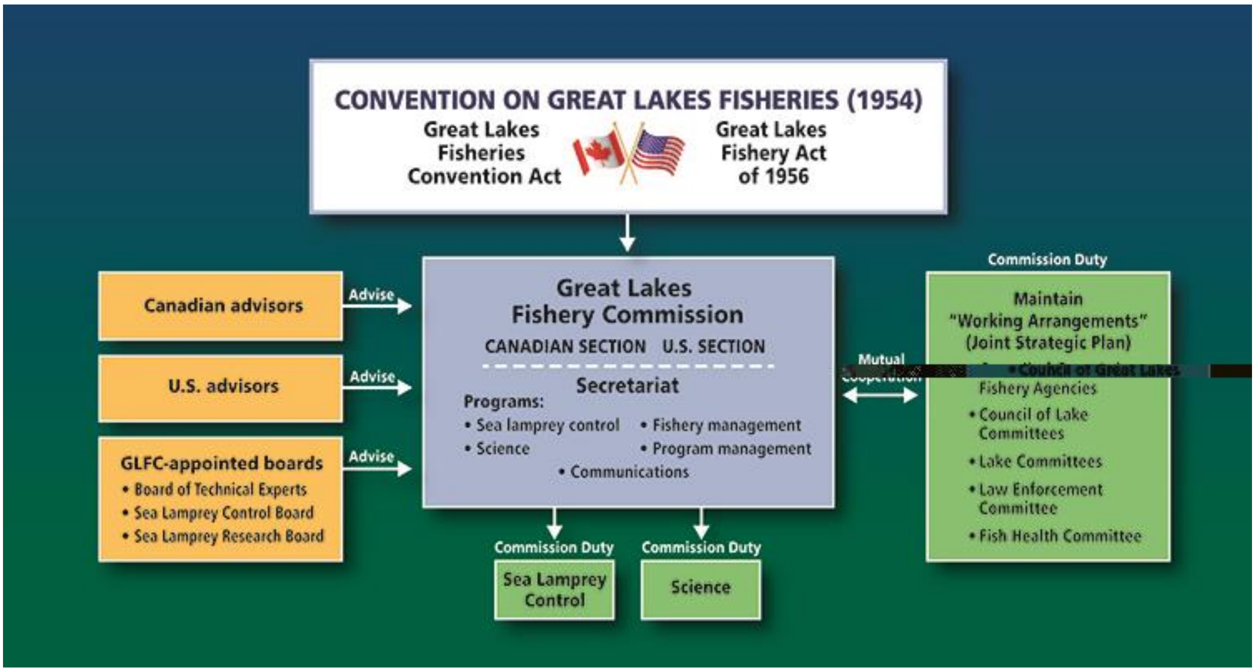

Figure 44. GLFC's Organizational structure[251].

The GLFC's Commissionners are charged with five duties:

- develop a binational research program aimed at sustaining Great Lakes fish stocks;
- coordinate or conduct research consistent with that program;
- recommend measures to governments that protect and improve the fishery;
- formulate and implement a comprehensive sea lamprey control program; and
- publish or authorize publication of scientific and other information critical to sustaining the fishery.

The programs which support these duties are formulated through recommendations from several research and management committees, comprising scientists, fishery managers, and academic experts. In addition, the commission receives advice from the Committee of Advisors, made up of citizens from Canada and the United States. The commission is also mandated to establish "working arrangements" among governments to ensure multi-jurisdictional fishery management within the parameters of the Commission's inter-agency JSP.

Council of Lake Committees[252]

The Council of Lake Committees (CLCs) is composed of representatives from state, tribal, and provincial agencies represented on Lakes Committees, for a maximum of twenty-one members. The Council's purposes and other functionalities are described in its' Terms of Reference[253] and include to:

- consider issues pertinent to, or referred by, the Great Lakes Fishery Commission;
- consider issues and problems of common concern to member agencies;

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[251] http://www.glfc.org/about.php#mission

[252] http://www.glfc.org/council-of-lake-committees.php

[253] http://www.glfc.org/pubs/lake_committees/Council%20of%20Lake%20Committees%20TOR.pdf

- develop and coordinate joint programs and research projects;
- serve as a forum for state, provincial, tribal, and federal agencies; and
- respond to requests made to it by any of the Lake Committees.

Council of Great Lakes Fishery Agencies[254]

The Council was created to oversee the implementation of the JSP for Management of Great Lakes Fisheries. The primary responsibility of this committee is to guide and support the process of implementing the Plan in accordance with its' Terms of Reference.[255] Its' stated purposes are to:

- ensure mutual accountability of the Parties to the Plan;
- provide guidance and support to the Plan's institutional arrangements;
- encourage and support timely and effective information exchange between fishery law enforcement agencies and fishery managers;
- ensure that environmental objectives are articulated and reciprocal strategies with environmental agencies are developed;
- represent fishery interests to the most appropriate body or process on unresolved or emerging environmental issues which may be referred to the Council by Lake Committees or the Council of Lake Committees; and
- inform and educate on a basin-wide perspective, including the development and implementation of a strategic communications framework that details the roles and responsibilities of the Parties and the Great Lakes Fishery Commission.

Law Enforcement Committee[256]

The Committee serves to protect, enhance and promote the safe and wise use of the natural resources in the Great Lakes in accordance with its' Terms of Reference.[257] The Committee's stated purposes are to:

- promote recognition that the Great Lakes fisheries resource is a shared, renewable resource whose protection and enhancement requires close cooperation between all jurisdictions charged with the responsibility of resource protection;
- promote recognition and acceptance that law enforcement is an integral part of effective Great Lakes fisheries and fisheries habitat management;
- promote cooperation among all Great Lakes law enforcement jurisdictions by:
    - identifying and promoting Great Lakes law enforcement priorities and tactics;
    - sharing of law enforcement information;
    - supporting investigations that span jurisdictional lines;
    - supporting development and dissemination of information about emerging enforcement technologies and techniques; and
    - development and recommending consistent regulations and commensurate penalties among jurisdictions.
- provide a basin update annually to the Great Lakes Fishery Commission;
- ensure law enforcement information is made available for incorporation into fisheries management decision-making; and
- participate in the management of fisheries resources and fish habitat by preventing exploitation by unlawful means.

The work priorities, roles and responsibilities of the five Councils and Committees under the JSP are described by their established governance provisions (i.e.Terms of Reference). Having reviewed the provisions, the

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[254] http://www.glfc.org/council-of-great-lakes-fisheries-agencies.php

[255] http://www.glfc.org/pubs/cglfa/Council%20of%20Great%20Lakes%20Fishery%20Agencies%20TOR.pdf

[256] http://www.glfc.org/law-enforcement-committee.php

[257] http://www.glfc.org/pubs/lake_committees/LAW%20Terms%20of%20Reference.pdf

Reassessment team found them to be comprehensive and functional with clearly defined roles, responsibilities, authorities and accountability.

Council and Committee meeting dates and locations are generally scheduled well in advance; meeting agendas and background materials are distributed prior to the meetings; stakeholders attend to represent the interests of their organizations; the public may attend and may, in some cases, be allowed to put questions or concerns to the committee's members (with the exception of the proceedings of the Board of Technical Experts whose meetings are closed); meeting minutes or a record of discussion are frequently posted on the sponsoring organization's website or can be obtained upon request.

Given the longstanding tenure of the Councils and Committees, the Reassessemnt team understands that professional relationships have been sustained, participants are well versed in their roles and responsibilities, and are encouraged to actively participate in all deliberations.

In addition to the formal meetings of the Councils and Committees, there are other ongoing opportunities that exist for public input and interactions through symposiums, conferences, workshops, and open houses (Table 44).

Table 44. Consultations and engagements with stakeholders and the public.

Dates (2019)	**Forums**	**Locations**
April 11	State of Lake Erie meeting	Hamburg, NY
June 12	Quarterly meeting of Ohio Lake Erie Commission	Cleveland, OH
June 17 - 19	Great Lakes Public Forum	Milwaukee, WI
June 18	Public meeting - International Joint Commission	Milwaukee, WI
July 10 August 8 September 11 October 9	Open houses - Ohio Wildlife Council	Various
June - October	Public roundtables and meetings - International Joint Commission	Various
September 11	Great Lakes Areas of Concern Conference	Cleveland, OH
September 18	Quarterly meeting of Ohio Lake Erie Commission	Lorain, OH
October 9 - 11	Annual meeting - Great Lakes Commission	Québec City, QC
October 29	Semi-annual meeting - Council of Lakes Committee (closed)	Romulus, MI

Lake Erie

Several Committees and Task Groups operate to monitor and manage various components of the lake's fisheries management system and to provide advice as may be requested by a Great Lake-wide Committee. These include:

- Lake Erie Committee (LEC)[258] and Task Groups (TGs)
- Standard Technical Committee (STC)
- Lake Erie Percid Management Advisory Group (LEPMAG)
- Ohio Wildlife Council (OWC)

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[258] http://www.glfc.org/lake-erie-committee.php

- Michigan State University (MSU) - Quantitative Fisheries Centre (QFC)[259]

Opportunities are available for stakeholders and the general public to provide perspectives or raise issues during scheduled meetings or at any number of outreach sessions listed previously.

The roles and responsibilities of the Committees and Task Groups were highlighted previously. Detailed descriptions are provided in footnoted Terms of Reference. MSU's QFC is a science-based academic institution that provides Great Lakes-wide research, outreach services, and teaching programs to (i) build greater capacity within fishery management agencies in quantitative methods; (ii) improve quantitative methods for assessing fish stocks; (iii) assist agencies in the use of model-based approaches in decision-making, and (iv) develop a better understanding of fish community and population dynamics. QFC staff have frequently been called upon to facilitate inter-agency discussions and stakeholder interactions.

The LEPMAG group comprises approximately 35 members, with representatives from all interest groups and jurisdictions. The LEPMAG meets several times a year, for full day discussions, creating a time and place for all interested parties to engage in the decision-making process. The meetings are facilitated by the team from the QFC. These discussions allow for debate over potential refinements to assessment models, and development of candidate harvest control rules. The LEPMAG has also identified quantitative performance indices; stakeholders evaluate expected performance of various scenarios, and have debated both alternative configurations to, and assumptions for, the models used to simulate those scenarios.

Ohio's Lake Erie Fisheries 2018 Annual Report[260] acknowledges that the success of the Lake Erie program depends on informed stakeholders. Division of Wildlife management practices need to be completed in a transparent fashion and by interacting with an informed public using direct media and electronic methods. Because of the importance of the Lake Erie fishery and fish populations to the Ohio economy, communication of environmental conditions, fish population trends, fishing success, research findings, habitat initiatives, and the need for/effect of fishery regulations is essential to sustain stakeholder support.

All public and media requests for Lake Erie fisheries and resource information or public inquiries are addressed by staff at the Fairport and Sandusky Research Stations. Division of Wildlife employees present and display management, assessment, and research findings to symposia, workshops, sports shows, angler clubs, civic groups, schools, and other user groups or interested parties upon request and available scheduling. Staff also participate in preparing and providing Lake Erie fishery and resource information to the public though internet, media, and ODNR outlets.

7.4.1.8 Decision-making Processes

The decision-making processes for the UoAs of this reassessment occur through two distinct but inter-connected structures: (a) the Lakes governance committees, and (b) State and Provincial management agencies.

A. Lakes Committees

The decision-making processes at the level of the Great Lakes generally, and Lake Erie specifically, are supported by top-down and bottom-up mechanisms that incorporate the outcomes from stakeholder and public engagements, ongoing monitoring activities, and committee deliberations. The processes are further framed by federal-state-provincial statutory requirements and by the mandated roles and responsibilities of established committees and other entities.

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[259] https://www.canr.msu.edu/qfc/

[260] https://wildlife.ohiodnr.gov/portals/wildlife/pdfs/fishing/LakeErieStatus.pdf (p.13)

The **Great Lakes Fishery Commission** was established under the *1954 Convention on Great Lakes Fisheries*. Decisions by the Commission are the purview of representatives that comprise the Canadian Section and the U.S. Section and ''shall be made only with the approval of both Sections'' (Article II). The Commission's decision-making powers are set out in other articles of the Convention and pertain largely to governance and organizational arrangements. The Commission's capacity to formulate and oversee its' inter-jurisdictionally-mandated programs is largely dependent on advice provided by the Committee of Advisors and members of the Board of Technical Experts, with the cooperation of the Contracting Parties.

While the Commission has no specific decision-making authority to direct government agencies on how the Lakes' day-to-day fisheries programs are managed, it plays an important role in facilitating informed fisheries management decision-making by conducting, coordinating and communicating information from research programs. The Commission's Strategic Vision 2011-2020, Goal 3, Strategy 7 states: Facilitate information sharing and communicate the results of Research to better inform fishery managers. The outcome of this goal is that ''Fishery managers and other stakeholders will have access to knowledge and information about Great Lakes ecosystems sufficient to make informed and effective decisions.''[261]

The day-to-day fisheries management activities are exercised by non-government agencies (States, Provinces and U.S. Tribes) and several federal agencies, who, collectively, are signatories to the JSP. Member agencies that participate in the work of the JSP committees such as the LEC, are accountable for implementing joint decisions made under the plan. The plan calls for the production of a decision record through publication of meeting minutes, agency reports, and lake committee reports.

The JSP requires that the fishery agencies who participate on its implementation committees commit to cooperation, consensus, strategic planning, and ecosystem-based management. All agencies must agree before management actions that affect multiple jurisdictions can be initiated. Agencies are accountable for implementing joint decisions made under the plan.

The **Council of Great Lakes Fishery Agencies'** Operational Protocol states that it ''shall use consensus when making decisions, since achieving consensus is an essential feature of the JSP. If consensus cannot be achieved, the concerns of dissenting Parties shall be described in the meeting minutes of the Council and in the report of the Council to the GLFC.

Decisions of the **Council of Lake Committees** are made by consensus. When consensus cannot be achieved, the concerns of all agencies (i.e. dissenting Parties) are described in the council report to the GLFC. A similar protocol exists with respect to the **Lake Erie Committee.** Furthermore, the LEC's established **Task Groups** operate under a similar consensus approach in which issues are resolved by consensus of the members. If consensus cannot be achieved on an issue, the issue is referred first to the **Standing Technical Committee** and then to the LEC for resolution.

Since 2010, the **Lake Erie Percid Management Advisory Group** has served as the primary method to incorporate stakeholder needs and objectives into the decision-making process regarding harvest of walleye and yellow perch. Members work together to identify the harvest policies for Lake Erie percids that meet the needs of all stakeholders while maintaining stability in the percid fishery. Michigan State University's **Quantitative Fisheries Center** facilitates the LEPMAG process. Walleye and Yellow perch fisheries are now managed under separate multi-year management plans that were developed through the LEPMAG and formally adopted by the LEC.

B. State and Provincial Management Agencies

Officials with the MNRF in Ontario and the ODNR in Ohio have decision-making powers that are conveyed either administratively as a function of their employment or as may be granted by legislation. Typically, the

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[261] http://www.glfc.org/pubs/misc/StrategicVision2011.pdf

former would cover matters such as commercial fishery access, allocations, quota transfers; operational programs; and policy development. The latter would cover authorities that are defined by Acts and Regulations.

7.4.1.9 Dispute Resolution

One of the features of the JSP for the Great Lakes involves a Strategic Procedure for Conflict Resolution. Essentially, if consensus cannot be achieved, a party may seek advice from within the committee structure of the Fishery Commission, or a party may ask the Fishery Commission to arrange/facilitate a forum for information exchange, arrange third-party mediation with any resolution accepted only by a consensus of the affected parties, or provide a mutually acceptable third-party intermediary to make a non-binding recommendation. Moreover, in relation to environmental issue resolution, the Plan's Ecosystem Management Strategic Procedure allows unresolved or emerging environmental issues to be referred by Lake Committees to the parties, the Council of Great Lakes Fishery Agencies, or the Fishery Commission, asking them to represent their interests before the appropriate controlling authority.

Historically, conflicts between the interests of commercial and recreational percid fishers have resulted in an ongoing lack of consensus on management procedures. Despite these challenges, and a lack of any formal obligation for reaching consensus, the LEC has endeavored to do so, particularly since implementation of the Joint Strategic Plan for Management of Great Lakes Fisheries in 1981.[262] All agencies must agree before management actions that affect multiple jurisdictions can be initiated. To help achieve consensus, agencies have developed shared fish community objectives for each lake. In the rare instance where consensus cannot be achieved, the plan contains provisions for conflict resolution.

in the mid-2000s, the LEC supported a process for harvest policy development that explicitly involved stakeholders, fishery managers, agency fishery biologists, stock assessment specialists, and modelers. A neutral party (Quantitative Fisheries Center at Michigan State University) was solicited to facilitate the process, to help build trust among stakeholders and managers. The group of stakeholders, managers, and facilitators became known as the LEPMAG.

7.4.1.10 Compliance and Enforcement

The MSC Fisheries Standard requires that there must be a monitoring, control and surveillance (MCS) system in place as evidence that fishers comply with the requirements of the (fishery-specific) management system and there is no evidence of systematic non-compliance. The MCS system operates at both the Great Lakes level and at the state-provincial level.

Great Lakes

The activities of the former are largely performed by member agencies of the GLFC's Law Enforcement Committee[263], a forum of eight states, three U.S. intertribal agencies, one province and several federal agencies who are responsible for developing, implementing and enforcing fishery regulations throughout more than 100,000 square miles of shared waters. The Committee is charged with:

- Maintaining each jurisdiction's interests in cooperative fishery enforcement activities and decisions;
- Sharing law enforcement information;
- Supporting investigations that cross jurisdictional lines;
- Developing consistent regulations and commensurate penalties among jurisdictions;
- Providing the necessary leadership to bring resolution to important enforcement issues;
- Developing strategies to effectively communicate with resource users; and

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[262] http://www.ices.dk/sites/pub/ASCExtendedAbstracts/Shared%20Documents/L%20-%20Science-industry%20partnership.%20The%20value%20of%20cooperative%20research%20in%20fisheries%20and%20marine%20management/L3015.pdf

[263] http://www.glfc.org/law-enforcement.php

- Organizing special training sessions for Great Lakes officers on everything from invasive species identification to information sharing.

The Terms of Reference of the Law Enforcement Committee stipulate, *inter alia,* that (i) information is made available for incorporation into policies that affect fisheries management and regulations-based decision-making, (ii) it identify and evaluate issues associated with compliance to fishery regulations in the Great Lakes basin, and it support agencies in their resolution to deter illegal activities, (iii) it draft recommendations for consideration by the Council of Lake Committees on the cooperative procedures and the practical fishery management policies required to reduce and prevent illegal commercialization in the Great Lakes basin; (iv) it meet twice per year in advance of the Council of Lake Committees meetings, and produce detailed reports of its meetings.

Ohio

The State's MCS program is carried out by the Wildlife Division of the Department of Natural Resources, in accordance with the roles, responsibilities and authorities as defined by the State's Administrative Code and Revised Code (Sections 1531 and 1533). The chief of the Division has been established as the executive officer who initiates and concurs on all statutory responsibilities which are either mandatory or directory in nature. The Division is required by Section 1531.04 of the ORC to (in part):

- Plan, develop, and institute programs and policies based on the best available information;
- Enforce by proper legal action or proceeding the laws of the state and division rules for the protection, preservation, propagation, and management of wild animals and sanctuaries and refuges; and
- Promote, educate, and inform the citizens of the state about conservation and the values of fishing, hunting, and trapping.

The Division's Law Enforcement organizational structure, personnel responsibilities and powers, and operational features are detailed in its 200-page Law Enforcement Operations Manual.[264] The working-level Wildlife Officers (one for each of the State's 88 counties) serve (in part) to:

- Protect people, wildlife and property throughout the state;
- Enforce laws and regulations and conduct investigations of crimes relating to the taking, possession, protection and propagation of wild animals and other crimes;
- Inspect for compliance with license and permit requirements, as well as hunting, fishing and trapping regulations;
- Make physical arrests;
- Execute search warrants, issue summonses, investigate reported violations, prepare affidavits, and testify in court;
- Conduct interviews and interrogations relating to suspected violations of laws or regulations; and
- Implement information and education outreach services.

The organization's structure is complemented by (i) wildlife Investigators, (ii) Lake Erie investigators, (iii) wildlife officer supervisors, (iv) district law enforcement supervisors, (v) a permit coordinator, (vi) a program manager, and (vii) an executive administrator and support staff.

Lake Erie Law Enforcement Unit

The primary role of the Unit is to enforce commercial fishing laws (including for aquatic invasive species) through patrols and investigations. It operates from two locations: Sandusky and Fairport Harbour. A Special Operations team utilizes "covert" operations for the detection and investigation of illegal taking, illicit trade in wild animals, and other crimes under the authority of the Division. The Division operates a ''Turn-in-the Poacher'' (TIP) Program. The goal of the TIP program is to open lines of communication with the public to encourage and facilitate the reporting of wildlife crimes.

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[264] http://wildlife.ohiodnr.gov/portals/wildlife/pdfs/publications/laws%20&%20regs/Pub%205501%20Law%20Ops%20Manual.pdf

Directives

Section 13 of the Operations Manual contains approximately 50 directives that serve to add clarity to the program's components and, in the process, ensure consistency and assurance in how the Division's enforcement activities are conducted.

Licence Conditions - Commercial Yellow perch Trapnet Fishery

The compliance requirements of the Division's MCS program in respect of Ohio's 2019 commercial Yellow Perch small mesh trap net fishery are reported here. Additional compliance requirements from the OAC have been added.

- Season: It shall be unlawful for any person to take or attempt to take Yellow Perch (*Perca flavescens*) with any commercial fishing device in the Lake Erie Fishing District except from May 1 to December 10 of each year;
- Limited entry: Only persons holding a license in reserve or licensed to fish in the previous season or holders of a transferred license will be licensed to fish, provided they have complied with Chapters 1531 and 1533 of the ORC and the OAC in the previous fishing seasons;
- Gear markings: (i) the backs of all trap nets must measure not less than 1/4 inch or more than four inches stretched mesh, (ii) a commercial orange uphaul buoy must be attached to each net; (iii) numbered tags issued by the Division of Wildlife must be attached by the licensee to the uphaul buoy line within 36 inches of the uphaul buoy; (iv) each trap net set singly, or the first and last net in a string of nets, in Lake Erie must display one red flag on the inshore end and two flags on the offshore end;
- Closed areas and times (partial description): (i) it is unlawful to set a net within 1/4 mile of an island or the mainland bordering Lake Erie from June 15 through September 15; (ii) no person may lay out or set a net of any kind in any channel between islands or an island and the mainland at a distance from the shore of such islands or mainland greater than one-fourth the distance across such channel, (iii) it is unlawful to set a net or trotline on a reef at any time; and (iv) no fishing device may be lifted, pulled, hauled, set, or have fish removed from it from one-half hour after sunset to one-half hour before sunrise;
- Monitoring and catch reporting: (i) all vessels engaged in trapnetting must have an operating vessel monitoring system aboard approved by the chief of the Division of Wildlife, (ii) trap net licensees shall keep an accurate daily record of their catch on an electronic catch reporting system as established by the chief of the Division of Wildlife; (iii) an estimated weight of all quota species of fish taken by trap net shall be entered into an electronic catch reporting system immediately after each net is lifted, (iv) all of the estimated weights entered into the electronic catch reporting system shall be electronically transmitted after lifting the last net, or at least one half hour prior to landing at the dock listed on the license;
- All undersized fish and species that cannot be taken commercially must be released immediately with as little injury as possible while the fishing device is lifted, pulled, or hauled;
- It is unlawful for any person to sell, buy, offer for sale, possess, or transport for sale fish which have a length or weight limit in any form other than round, headed and gutted, or filleted;
- Commercial fish minimum sizes: 8 1/2 in (in the round); 5 5/8 in (fillet); 6 7/8 in (headless); and
- All fish taken or caught from Ohio waters shall be brought into an Ohio port for inspection. No person shall ship, carry, transport, or cause to be transported any fish taken or caught from Ohio waters directly to a point outside the state (ORC Chapter 1533.63).

Ontario

As previously reported, the MNRF is the agency responsible for administering and enforcing the *Fish and Wildlife Conservation Act, 1997*, the *Ontario Fishery Regulations*, and the Federal *Fisheries Act*, including allocation and licensing of fisheries resources, fisheries management (e.g., control of angling activities and stocking), fisheries management planning, fish and fish habitat information management, and fish habitat rehabilitation. Ontario works with DFO to help achieve the requirements of the *Fisheries Act* through agreements and protocols. Regulatory compliance by Provincial Conservation Officers is achieved through activities ranging from outreach and education to field inspections and prosecutions.

A risk-based framework for compliance and enforcement planning supports fisheries management by focusing efforts on areas of highest risk to fisheries resources. This approach helps to ensure compliance with fisheries legislation in areas where threats are greatest or the resources most need protection. Priorities are then set on the basis of risk posed to human health and safety, natural resources, the economy and social/cultural values.

Licence Conditions - Commercial Yellow perch Gillnet and Trapnet Fisheries

The compliance requirements in respect of Ontario's 2019 commercial Yellow perch and Walleye fisheries are listed below. Conditions that pertain to the numerous closed areas and times, and the handling and packaging of landed species prior to landing have been excluded. The information is described in a 14th December 2018 document issued by the MNRF.[265]

- While engaged in fishing, the licencee or designate shall submit an accurate and complete Daily Catch Report (DCR) prior to landing any fish, even when no fish are caught;
- Any no harvest permitted species, SARO species or wildlife species that are caught and are still alive must be released in a manner which causes the least harm to the fish or wildlife;
- The licencee or designate shall not fish in an area other than that which is described on the face of this licence;
- The vessel(s) named on this licence is/are the only vessel(s) that shall be used for commercial fishing, transporting or possession of commercial fish taken under the authority of this licence;
- The licencee or designate shall accurately maintain, on a daily basis, a bound log book with entries for each day's fishing activities. This shall include: the complete coordinates, in latitude and longitude, for the start and end of each continuous series of nets set and lifted; the dates on which nets are set and lifted; and the length of each net fished;
- The logbook shall be kept on the vessel at all times and made available for inspection by a Port Observer or a Conservation Officer upon request;
- A licencee or designate licenced to use gill nets shall not fish for any species of fish or set, lift or possess a gill net with a mesh size less than 57 millimeters (2.25 inches) in extension measure as defined in these conditions (for Walleye, 89 mm or 3.5 inches);
- All fish on a vessel used for commercial fishing or transporting commercially caught fish shall be in round form;
- All fish shall be landed at designated ports between the specified hours for the ports, except as otherwise authorized by a Port Observer or Conservation Officer;
- When a red flag is displayed at the designated port, the licencee/designate shall report to the Port Observer, Conservation Officer or Observer for sampling, weight verification and/or a vessel inspection;
- When a white flag is displayed at the designated port, the licencee/designate shall proceed to his/her normal place of unloading and wait for a Port Observer, Conservation Officer or Observer for inspection or sampling;
- All fish, with the exception of fish destined for discard, shall be iced immediately upon being removed from nets and placed in receptacles;
- This licence is valid for an assigned quantity of fish by species as listed in the Appendix "C" assigned to this licence. Any fish harvested in excess of quota must be covered off by a transfer of quota from the same quota area sufficient to cover the excess quantity of fish or be subject to the following provisions. There will be no transfers of any quota between quota areas unless authorized in writing by the Lake Manager on a species by species basis;

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[265] Document is entitled: *Lake Erie Commercial Food Fishing Licence Conditions for the Year 2019 - Appendix B.*

- Over quota harvest by species at the end of the initial quota period, on the day quota was exceeded, will be subtracted from the final quota allocation for which this licence is valid. Additional Walleye over quota must be covered by a transfer prior to May 1st;
- All transfer of quota must take place by January 31st following the year in which this licence is valid;
- Licencees must make restitution to the Crown for over quota harvest incurred in the current fishing year. Final allocation will not be issued for the next year if restitution has not been made to the Crown;
- With the exception of nets set between March 15th and December 15th fishing with gill nets in any part of Lake Erie during the periods January 1st to March 31st and December 15th to December 31st will be subject to the following conditions:
    - a GPS tracking device (vessel monitoring system [VMS]) must be installed on each vessel engaged in fishing operations and remain functional from the time the vessel leaves the harbour until its' return to port on each day fishing,
    - each vessel must be covered by a valid service contract with a service provider that captures the output from the GPS tracking device in real time and archives data,
    - you must provide internet access codes to the Ministry to access the data captured by the service provider,
    - the vessel captain shall ensure that the GPS transponder (antenna), the unit itself (black box), or its power supply is not rendered inoperable, damaged or interfered with,
    - if you or a designate receives a communication from a Conservation Officer or Ministry official that the vessel monitoring system on their vessel is not functioning, and upon direction from a Conservation Officer or Ministry official, the vessel must cease all fishing activities and immediately return to the port from which it left and have the VMS unit repaired by a qualified technician employed by the equipment supplier before conducting further fishing activities or leaving port for any other reason unless authorized by a Conservation Officer or Ministry official; and
- A licencee or designate shall immediately report any lost or stolen net(s) to a Conservation Officer.

MCS Outcomes - Ohio and Ontario

In 2015, Ontario's conservation officers (i) made over 220,000 enforcement contacts, (ii) issued close to 7,000 warnings; (iii) laid nearly 3,000 natural resource charges, and (iv) spent more than 8,900 hours educating the public on conservation and safety[266].

Conservation officers are empowered to:

- stop and/or inspect a vehicle, boat or aircraft
- inspect firearms, ammunition, fish or game
- inspect buildings or other places
- search with a warrant, and in circumstances requiring immediate action, without one
- seize items related to an offence
- ask questions relevant to the inspection
- arrest anyone who has committed, is committing or is about to commit an offence under many of the acts they are authorized to enforce

7.4.1.11 Monitoring and Management Performance Evaluation

This PI focusses on whether the management system has a process of monitoring and evaluating management performance relevant to fishery-specific management and supporting structures that are able to effect change. MSC Guidance (GSA4.10) lists the components of the management system as including: (i) the decision-making process, (ii) data collection, (iii) scientific research, (iv) collaboration in the preparation of plans, (v) responding to feedback and responses, (vi) compliance and enforcement, and (vii) monitoring systems as required by P1 and P2.

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[266] https://www.ontario.ca/page/conservation-officer-powers-and-authorities. Based on current public information.

Great Lakes

Monitoring and management performance evaluation of the management systems in place for the Great Lakes' fisheries and ecosystems are informed by the Accountability and Reporting Standard[267] of the JSP to which all jurisdictions and agencies must comply with. This strategic procedure provides clear direction and incorporates the following:

- **Decision Record** – Consensus decisions made by lake committees or the Council of Lake Committees shall be made a matter of record;
- **Agency Reports** – Fishery agencies, separately or jointly, should make annual reports to the lake committees of the progress made toward achieving their mutual committee objectives.
- **Lake Committee Reports** – Each lake committee will prepare an annual progress report and make recommendations to both the agencies and the fishery commission. In addition, each lake committee will convene, on a rotational basis once every five years, a special conference focused on the state of its lake. The proceedings of this conference will be a publishable report on progress towards achievement of fish-community objectives.
- **Fishery Commission Report** – The fishery commission's annual report to the governments and the public will include a summary of lake committee reports and recommendations regarding fishery and environmental objectives, ongoing programs, and issues needing attention.

The reporting requirement calls on the agency members of the individual Lake Committees to contribute to annual lake-wide reports and for these to be included in the GLFC's annual reports to governments and the general public.

In 2017, the GLFC published a report entitled *A Mid-Decade Review of Progress under a Strategic Vision of the Great Lakes Fishery Commission 2011-2020.*[268] This report, the third in the series (1992, 2008), reviews progress from 2011 to 2015, the first half of the period covered by the GLFC's third strategic vision. The major policy objectives within the current strategic vision (2011) are described metaphorically as pillars, one for each of the three focal areas within the GLFC (i.e., healthy ecosystems/sustainable fisheries, sea lamprey control, and alliances/partnerships. Each pillar is supported by a strategic formulation of what is to be accomplished in the broadest sense and it, in turn, is operationally defined by one or more goals, each to be effected by one or more strategies all having specified outcomes. The outcomes are measurable and, in the aggregate, provide an assessment of progress for each pillar.

The status and performance of the goals, strategies and outcomes of Pillar One - Healthy Ecosystems and Sustainable Fisheries - are reported in considerable detail at pages 2 - 8.

Lake Erie Fish Community Objectives

The third *State of the Report for Lake Erie* [269] was published by the GLFC in July 2017. The report's information and data are focussed on assessing the performance and outcomes of the two goals and thirteen objectives that comprise Lake Erie's Fish Community Objectives (described previously) for the period from 2004 through 2008. The assessment of the achievements of the Objectives is summarized in Table 2 of the report (page 11-12).

Seven FCOs that addressed ecosystem conditions, various habitats, contaminants, and genetic diversity of fish stocks were considered to be partially achieved. Six FCOs that addressed sustainable harvests of basin-specific fish stocks, food-web structure, protection of rare fish species, and fishery yield were judged to be mostly achieved.

Lake Erie Walleye Task Group

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[267] http://www.glfc.org/pubs/misc/jsp97.pdf, p.11
[268] http://www.glfc.org/pubs/misc/SVReview2017-01.pdf
[269] http://www.glfc.org/pubs/SpecialPubs/Sp17_01.pdf

The March 2019 report by the Walleye Task Group for the 2018-2019 fishing season examined and reported on two charges by the LEC's STC. They were:

- Maintain and update the centralized time series of datasets required for bi-national population models and assessment, and the derivation of the annual Recommended Allowable Harvest (RAH); and
- Maintain working knowledge of the most current academic and agency research related to a. Lake Erie walleye population assessment and modeling including estimating and forecasting: abundance, age/size/spatial stock structure (migration rates), recruitment, and mortality; b. provide critical evaluation and guidance for incorporating new research into Lake Erie walleye management to produce the most scientifically sound and reliable population models.

Lake Erie Yellow perch Task Group

The March 2019 report by the Yellow perch Task Group for the 2018-2019 fishing season examined and reported on four charges by the LEC's STC. They were:

- Maintain and update the centralized time series of datasets required for population models and assessment including fishery harvest, effort, age composition, biological and stock parameters; survey indices of young of year, juvenile and adult abundance, size at age and biological parameters; fishing harvest and effort by grid;
- Report recommended Allowable Harvest (RAH) levels for 2019;
- Participate in the LEPMAG yellow perch harvest strategy evaluation process by assisting the STC with the development of new catch-at-age models and exploitation strategies for yellow perch, leading to the development of a Yellow Perch Management Plan; and
- Improve existing population models to produce the most scientifically defensible and reliable method for estimating and forecasting abundance, recruitment, and mortality.

Lake Erie Habitat Task Group

The March 2019 report by the Habitat Task Group for the 2018-2019 fishing season examined and reported on three charges by the LEC's STC. They were:

- Systematically develop and maintain a list of functional habitats and impediments for species specified by the LEC' FCOs that can be used to identify and evaluate status of priority management areas that support the Lake-wide Management Plan (LaMP), LEC Environmental Objectives (LEEOs and FCOs); strategic research direction for the LEEOs; and documentation of key habitat and research projects as related to priority management areas;
- Assist member agencies with the use of technology (i.e., side-scan, GIS, remote sensing, etc.) to facilitate better understanding of habitat in Lake Erie, particularly in the Huron-Erie corridor, the nearshore, and other critical areas; and
- Support other task groups by compiling metrics of habitat use by fish.

Lake Erie Forage Task Group

The March 2019 report by the Forage Task Group for the 2018-2019 fishing season examined and reported on five charges by the LEC's STC. They were:

- Report on the results of the interagency lower trophic level monitoring program and status of trophic conditions as they relate to the Lake Erie Fish Community Goals and Objectives;
- Describe the status and trends of forage fish in each basin of Lake Erie;
- Continue hydroacoustic assessment of the pelagic forage fish community in Lake Erie, incorporating new methods in survey design and analysis while following the GLFC's Great Lakes Hydroacoustic Standard Operating Procedures where possible/feasible;
- Report on the use of forage fish and new invasive species in the diets of selected commercially or recreationally important Lake Erie predator fishes; and
- Develop and maintain a database to track new or emerging Aquatic Invasive Species in Lake Erie that exhibit the potential to directly impact economically important fisheries.

Lake Erie Coldwater Task Group

The March 2019 report by the Habitat Task Group for the 2018-2019 fishing season examined and reported on five charges by the LEC's STC. They were:

- Coordinate annual standardized coldwater assessment among all eastern basin agencies and report upon the status of the coldwater fish community;
- Continue to assess and report on status of the Lake Whitefish fishery, including biological reference points, knowledge gaps, impediments and uncertainties required to provide advice to future management;
- Continue to participate in the Integrated Management of Sea Lampreys (IMSL) process on Lake Erie to outline and prescribe the needs of the Lake Erie Sea Lamprey management program;
- Maintain an annual interagency electronic database of Lake Erie salmonid stocking and current projections for the STC, GLFC and Lake Erie agency data depositories; and
- Report on the status of steelhead in Lake Erie and develop a proposal for mass marking, including lake wide and agency goals and objectives, a study plan, and logistics.

Compliance and enforcement performance monitoring

The Reassessment team was unable to locate information pertaining to recent internal evaluations of the MCS Program for Lake Erie and its UoAs, either by the Committee on behalf of member agencies, or, individually by the agencies themselves. The team intends to pursue this issue during the site visit meetings in early 2020, and is hopeful that program performance information will be available at that time.

Ontario

The Provincial Fish Strategy includes a description of how the MNRF intends to measure the performance of its activities. An important part of implementation is the identification of specific desired outcomes and associated performance measures (indicators) that can be used to measure progress toward Goals and Objectives (Figure 47). Performance measures must be specific and feasible; most are quantitative.

Ontario's Office of the Auditor General conducted an audit of the Fish and Wildlife Program in 1998 and 2007 which included updates in 2000 and 2009 respectively.

Figure 45. Illustration of MNRF's performance measurement scheme.

A variety of approaches are used to define science-based performance measures. In many cases it will be necessary for MNRF to collaborate with partner agencies, major stakeholders, and the broader scientific community to arrive at measurable targets and workable performance measures. Performance measures will need to be reviewed periodically, as part of adaptive management, to determine if they continue to be meaningful or require adjustment. The Strategy notes that progress toward achievement of its' goals, objectives and outcomes will be measured regularly and reported on through provincial State of Resource Reporting.

External Audits

Occasional external audits of the state and provincial fisheries management agencies have been carried out, by a goverment agency, and reported publicly. For example, Ohio's Auditor of State published a report in February 2015[270] which reviewed and assessed the performance of selected program areas within ODNR in relation to surrounding states, industry standards, and recommended or leading practices pursuant to Ohio Revised Code § 117.46. The scope of the engagement was confined to the areas of Capital Planning and Budgeting, Parks and Recreation Operations, Seasonal Workforce Strategies, Wildlife Licenses and Participation, Fleet Management, Fish Hatchery Operations, and Watercraft Registration Operations.

Ontario's Office of the Auditor General audited the province's Fish and Wildlife Program in 2007 with a follow-up audit in 2009.[271]

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[270] http://ohiodnr.gov/portals/0/pdfs/audit/2015_Performance_Audit.pdf

[271] http://www.auditor.on.ca/en/content/annualreports/reportsbytopic/bytopic_natural.html

7.8.2 Principle 3 Performance Indicator scores and rationales

PI 3.1.1 – Legal and/or customary framework

PI 3.1.1		The management system exists within an appropriate legal and/or customary framework which ensures that it: - Is capable of delivering sustainability in the UoA(s); - Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and - Incorporates an appropriate dispute resolution framework		
Scoring Issue		SG 60	SG 80	SG 100
a	Compatibility of laws or standards with effective management			
	Guide post	There is an effective national legal system **and a framework for cooperation** with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2	There is an effective national legal system and **organised and effective cooperation** with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2.	There is an effective national legal system and **binding procedures governing cooperation with other parties** which delivers management outcomes consistent with MSC Principles 1 and 2.
	Met?	**Yes**	**Yes**	**Yes**
Rationale: **There is an effective national legal system and binding procedures governing cooperation with other parties which delivers management outcomes consistent with MSC Principles 1 and 2.** Lake Erie’s overall management system is delivered through a comprehensive framework of bi-national organizations and enabling legislation whereby cooperation among and between the signatory parties at the international, state and provincial levels is firmly entrenched in corresponding legislation and agreements. These instruments deliver management outcomes via lake-wide programs consistent with MSC Principles 1 and 2 (e.g. stock assessments, scientific research, protection of species-at-risk, fish habitat and ecosystems, water and environmental quality). **SG 60 is likely to be met for all UoAs** The enduring nature of the bi-national legal system and associated agreements speak to their effectiveness in delivering organized and effective approaches to cooperation by all participating parties and which deliver management outcomes consistent with MSC Principles 1 and 2. **SG 80 is likely to be met for all UoAs.** Moreover, the bi-national legal system and associated agreements embody binding procedures that commit the signatory parties to work cooperatively in developing and implementing action plans as required, and which also deliver management outcomes consistent with MSC Principles 1 and 2. **SG 100 is likely to be met for all UoAs.**				
b	Resolution of disputes			
	Guide post	The management system incorporates or is subject by law to a **mechanism** for the resolution of legal disputes arising within the system.	The management system incorporates or is subject by law to a **transparent mechanism** for the resolution of legal disputes which is **considered to be effective** in dealing with most issues and that is appropriate to the context of the UoA.	The management system incorporates or is subject by law to a **transparent mechanism** for the resolution of legal disputes that is appropriate to the context of the fishery and has been **tested and proven to be effective**.
	Met?	**Yes**	**Yes**	**Yes**
Rationale: The management system incorporates or is subject by law to a **transparent mechanism** for the resolution of legal disputes that is appropriate to the context of the fishery and has been **tested and proven to be effective**.				
The resolution of legal disputes that may arise from the system is initiated through longstanding and well-established judicial processes at the district, state and federal levels in the U.S., and the provincial and federal levels				

PI 3.1.1	**The management system exists within an appropriate legal and/or customary framework which ensures that it:** **- Is capable of delivering sustainability in the UoA(s);** **- Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and** **- Incorporates an appropriate dispute resolution framework**

in Canada. Both judicial processes are mature, reliable, rules-based and available to all stakeholders irrespective of whether they are located within or outside the UoAs. Stakeholders who may be dissatisfied with a lower court decision can file to have their arguments heard by a higher-level court. This includes seeking judicial review of certain types of decisions in lieu of a formal court challenge. In all matters, the judicial processes of both countries are known to be transparent (open to public, media covered, published decisions), tested (e.g. occasional fisheries, environmental, constitutional, and native challenges), and proven to be effective (public confidence).

Several Great Lakes committees with responsibilities for implementing the Joint Strategic Plan provide members with the option of accessing internal administrative processes for resolving disagreements. The arrangements are process driven and inclusive. The Reassessment team understands that all of the established Great lakes committees operate on the basis of a strong and longstanding commitment to cooperation and consensus building in discharging their mandates; thus disputes are not a common occurence.

Accordingly, **SG 60, SG 80 and SG 100 are likely to be met for all UoAs.**

c	Respect for rights			
	Guide post	The management system has a mechanism to **generally respect** the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.	The management system has a mechanism to **observe** the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.	The management system has a mechanism to **formally commit** to the legal rights created explicitly or established by custom of people dependent on fishing for food and livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.
	Met?	**Yes**	**Yes**	**Yes**

Rationale: The management system has a mechanism to **formally commit** to the legal rights created explicitly or established by custom of people dependent on fishing for food and livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.

In Canada, the inherent and treaty rights of Indigenous Peoples dependent on fishing for food and livelihood has been settled law since 1990 by the Supreme Court (R v. Sparrow). Therefore, where the rights exist, the Court ruled that access to the fisheries takes precedence over all other resource uses after conservation requiremens have been satisfied. As a result, federally and provincially managed fisheries are required to formally respect, observe and commit to the rights of Indigenous Peoples to access fisheries for 'food, social and ceremonial' purposes. In response to this decision, and to provide stable fishery management, DFO launched the Aboriginal Fisheries Strategy (AFS) in 1992. The AFS is applicable where DFO manages the fishery and where land claims settlements have not already put a fisheries management regime in place. Formal agreements negotiated between DFO and First Nations set out how the rights are to be exercised within the established management systems for the fisheries. Accordingly, **SG 60, SG 80 and SG 100 are likely to be met for all UoAs of the Canadian portion of Lake Erie.**

In the U.S., the rights of Native Americans are enshrined in treaties. At the initial MSC certification of Lake Erie's Yellow perch and Walleye fisheries in 2015, the firm Intertek reported that the interests of 11 Ogibwe Native American tribes based in Minnesota, Wisconsin and Michigan were represented by the Great Lakes Indian Fish and Wildlife Commission for relevant Great Lakes. A number of U.S. Court decisions (Gurnoe in 1972, Voigt in 1983, and Mille Lacs in 1997) became settled law in affirming treaty rights and tribal self-regulation in defined geographical areas of these states. The Reassessment team is not aware of any binding legal decisions that relate specifically to the rights of Native Americans residing in Ohio, and fishing Lake Erie. Nevertheless, it is quite reasonable to conclude that were rights to be settled law, the State of Ohio would respect, observe and formally commit to establishing a management system that incorporated the associated legal rights to fish for food and other purposes in a manner

PI 3.1.1	**The management system exists within an appropriate legal and/or customary framework which ensures that it:** - **Is capable of delivering sustainability in the UoA(s);** - **Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and** - **Incorporates an appropriate dispute resolution framework**

consistent with the objectives of MSC Principles 1 and 2. Further discussions will be scheduled when the team meets with officials of the ODNR in early 2020. In the meantime, **the team has assigned a provisional score of SG 100 that is likely to be met for all UoAs of the U.S. portion of Lake Erie.**

References:

1. International Joint Commission – Mission and mandate:
https://www.ijc.org/en/who/role
2. Convention of Great Lakes Fisheries between U.S.A. and Canada:
http://www.glfc.org/pubs/conv.htm
3. Canada-Ontario Agreement on Great Lakes:
https://www.canada.ca/en/environment-climate-change/services/canadian-environmental-protection-act-registry/publications/canada-ontario-agreement-great-lakes.html
4. Canada-Ontario Lake Erie Action Plan:
https://www.ontario.ca/page/canada-ontario-lake-erie-action-plan
5. Western Basin of Lake Erie Collaborative Agreement:
https://www.michigan.gov/documents/snyder/Western_Basin_of_Lake_Erie_Collaborative_Agreement--Lieutenant_Governor_491709_7.pdf
6. Ontario's Great Lakes Strategy:
https://www.ontario.ca/page/ontarios-great-lakes-strategy
7. Fisheries Act (R.S.C., 1985, c. F-14):
https://laws-lois.justice.gc.ca/eng/acts/f-14/page-1.html
8. Constitution Acts, 1867 to 1982:
https://laws-lois.justice.gc.ca/eng/const/index.html
9. Canada Shipping Act, 2001 (S.C. 2001, c. 26):
https://laws-lois.justice.gc.ca/eng/acts/C-10.15/FullText.html
10. Navigation Protection Act (R.S.C., 1985, c. N-22):
https://laws-lois.justice.gc.ca/eng/acts/n-22/page-1.html
11. Canadian Code of Conduct for Responsible Fishing Operations:
http://www.dfo-mpo.gc.ca/fisheries-peches/policies-politiques/cccrfo-cccppr-eng.html#annex1
12. Ministry of Natural Resources Act, R.S.O. 1990, c. M.31:
https://www.ontario.ca/laws/statute/90m31
13. Fish and Wildlife Conservation Act, 1997:
https://www.ontario.ca/laws/statute/97f41#BK100
14. O. Reg. 664/98: Fish Licensing:
https://www.ontario.ca/laws/regulation/980664
15. Endangered Species Act, 2007, S.O. 2007, c. 6:
https://www.ontario.ca/laws/statute/07e06
16. Aboriginal Communal Fishing Licences Regulations:
https://laws-lois.justice.gc.ca/eng/regulations/SOR-93-332/page-1.html#h-953176
17. Fishery (General) Regulations (SOR/93-53)
https://laws.justice.gc.ca/eng/regulations/SOR-93-53/index.html
18. U.S. Fish and Wildlife Service:
https://www.fws.gov/help/about_us.html.
19. U.S. Fish and Wildlife Coordination Act:

PI 3.1.1	**The management system exists within an appropriate legal and/or customary framework which ensures that it:** - **Is capable of delivering sustainability in the UoA(s);** - **Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and** - **Incorporates an appropriate dispute resolution framework**

https://en.wikipedia.org/wiki/Fish_and_Wildlife_Coordination_Act
20. U.S. Endangered Species Act :
https://www.fws.gov/endangered/laws-policies/
21. U.S. Lacey Act:
https://www.fws.gov/international/laws-treaties-agreements/us-conservation-laws/lacey-act.html
22. U.S. Coastal Zone Management Act:
https://coast.noaa.gov/czm/act/
23. Ohio Department of Natural Resources:
http://ohiodnr.gov/
24. Ohio Administrative Code:
http://codes.ohio.gov/oac/
25. Ohio Revised Code:
http://codes.ohio.gov/orc/1506
26. ODNR Commercial Fishing Law Digest:
https://wildlife.ohiodnr.gov/portals/wildlife/pdfs/publications/laws%20&%20regs/pub002.pdf
27. Ohio Coastal Management Program (OCMP):
http://coastal.ohiodnr.gov/ocmp
28. OCMP – Fish and Wildlife Management:
http://coastal.ohiodnr.gov/portals/coastal/pdfs/about/OCMP/Policies/Issue6.pdf
29. OCMP – Fisheries Management (Policy 27)
http://coastal.ohiodnr.gov/portals/coastal/pdfs/about/OCMP/Policies/Policy27-Fisheries-Management.pdf
30. OCMP – Fisheries Research and Interstate Cooperation (Policy 28):
http://coastal.ohiodnr.gov/portals/coastal/pdfs/about/OCMP/Policies/Policy28-Fisheries-Research-Interstate-Cooperation.pdf
31. OCMP – Wildlife Management (Policy 29):
http://coastal.ohiodnr.gov/portals/coastal/pdfs/about/OCMP/Policies/Policy29-Wildlife-Management.pdf
32. Great Lakes Indian Fish and Wildlife Commission:
https://www.glifwc.org/
33. Ontario Fishery Regulations, 2007:
https://laws-lois.justice.gc.ca/eng/regulations/SOR-2007-237/page-1.html#docCont
34. Ohio Wildlife Council:
http://wildlife.ohiodnr.gov/about-contacts/wildlife-council

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

	Applicable SGs/elements likely met			Likely overall PI score
Draft scoring range	SG60	SG80	SG100	
	3 of 3	3 of 3	3 of 3	All UoAs ≥80
Information gap indicator	Information sufficient to score PI			

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Individual scoring elements	Applicable SGs met per individual scoring element	

PI 3.1.1	**The management system exists within an appropriate legal and/or customary framework which ensures that it:** - **Is capable of delivering sustainability in the UoA(s);** - **Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and** - **Incorporates an appropriate dispute resolution framework**				
(add rows as required; delete if not scoring by elements)		**SG60**	SG80	SG100	Scoring element scores
1	Scoring element 1	**X of x**	X of x	X of x	
2	Scoring element 2	**X of x**	X of x	X of x	
Overall Performance Indicator score		Applicable SGs/elements met			Overall score
		SG60	SG80	SG100	
		X of x	X of x	X of x	
Condition number (if relevant)					

PI 3.1.2 – Consultation, roles and responsibilities

<table>
<tr><th colspan="2">PI 3.1.2</th><th colspan="3">The management system has effective consultation processes that are open to interested and affected parties
The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties</th></tr>
<tr><td colspan="2">Scoring Issue</td><td>SG 60</td><td>SG 80</td><td>SG 100</td></tr>
<tr><td rowspan="3">a</td><td colspan="4">Roles and responsibilities</td></tr>
<tr><td>Guide post</td><td>Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are generally understood.</td><td>Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are explicitly defined and well understood for key areas of responsibility and interaction.</td><td>Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are explicitly defined and well understood for all areas of responsibility and interaction.</td></tr>
<tr><td>Met?</td><td>Yes</td><td>Yes</td><td>Yes</td></tr>
<tr><td colspan="5">Rationale: Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are explicitly defined and well understood for all areas of responsibility and interaction.</td></tr>
<tr><td colspan="5">The Great Lakes management systems, including for the UoAs and UoCs for the Lake Erie multispecies fisheries, consists of a comprehensive governance arrangement of Commissions, Councils and Committees including Task Groups. The structures and operational processes of these fora have evolved over time to meet the ongoing needs and challenges of the overarching management systems. The roles and responsibilities of these fora, including their participating agencies, are clearly and explicitly defined by Terms of Reference (ToRs). Despite the many jurisdictional entities in existence, appropriate measures have been taken to ensure that interactions in matters of roles, responsibilities and accountabilities are not duplicitous. Accordingly, SG 60, SG 80 and SG 100 are likely to be met for all UoAs.</td></tr>
<tr><td rowspan="3">b</td><td colspan="4">Consultation processes</td></tr>
<tr><td>Guide post</td><td>The management system includes consultation processes that obtain relevant information from the main affected parties, including local knowledge, to inform the management system.</td><td>The management system includes consultation processes that regularly seek and accept relevant information, including local knowledge. The management system demonstrates consideration of the information obtained.</td><td>The management system includes consultation processes that regularly seek and accept relevant information, including local knowledge. The management system demonstrates consideration of the information and explains how it is used or not used.</td></tr>
<tr><td>Met?</td><td>Yes</td><td>Yes</td><td>No</td></tr>
<tr><td colspan="5">Rationale: The management system includes consultation processes that regularly seek and accept relevant information, including local knowledge. The management system demonstrates consideration of the information and explains how it is used or not used.</td></tr>
<tr><td colspan="5">The membership of the Commissions, Councils and Committees that constitute the Great Lakes' management system, including the Lake Erie's system, operate on the basis of regularly seeking and accepting relevant information that informs their programs and workplans. Members contribute their local knowledge and experiences to discussions. A number of outreach services undertaken by the agency partners and outside organizations serve to incorporate local knowledge of affected stakeholders and the general public on matters under consideration.</td></tr>
</table>

PI 3.1.2	**The management system has effective consultation processes that are open to interested and affected parties** **The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties**

The manner in which the LEC, the LEPMAG and associated TGs operate in fulfilling their mandate is particularly conducive to seeking and accepting relevant information from stakeholders and the general public. Accordingly, **SG 60 and SG 80 are likely met for all UoAs.**

More complete evidence is lacking however as to whether the management system for the UoAs demonstrates how local knowledge is used or not used **(SG 100 is not likely met for all UoAs.**

c	Participation			
	Guide post		The consultation process **provides opportunity** for all interested and affected parties to be involved.	The consultation process provides **opportunity and encouragement** for all interested and affected parties to be involved, and **facilitates** their effective engagement.
	Met?		**Yes**	**Yes**

Rationale: The consultation process provides **opportunity and encouragement** for all interested and affected parties to be involved, and **facilitates** their effective engagement.

The operating methods and practices of Lake Erie's formal committees and task groups are well designed to provide both opportunities and encouragement for all interested and affected parties to be involved in their assigned tasks. Their approach to engagement is effective and facilitated in several ways: (i) meetings are scheduled well in advance for planning purposes; and (ii) similarly, meeting agendas and background documents are provided in advance to allow participants time to solicited inputs and prepare their positions. Opportunities are also available through meetings with specific agencies outside of the formal committee processes.

Accordingly, **SG 80 and SG 100 are likely met for all UoAs.**

References:

1. Great Lakes Fishery Commission:
http://www.glfc.org/about.php#mission
2. Council of Lake Committees:
http://www.glfc.org/council-of-lake-committees.php
3. Council of Lake Committees – Terms of Reference:
http://www.glfc.org/pubs/lake_committees/Council%20of%20Lake%20Committees%20TOR.pdf
4. Council of Great Lakes Fisheries Agencies:
http://www.glfc.org/council-of-great-lakes-fisheries-agencies.php
5. Council of Great Lakes Fisheries Agencies – Terms of Reference:
http://www.glfc.org/pubs/cglfa/Council%20of%20Great%20Lakes%20Fishery%20Agencies%20TOR.pdf
6. Law Enforcement Committee:
http://www.glfc.org/law-enforcement-committee.php
7. Law Enforcement Committee – Terms of Reference:
http://www.glfc.org/pubs/lake_committees/LAW%20Terms%20of%20Reference.pdf
8. Lake Erie Committee:
http://www.glfc.org/lake-erie-committee.php
9. Michigan State University – Quantitative Fisheries Center:
https://www.canr.msu.edu/qfc/
10. LEC's Standing Technical Committee – Terms of Reference:
http://www.glfc.org/pubs/lake_committees/Lake%20Erie%20Committee%20Standing%20Technical%20Committee%20TOR.pdf
11. LEC's Coldwater Task Group – Terms of Reference:

PI 3.1.2	**The management system has effective consultation processes that are open to interested and affected parties** **The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties**
http://www.glfc.org/pubs/lake_committees/Lake%20Erie%20Committee%20Coldwater%20Task%20Group%20TOR.pdf 12. LEC's Forage Task Group – Terms of Reference: http://www.glfc.org/pubs/lake_committees/Lake%20Erie%20Committee%20Forage%20Task%20Group%20TOR.pdf 13. LEC's Habitat Task Group – Terms of Reference: http://www.glfc.org/pubs/lake_committees/Lake%20Erie%20Committee%20Habitat%20Task%20Group%20TOR.pdf 14. LEC's Walleye Task Group – Terms of Reference: http://www.glfc.org/pubs/lake_committees/Lake%20Erie%20Committee%20Walley%20Task%20Group%20TOR.pdf 15. LEC's Yellow perch Task Group – Terms of Reference: http://www.glfc.org/pubs/lake_committees/Lake%20Erie%20Committee%20Yellow%20Perch%20Task%20Group%20TOR.pdf	

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	Applicable SGs/elements likely met			Likely overall PI score
	SG60	SG80	SG100	
	2 of 2	3 of 3	2 of 3	All UoAs ≥80
Information gap indicator	Information is sufficient to score PI.			

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Individual scoring elements **(add rows as required; delete if not scoring by elements)**		Applicable SGs met per individual scoring element			Scoring element scores
		SG60	SG80	SG100	
1	Scoring element 1	**X of x**	X of x	X of x	
2	Scoring element 2	**X of x**	X of x	X of x	
3	Scoring element 3	**X of x**	X of x	X of x	
4	Scoring element 4	**X of x**	X of x	X of x	

Overall Performance Indicator score	Applicable SGs/elements met			Overall score
	SG60	SG80	SG100	
	X of x	X of x	X of x	
Condition number (if relevant)				

PI 3.1.3 – Long term objectives

PI 3.1.3	**The management policy has clear long-term objectives to guide decision-making that are consistent with MSC Fisheries Standard, and incorporates the precautionary approach**			
Scoring Issue		SG 60	SG 80	SG 100
a	Objectives			
	Guide post	Long-term objectives to guide decision-making, consistent with the MSC Fisheries Standard and the precautionary approach, are **implicit** within management policy.	**Clear** long-term objectives that guide decision-making, consistent with MSC Fisheries Standard and the precautionary approach are **explicit** within management policy.	**Clear** long-term objectives that guide decision-making, consistent with MSC Fisheries Standard and the precautionary approach, are **explicit** within **and required by** management policy.
	Met?	**Yes**	**Yes**	**Yes**

Rationale: **Clear** long-term objectives that guide decision-making, consistent with MSC Fisheries Standard and the precautionary approach, are **explicit** within **and required by** management policy.

SA4.5.1 of the Standard (v 2.01) stipulates that 'management policy' is to be interpreted to mean outside the specific UoA (i.e. at a higher level or within a broader context than the fishery-specific management system). Management policy for this reassessment involves UoAs that are under dual control; that is, they are managed internationally where management falls to both a national agency and a bilateral/multinational agreement or organization).

Referenced documents were scrutinized in terms of how the long-term objectives of various binational/multinational and state-provincial agreements and plans are described, how they reflect the requirements of the MSC Standard regarding the decision-making process and the precautionary approach, and whether they are explicit and required by management policy.

The long-term objectives were found to be comprehensive and well suited to guide both the Standard's decision-making and precautionary approach; were described in clear language; and were explicit within and required by management policy;

Accordingly, **SG 60, SG 80 and SG 100 are likely met for all UoAs.**

References

1. Ryan, P.A., R. Knight, R. MacGregor, G. Towns, R. Hoopes, and W. Culligan. 2003. Fish-community goals and objectives for Lake Erie. Great Lakes Fish. Comm. Spec. Publ. 03-02. 56 p.
http://www.glfc.org/pubs/SpecialPubs/Sp03_2.pdf
2. Ohio Department of Natural Resources Strategic Plan 2011-2030:
https://wildlife.ohiodnr.gov/portals/wildlife/pdfs/dowstrategicplan.pdf
3. Protocol Amending the Agreement Between Canada and the United States of America on Great Lakes Water Quality, 1978, as Amended on October 16, 1983, and on November 18, 1987; Signed September 7, 2012; Entered into force February 12, 2013:
http://www.ec.gc.ca/grandslacs-greatlakes/A1C62826-72BE-40DB-A545-65AD6FCEAE92/1094_Canada-USA%20GLWQA%20_e.pdf
4. Ontario Provincial Fish Strategy:
https://docs.ontario.ca/documents/4538/ontarios-provincial-fish-strategy.pdf
5. Strategic Vision of the Great Lakes Fishery Commission, 2011-2020:
http://www.glfc.org/pubs/misc/StrategicVision2011.pdf

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

PI 3.1.3	**The management policy has clear long-term objectives to guide decision-making that are consistent with MSC Fisheries Standard, and incorporates the precautionary approach**			
Draft scoring range	Applicable SGs/elements likely met			Likely overall PI score
	SG60	SG80	SG100	
	1 of 1	1 of 1	1 of 1	All UoAs ≥80
Information gap indicator	Information is sufficient to score PI			
Overall Performance Indicator scores added from Client and Peer Review Draft Report				
Individual scoring elements **(add rows as required; delete if not scoring by elements)**	Applicable SGs met per individual scoring element			Scoring element scores
	SG60	SG80	SG100	
1 Scoring element 1	**X of x**	X of x	X of x	
2 Scoring element 2	**X of x**	X of x	X of x	
3 Scoring element 3	**X of x**	X of x	X of x	
4 Scoring element 4	**X of x**	X of x	X of x	
Overall Performance Indicator score	Applicable SGs/elements met			Overall score
	SG60	SG80	SG100	
	X of x	X of x	X of x	
Condition number (if relevant)				

PI 3.2.1 – Fishery-specific objectives

PI 3.2.1		**The fishery-specific management system has clear, specific objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2**		
Scoring Issue		SG 60	SG 80	SG 100
a	Objectives			
	Guide post	**Objectives**, which are broadly consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are **implicit** within the fishery-specific management system.	**Short and long-term objectives**, which are consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are **explicit** within the fishery-specific management system.	**Well defined and measurable short and long-term objectives**, which are demonstrably consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are **explicit** within the fishery-specific management system.
	Met?	**Yes**	**Yes**	**No (but may be partially met)**

Rationale: **Short and long-term objectives**, which are consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are **explicit** within the fishery-specific management system.

The objectives listed in the Management Plans for the Yellow perch and Walleye commercial fisheries, such as they are, are broadly consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are **implicit** within the fishery-specific management system. **SG 60 is likely met for all UoAs.**

On the other hand, both the Ontario Fish Strategy and Ohio's Coastal Management Plan include a comprehensive listing of the short and long-term objectives of direct application to the Lake's fishery-specific management systems, including the system for the target fisheries. They inform the outcomes associated with the MSC's Principle 1 components (stock status, harvest strategy, control rules, information and monitoring) as well as those expressed by Principle 2 (primary, secondary and ETP species outcomes, management strategy and information; habitat outcomes, management strategy and information; ecosystem outcomes, management strategy and information). In other words, the objectives are formulated so as to align with achieving sustainability as expressed by the MSC's Principles.Moreover, they are explicit within the management system. **SG 80 is likely met for all UoAs.**

While the evidence available to the team suggests that the short and long-term objectives referred to previously are, for the most part, well-defined, evidence was lacking to conclude that they are all ''measurable'' as defined by SA4.7.2 of the Standard (i.e.performance against the objectives cannot be measured). This, therefore, extends to some objectives as not being demonstrably consistent. Examples include: social, economic contributions. Nevertheless, recognition is warranted on the basis that the majority of the objectives are well-defined. Accordingly, **a score somehow higher than SG80 but les than SG100 maybe met for all UoAs.**

References:

1. Ontario Fish Strategy:
https://dr6j45jk9xcmk.cloudfront.net/documents/4538/ontarios-provincial-fish-strategy.pdf
2. Ohio Coastal Management Plan:
http://coastal.ohiodnr.gov/ocmp
3. Lake Erie Walleye Management Plan 2015-2019:
http://www.glfc.org/pubs/lake_committees/erie/LEC_docs/position_statements/walleye_managment_plan.pdf
4. Lake Erie Yellow Perch Management Plan:

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	Applicable SGs/elements likely met			Likely overall PI score
	SG60	SG80	SG100	

PI 3.2.1		The fishery-specific management system has clear, specific objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2			
		1 of 1	1 of 1	0 of 1	All UoAs ≥80
Information gap indicator		Information is sufficient to score PI.			
Overall Performance Indicator scores added from Client and Peer Review Draft Report					
Individual scoring elements **(add rows as required; delete if not scoring by elements)**		Applicable SGs met per individual scoring element			Scoring element scores
		SG60	SG80	SG100	
1	Scoring element 1	**X of x**	X of x	X of x	
2	Scoring element 2	**X of x**	X of x	X of x	
3	Scoring element 3	**X of x**	X of x	X of x	
4	Scoring element 4	**X of x**	X of x	X of x	
Overall Performance Indicator score		Applicable SGs/elements met			Overall score
		SG60	SG80	SG100	
		X of x	X of x	X of x	
Condition number (if relevant)					

PI 3.2.2 – Decision-making processes

PI 3.2.2		**The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery**		
Scoring Issue		SG 60	SG 80	SG 100
a	Decision-making processes			
	Guide post	There are **some** decision-making processes in place that result in measures and strategies to achieve the fishery-specific objectives.	There are **established** decision-making processes that result in measures and strategies to achieve the fishery-specific objectives.	
	Met?	**Yes**	**Yes**	
Rationale: There are **established** decision-making processes that result in measures and strategies to achieve the fishery-specific objectives.				
The fishery-specific management system for the Lake Erie multispecies fishery is comprised of established decision-making processes that have been triggered in the past and which continue at both the level of the various Lakes Committees (as described) and within the key Government agencies that manage the fisheries, as stipulated by internal agency practices, and as authorized by statutes and regulations. Both decision-making levels have been in use for many years, and are known to and understood by stakeholders and partner agencies. **SG 80 is likely met for all UoAs.**				
b	Responsiveness of decision-making processes			
	Guide post	Decision-making processes respond to **serious issues** identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take some account of the wider implications of decisions.	Decision-making processes respond to **serious and other important issues** identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.	Decision-making processes respond to **all issues** identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.
	Met?	**Yes**	**Yes**	**No**
Rationale: Decision-making processes respond to **serious and other important issues** identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.				
Serious issues for which the decision-making processes would be triggered are identified in the mandates (Terms of Reference) of all Lakes Committees. They are researched, evaluated, and discussed with affected parties before decisions are taken. The most serious issues may have implications across MSC Principles 1 and 2 or across jurisdictions with competing interests. They may be studied, evaluated, and discussed more intensively, perhaps involving an adhoc committee of experts, and by other Committees, before decisions are taken Decisions reflect the consensus requirement under which all Committees operate. A series of checks and balances akin to a challenge function exist across some Committees as does an accountability standard for all Committees so that wider implications of decisions are considered. The decisions taken are described in reports that all Committees are required to file. **SG 60 and SG 80 are likely met for all UoAs.** While there is some evidence to indicate that a few Committees include a form of adaptive management in addressing their assigned issues, there is no conclusive evidence to indicate that the established decision-making processes are capable of responding to all issues on a timely basis. For example, this would be the case if a decision involving any of the UoAs was the subject of a legal challenge by competing resource users. Accordingly, under this example, **SG 100 would not likely be met.**				

PI 3.2.2	**The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery**			
c	Use of precautionary approach			
	Guide post		Decision-making processes use the precautionary approach and are based on best available information.	
	Met?		**Yes**	

Rationale: Decision-making processes use the precautionary approach and are based on best available information.

There is clear evidence that the decision-making processes in use for the Lake Erie multispecies fishery are based on the Precautionary Approach, the application of which is a fundamental tenet of the fishery management system in all UoAs. The components of the Management Plans for both the Yellow perch and Walleye fisheries in regards to harvest strategies and rules, reference points, and the setting of annual quotas are derived from the best available information and the application of the Precautionary Approach. **SG 80 is likely met for all UoAs.**

d	Accountability and transparency of management system and decision-making process			
	Guide post	Some information on the fishery's performance and management action is generally available on request to stakeholders.	**Information on the fishery's performance and management action is available on request**, and explanations are provided for any actions or lack of action associated with findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.	Formal reporting to all interested stakeholders **provides comprehensive information on the fishery's performance and management actions** and describes how the management system responded to findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.
	Met?	**Yes**	**Yes**	**Yes**

Rationale: **Information on the fishery's performance and management action is available on request**, and explanations are provided for any actions or lack of action associated with findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.

The membership of the Lakes Committees described in this report includes a broad cross-section of stakeholders who have direct access to information pertaining to the fishery's performance and management action. This information is published in reports generated by the various committees, and is publicly available including on request. **SG 60 is likely met for all UoAs.**

Similarly, as Committee stakeholders with direct access to information on the fishery's performance and management action, they would be well versed on all information generated from research, monitoring, evaluation and review activities, and, as such, would receive explanations for any actions taken or not taken from findings and recommendations. **SG 80 is likely met for all UoAs.**

This extends to non-committee stakeholders and the general public who, in addition to reports published on line, have access to the deliberations of the majority of Lakes Committees, and can therefore interact with members on the findings and recommendations. This interaction is extended to non-Committee activities given the extensive consultation and engagement activities that are available throughout the year (as outlined in this report). Accordingly, **SG 100 is likely met for all UoAs.**

e	Approach to disputes			
	Guide post	Although the management authority or fishery may be	The management system or fishery is attempting to comply	The management system or fishery acts proactively to avoid

PI 3.2.2		**The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery**		
		subject to continuing court challenges, it is not indicating a disrespect or defiance of the law by repeatedly violating the same law or regulation necessary for the sustainability for the fishery.	in a timely fashion with judicial decisions arising from any legal challenges.	legal disputes or rapidly implements judicial decisions arising from legal challenges.
	Met?	**Yes**	**Yes**	**Yes**

Rationale: The management system or fishery acts proactively to avoid legal disputes or rapidly implements judicial decisions arising from legal challenges.

According to Lake Erie fishery managers and law enforcement officials, the management authority is not indicative of disrespect or defiance of the fishery's legal framework. While there have been instances in the past where the management authority has been challenged in the Courts (case law cited by Intertek in the 2015 assessment report), they were not as a result of a disrespect or defiance of the law. **SG 60 is likely met for all UoAs.**

The management system or fishery is not immune to legal challenges. When judicial decisions and any subsequent appeals result in required changes to either or both, the regulatory agencies are bound by the Courts' decisions to comply in a timely fashion. **SG 80 is likely met for all UoAs.**

The management system for Lake Erie's fisheries, like all other Great Lakes' fisheries, has evolved over time to proactively avoid legal disputes that are within their capacity to act. The system is built to formally and informally engage stakeholders and other affected parties on a continuous basis on all matters of relevance to the fisheries. Moreover, the Committees are required to conduct their deliberations through consensus and accountability standards which, in and of themselves, have been shown to be effective in avoiding legal disputes that are within their purview. The recent work of the LEPMAG in modelling components of the Yellow perch and Walleye Management Plans, with the support of the MSU's QFC, is a good example of how the system has acted to avoid potential legal challenges. Accordingly, **SG 100 is likely met for all UoAs.**

References:

The information used to complete this PI was sourced from the Terms of Reference of the various Lakes Committees and Task Groups previously cited for PI 3.1.2.

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	Applicable SGs/elements likely met			Likely overall PI score
	SG60	SG80	SG100	
	4 of 4	5 of 5	3 of 3	All UoAs ≥80
Information gap indicator	Information is sufficient to score PI.			

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Individual scoring elements **(add rows as required; delete if not scoring by elements)**		Applicable SGs met per individual scoring element			Scoring element scores
		SG60	SG80	SG100	
1	Scoring element 1	**X of x**	X of x	X of x	
2	Scoring element 2	**X of x**	X of x	X of x	

PI 3.2.2	**The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery**				
3	Scoring element 3	**X of x**	X of x	X of x	
4	Scoring element 4	**X of x**	X of x	X of x	
Overall Performance Indicator score		Applicable SGs/elements met			Overall score
		SG60	SG80	SG100	
		X of x	X of x	X of x	
Condition number (if relevant)					

PI 3.2.3 – Compliance and enforcement

PI 3.2.3		Monitoring, control and surveillance mechanisms ensure the management measures in the fishery are enforced and complied with		
Scoring Issue		SG 60	SG 80	SG 100
a	MCS implementation			
	Guide post	Monitoring, control and surveillance **mechanisms** exist, and are implemented in the fishery and there is a reasonable expectation that they are effective.	A monitoring, control and surveillance **system** has been implemented in the fishery and has demonstrated an ability to enforce relevant management measures, strategies and/or rules.	A **comprehensive** monitoring, control and surveillance system has been implemented in the fishery and has demonstrated a consistent ability to enforce relevant management measures, strategies and/or rules.
	Met?	**Yes**	**Yes**	**Yes**

Rationale: A **comprehensive** monitoring, control and surveillance system has been implemented in the fishery and has demonstrated a consistent ability to enforce relevant management measures, strategies and/or rules.

The MCS programs that are carried out by the Law Enforcement Units of Ontario's MNRF and Ohio's DNR Ministry are supported by mechanisms which *inter alia* include (i) comprehensive legislation with clearly-defined authorities, (ii) operational policies, (iii) internal checks and balances, and (iv) physical assets that, when implemented in the fishery, result in a reasonable expectation of effectiveness. **SG 60 is likely met for all UoAs.**

These MCS mechanisms are further supported by on-going outreach/engagement activities that complement the operational aspects of the programs by promoting and achieving fisher, stakeholder and public understanding and support of the management measures, strategies and rules of the UoAs for the fishery. These activities have a direct impact on how the MCS's mechanisms are planned and implemented. The mechanisms are further supported by inter-agency protocols for cooperation and coordination through the Lake Erie and Law Enforcement Committees of the GLFC. Evidence is sufficient to establish that a MCS system has been implemented. **SG 80 is likely met for all UoAs.**

The Ohio and Ontario MCS systems are comprehensive in that they extend to regulatory imperatives within the UoAs that are in addition to actual fishing operations e.g., protection of ETP-designated species, and sensitive habitats and ecosystems. There is some evidence to conclude that the reported outcomes from the enforcement activities carried out by Ontario and Ohio are demonstrative of a consistent ability to enforce relevant management measures, strategies and/or rules. **SG 100 is likely met for all UoAs.**

b	Sanctions			
	Guide post	Sanctions to deal with non-compliance exist and there is some evidence that they are applied.	Sanctions to deal with non-compliance exist, **are consistently applied** and thought to provide effective deterrence.	Sanctions to deal with non-compliance exist, are consistently applied and **demonstrably** provide effective deterrence.
	Met?	**Yes**	**Yes**	**Yes**

Rationale: Sanctions to deal with non-compliance exist, are consistently applied and **demonstrably** provide effective deterrence.

Sanctions that are available to the Law Enforcement agencies when non-compliance issues arise in the fishery are detailed in State and Provincial legislation. In addition, the designated authorities in each of the agencies can issue administrative sanctions apart from those prescribed in statutes i.e. licence suspensions. Violations data reported in this report indicate that sanctions are applied. **SG 60 is likely met in all UoAs.**

The effectiveness of the enforcement activities of both agencies requires that sanctions to deal with non-compliance be consistently applied in accordance with prevailing laws and policies. Case law and public sentiment all but require

<table>
<tr><th colspan="2">PI 3.2.3</th><th colspan="3">Monitoring, control and surveillance mechanisms ensure the management measures in the fishery are enforced and complied with</th></tr>
<tr><td colspan="5">it. While the nature and scope of the sanctions are known to be different between jurisdictions (because of their respective judicial systems), their application is not applied inconsistently. Effective deterrence is thought to be achieved given that the level of recidivism in the fishery is known to be minimal. SG 80 is likely to be met in all UoAs.
While there is no evidence from internal or independent external studies (i.e. program audits or evaluations) that the effectiveness of the sanctions has been demonstrated, there is compelling evidence that the level of recidivism in the fishery is very minimal. Other factors such as (i) social disapproval, (ii) public reporting of suspicious activities, (iii) the participation of fishers in the consultation processes, (iv) fisher contributions to information required for monitoring purposes, and (v) outreach services that inform fishers about their obligations under the fishery-specific management system are all contributing factors that serve to demonstrate that sanctions provide effective deterrence. SG 100 is likely to be met for all UoAs.</td></tr>
<tr><td rowspan="3">c</td><td colspan="4">Compliance</td></tr>
<tr><td>Guide post</td><td>Fishers are generally thought to comply with the management system for the fishery under assessment, including, when required, providing information of importance to the effective management of the fishery.</td><td>Some evidence exists to demonstrate fishers comply with the management system under assessment, including, when required, providing information of importance to the effective management of the fishery.</td><td>There is a high degree of confidence that fishers comply with the management system under assessment, including, providing information of importance to the effective management of the fishery.</td></tr>
<tr><td>Met?</td><td>Yes</td><td>Yes</td><td>Yes</td></tr>
<tr><td colspan="5">Rationale: There is a high degree of confidence that fishers comply with the management system under assessment, including, providing information of importance to the effective management of the fishery.</td></tr>
<tr><td colspan="5">While the degree of confidence by fishers at the SG 100 level will need to be further explored during the forthcoming site visits, there is an expectation that the aforementioned evidence will support a finding that the degree of confidence is high. SG 100 is likely to be met for all UoAs.</td></tr>
<tr><td rowspan="3">d</td><td colspan="4">Systematic non-compliance</td></tr>
<tr><td>Guide post</td><td></td><td>There is no evidence of systematic non-compliance.</td><td></td></tr>
<tr><td>Met?</td><td></td><td>Yes</td><td></td></tr>
<tr><td colspan="5">Rationale: There is no evidence of systematic non-compliance.</td></tr>
<tr><td colspan="5">Evidence of systematic non-compliance could be established if the fishing activities were shown to be the result of disrespect for the legal and fishery-specific management systems. That is not the case here. SG 80 is likely met for all UoAs.</td></tr>
<tr><td colspan="5">References:</td></tr>
<tr><td colspan="5">1. Reilly, R.et al. 2015. Reflections on a stakeholder-centered approach to conflict resolution in Fisheries Management - Quantitative Fisheries Center, Department of Fisheries & Wildlife, Michigan State University, East Lansing, MI, USA.
http://www.ices.dk/sites/pub/ASCExtendedAbstracts/Shared%20Documents/L%20-%20Science-industry%20partnership.%20The%20value%20of%20cooperative%20research%20in%20fisheries%20and%20marine%20management/L3015.pdf
2. Great Lakes Fishery Commission: Law Enforcement Committee:
http://www.glfc.org/law-enforcement.php
3. Ohio Department of Natural Resources, Division of Wildlife - Law Enforcement Operations Manual:</td></tr>
</table>

PI 3.2.3	Monitoring, control and surveillance mechanisms ensure the management measures in the fishery are enforced and complied with

http://wildlife.ohiodnr.gov/portals/wildlife/pdfs/publications/laws%20&%20regs/Pub%205501%20Law%20Ops%20Manual.pdf
4. Lake Erie Commercial Licence Conditions – Appendix B (2019)4
5. Ontario MNRF – Conservation officer powers and authorities:
https://www.ontario.ca/page/conservation-officer-powers-and-authorities

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	Applicable SGs/elements likely met			Likely overall PI score
	SG60	SG80	SG100	
	3 of 3	4 of 4	3 of 3	All UoAs ≥80
Information gap indicator	Information sufficient to score PI			

Overall Performance Indicator scores added from Client and Peer Review Draft Report

	Individual scoring elements **(add rows as required; delete if not scoring by elements)**	Applicable SGs met per individual scoring element			Scoring element scores
		SG60	SG80	SG100	
1	Scoring element 1	**X of x**	X of x	X of x	
2	Scoring element 2	**X of x**	X of x	X of x	
3	Scoring element 3	**X of x**	X of x	X of x	
4	Scoring element 4	**X of x**	X of x	X of x	

Overall Performance Indicator score	Applicable SGs/elements met			Overall score
	SG60	SG80	SG100	
	X of x	X of x	X of x	
Condition number (if relevant)				

PI 3.2.4 – Monitoring and management performance evaluation

PI 3.2.4		**There is a system of monitoring and evaluating the performance of the fishery-specific management system against its objectives** **There is effective and timely review of the fishery-specific management system**		
Scoring Issue		SG 60	SG 80	SG 100
a	Evaluation coverage			
	Guide post	There are mechanisms in place to evaluate **some** parts of the fishery-specific management system.	There are mechanisms in place to evaluate **key** parts of the fishery-specific management system.	There are mechanisms in place to evaluate **all** parts of the fishery-specific management system.
	Met?	**Yes**	**Yes**	**Yes**
Rationale: There are mechanisms in place to evaluate all parts of the fishery-specific management system.				
Mechanisms exists to evaluate all parts of the fishery-specific management system. Generally speaking, as the management system for the target fisheries has evolved over time, so have the mechanisms for monitoring and evaluating it performance against its objectives. Information included in this report describes a monitoring and evaluation system that is structurally integrated across a broad range of lakes-wide, and lake specific strategic goals, objectives, and strategies in a top-down, bottom-up manner. Councils, Committees and Working Groups all have responsibilities associated with the monitoring and evaluation activities. For Lake Erie (and the UoAs), the performance of the fishery-specific management system in relation to its Fish Community Objectives are monitored and evaluating by Working Groups of experts under the direction of the LEC's STC. Objectives that are not within the specific purview of the LEC-driven process are monitored and evaluated by other Committee mechanisms that operate on a broader scale (i.e. some scientific research programs). Accordingly, **SG 60, 80 and 100 are likely met for all UoAs.**				
b	Internal and/or external review			
	Guide post	The fishery-specific management system is subject to **occasional internal** review.	The fishery-specific management system is subject to **regular internal** and **occasional external** review.	The fishery-specific management system is subject to **regular internal and external** review.
	Met?	**Yes**	**Yes**	**No**
Rationale: The fishery-specific management system is subject to regular internal and occasional external review.				
There is clear evidence to conclude that the fishery-specific management system for Lake Erie's Yellow perch and Walleye commercial fisheries is regularly monitored and evaluated against its objectives. Given the monitoring and evaluation regularity of the system's objectives (at least annually), decision-makers benefit from ongoing stakeholders' contributions and recommendations. The frequency of these activities are more than sufficient given the scale, context and complexity of the fishery. Accordingly, **SG 80 is likely to be met for all UoAs.** There have been very few external reviews of the programs administered by the lead agencies for Ontario and Ohio. **SG 100 is not likely to be met for all UoAs.** Perhaps there are other external reviews that will come to light during the planned site visits in early 2020 which may result in SG 100 being met.				
References:				
1.Ontario Conservation Officer Powers and Authorities: https://www.ontario.ca/page/conservation-officer-powers-and-authorities. Based on current public information. 2. A Joint Strategic Plan for the Management of Great lakes Fisheries, June 1997 (p.11): http://www.glfc.org/pubs/misc/jsp97.pdf 3. A Mid-Decade Review of Progress under a Strategic Vision of the Great Lakes Fishery Commission 2011-2020:				

PI 3.2.4	**There is a system of monitoring and evaluating the performance of the fishery-specific management system against its objectives** **There is effective and timely review of the fishery-specific management system**

http://www.glfc.org/pubs/misc/SVReview2017-01.pdf
4. The State of Lake Erie in 2009:
http://www.glfc.org/pubs/SpecialPubs/Sp17_01.pdf
5. State Auditor of Ohio: ODNR Performance Audit, February 2015:
http://ohiodnr.gov/portals/0/pdfs/audit/2015_Performance_Audit.pdf
6. Office of the Auditor General of Ontario - Fish and Wildlife Program:
http://www.auditor.on.ca/en/content/annualreports/reportsbytopic/bytopic_natural.html

Draft scoring range and information gap indicator added at Announcement Comment Draft Report

Draft scoring range	Applicable SGs/elements likely met			Likely overall PI score
	SG60	SG80	SG100	
	2 of 2	2 of 2	1 of 2	All UoAs ≥80
Information gap indicator	Information Sufficient to score PI			

Overall Performance Indicator scores added from Client and Peer Review Draft Report

Individual scoring elements **(add rows as required; delete if not scoring by elements)**		Applicable SGs met per individual scoring element			Scoring element scores
		SG60	SG80	SG100	
1	Scoring element 1	**X of x**	X of x	X of x	
2	Scoring element 2	**X of x**	X of x	X of x	
3	Scoring element 3	**X of x**	X of x	X of x	
4	Scoring element 4	**X of x**	X of x	X of x	
Overall Performance Indicator score		Applicable SGs/elements met			Overall score
		SG60	SG80	SG100	
		X of x	X of x	X of x	
Condition number (if relevant)					

8 Appendices

8.1 Assessment information

8.1.1 Previous assessments – delete if not applicable

The report shall include:

- A brief summary of any previous full assessments of the client operations, noting that these are available on the MSC website.
- Details of any conditions that were closed at or between the previous surveillance audits and this assessment, with justification for closing the conditions.
- A summary of previous conditions.

Reference(s): FCP v2.1

The Lake Erie Multi-species commercial fishery (same UoAs/UoCs as this re-assessment) was originally certified to the MSC standard v1.3 by Intertek Fisheries Certification (IFC) on the 20th August 2015, after an assessment that commenced on 18th June 2013. In September 2015, Acoura Marine (AM) assumed the IFC fisheries certification portfolio. In January 2016, the client confirmed AM as the CAB contracted for the Lake Erie Multispecies Commercial Fishery (Acoura Marine has since been part of Lloyd's Register). SAI Global was confirmed the new CAB for the 4th surveillance and re-assessment of the fishery. The 4th surveillance was published on the MSC website on the 9th of December 2019, and the last condition was closed during those surveillance activities (i.e. condition YP2).

Previous assessments and related information can be found on the MSC Website at: https://fisheries.msc.org/en/fisheries/lake-erie-multi-species-commercial/@@assessments

Conditions raised in 2015 and closed in subsequent surveillance assessments, with justification for closing the conditions, are listed below.

Table 45. Summary of previous assessment conditions.

Condition	PI(s)	Year closed	Justification
YP1. By the third annual surveillance audit, the following SG80 SIs must be met: The limit reference point is set above the level at which there is an appreciable risk of impairing reproductive capacity.	1.1.2	3	Specific limit reference points have been developed and explicitly incorporated into advice on annual TACs.
YP2. By the fourth annual surveillance audit, the following SG80 SI must be met: Well-defined harvest control rules are in place that are consistent with the harvest strategy and ensure that the exploitation rate is reduced as limit reference points are approached.	1.2.2	4	Yellow Perch exploitation policies were explicitly incorporated into advice on the 2019 TACs.

YP3. By the fourth annual surveillance audit, the following SG80 SIs must be met: - There shall be a partial strategy that is expected to maintain all main retained species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding. - There shall be some objective basis for confidence that the partial strategy for all main retained species will work, based on some information directly about the fishery and/or species involved. - There shall be some objective basis for confidence that the partial strategy for all main retained species will work, based on some information directly about the fishery and/or species involved.	2.1.2	3	The impacts of the fishery on both Freshwater Drum (FWD) and Channel Catfish (CC) are likely to be not significant. This information included a risk assessment (Productivity-Susceptibility Analysis) and updated catch data.
YP4. By the third annual surveillance audit, the following SG80 SI must be met: Qualitative information and some quantitative information are available on the amount of main by-catch species taken by the fishery.	2.2.3	3	Updated catch profiles for the Yellow Perch fishery, by MU, were provided. These show that main species (or likely main species) remain as FWD (5.1% in MU1), CC (4.3% in MU1) and white Perch (the latter being an introduced species and so not of further concern). No other species exceeds 1% of the total catch. Quantitative estimates of released fish were also provided.
WE 1. By the third annual surveillance audit, based on Condition WE2 the partial strategy of demonstrably effective management measures will be in place such that the fishery does not hinder the recovery and rebuilding of the lake whitefish stock.	2.1.1	3	The client submitted substantial new information in relation to the status and management of Lake Whitefish. The proportion of Lake Whitefish of the total large mesh fishery catch. This has been consistently below 1% over most of the last 5 years, with the highest percentage being 1.09% in 2014. Lake Whitefish population status information in relation to biological reference levels was also provided. The population had dropped slightly below SSB 20%B0 in 2016 and had since increased and at the last assessment was around SSB35%B0. The stock is within biologically based limits.
WE 2. By the third annual surveillance audit, there will be a partial strategy in place for managing the catch of lake whitefish and white bass that is designed to ensure the large mesh fishery does not pose a risk of serious or irreversible harm.	2.1.2	3	The client submitted substantial new information in relation to the status and management of Lake Whitefish. A range of measures are in place relating inter alia to whitefish and white bass. Both Lake Whitefish and White Bass are considered highly likely to be within biologically based limits. Catches of Lake Whitefish have been falling over recent years.

8.1.2 Small-scale fisheries

To help identify small-scale fisheries in the MSC program, the CAB should complete the table below for each Unit of Assessment (UoA). For situations where it is difficult to determine exact percentages, the CAB may use approximations e.g. to the nearest 10%.

Fleet information will be collected during site visits.

Table 46. Small-scale fisheries.

Unit of Assessment (UoA)	Percentage of vessels with length <15m	Percentage of fishing activity completed within 12 nautical miles of shore

8.2 Evaluation processes and techniques

8.2.1 Site visits

The report shall include:

- An itinerary of site visit activities with dates.
- A description of site visit activities, including any locations that were inspected.
- Names of individuals contacted.

Reference(s): FCP v2.1 Section 7.16

8.2.2 Stakeholder participation

The report shall include:

- Details of people interviewed: local residents, representatives of stakeholder organisations including contacts with any regional MSC representatives.
- A description of stakeholder engagement strategy and opportunities available.

Reference(s): FCP v2.1 Section 7.16

8.2.3 Evaluation techniques

The report shall include:

- Justification for how public announcements were developed.
- Methodology used, including sample-based means of acquiring a working knowledge of the management operation and sea base.
- Details of the scoring process e.g. group consensus process.
- The decision rule for reaching the final recommendation e.g. aggregate principle-level scores above 80.

If the RBF was used for this assessment, the report shall include:

- The justification for using the RBF, which can be copied from previous RBF announcements, and stakeholder comments on its use.
- The RBF stakeholder consultation strategy to ensure effective participation from a range of stakeholders including any participatory tools used.
- A summary of the information obtained from the stakeholder meetings including the range of opinions.
- The full list of activities and components that have been discussed or evaluated in the assessment, regardless of the final risk-based outcome.

The stakeholder input should be reported in the stakeholder input appendix and incorporated in the rationales directly in the scoring tables.

Reference(s): FCP v2.1 Section 7.16, FCP v2.1 Annex PF Section PF2.1

8.2.4 Modified assessment tree – delete if not applicable

For each change to the default assessment tree, the report shall include:

- New or altered Performance Indicators.
- Weights of relative importance assigned to each Performance Indicator.

- Justification for each of the changes and weights.

Reference(s): FCP v2.1 Section 7.12

8.3 Peer Review reports

To be drafted at Public Comment Draft Report

The report shall include unattributed reports of the Peer Reviewers in full using the relevant templates. The report shall include explicit responses of the team that include:

- Identification of specifically what (if any) changes to scoring, rationales, or conditions have been made; and,
- A substantiated justification for not making changes where peer reviewers suggest changes, but the team disagrees.

Reference(s): FCP v2.1 Section 7.14

8.4 Stakeholder input

To be drafted at Client and Peer Review Draft Report
To be completed at Public Certification Report

The CAB shall use the stakeholder input template to include all written stakeholder input during the stakeholder input opportunities and provide a summary of verbal stakeholder input received during the site visit. Using the stakeholder input template, the team shall respond to all written stakeholder input identifying what changes to scoring, rationales and conditions have been made in response, where the changes have been made, and assigning a 'CAB response code'. The team may respond to the verbal summary.

Reference(s): FCP v2.1 Section 7.15

Stakeholder Input

Xxxxxxxxxxxxxxxxxxx

Client Submission – Key Documents

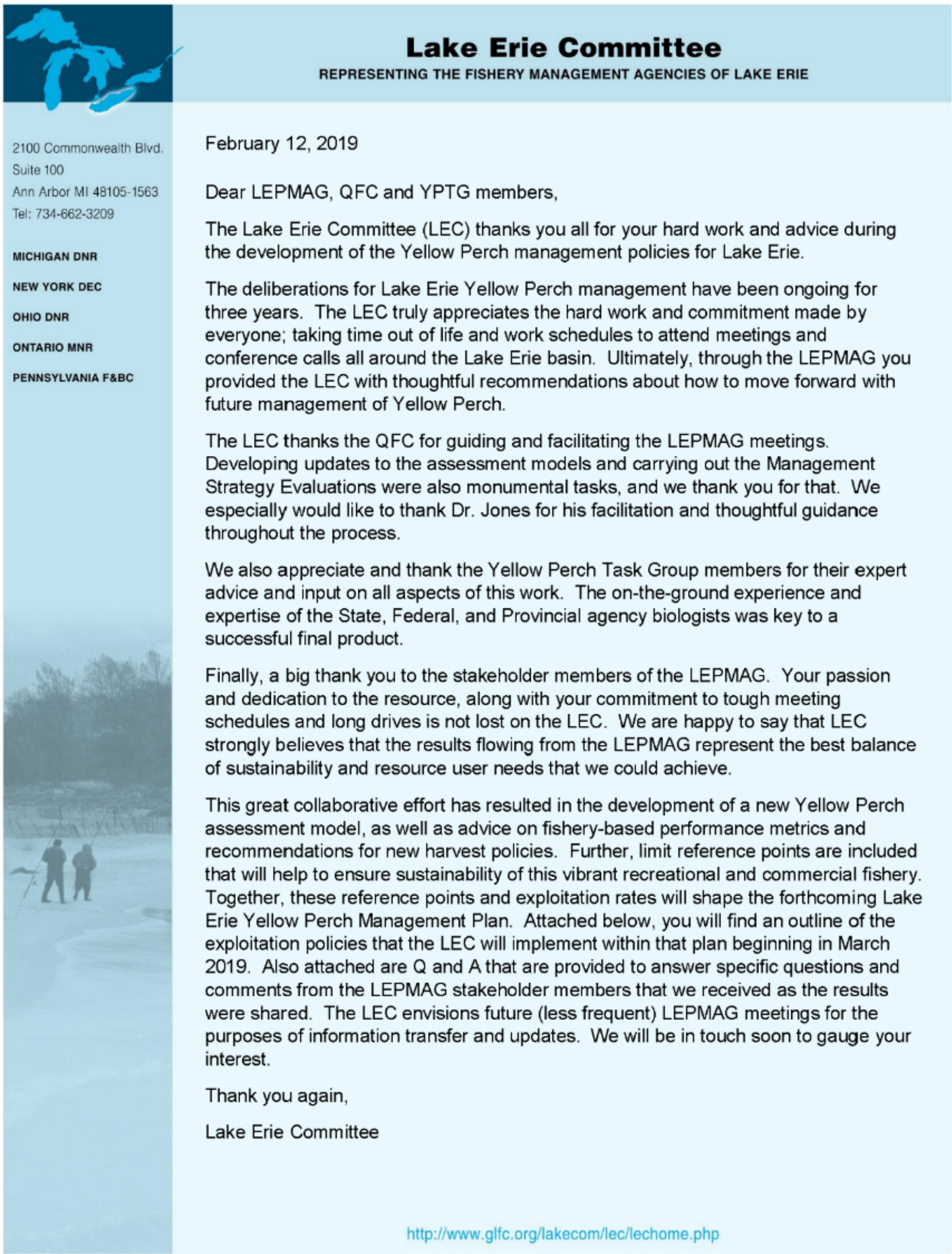
Xxxxxxxxxxxxxxxxxx

9 Appendix 1. Recruitment indices for Lake Erie young-of-the-year yellow perch and walleye in trawl catch·ha^{-1}.

Appendix 1. Recruitment indices for young-of-the-year yellow perch and walleye for a 31-year period, 1988–2018, expressed as trawl catch·ha^{-1}. The series includes Ontario and Ohio Management Unit 1 for age 0 fish in the summer period. The trawl index code is OOS11, and data for yellow perch are from YPTG (2019, Appendix Table 3) and for walleye from WTG (2019, Table 10). Means and 95% confidence intervals are provided.

	Recruitment index	
Year class	Yellow perch	Walleye
1988	212.6	18.280
1989	265.4	6.094
1990	259.2	39.432
1991	113.2	59.862
1992	94.1	6.711
1993	862.5	108.817
1994	469.7	63.921
1995	478.7	2.965
1996	2,544.9	85.340
1997	55.2	24.185
1998	170.6	14.313
1999	330.0	44.189
2000	102.5	4.113
2001	389.4	28.499
2002	26.4	0.139
2003	1,620.8	183.015
2004	45.2	5.402
2005	114.8	12.665
2006	222.8	2.051
2007	444.5	25.408
2008	387.2	7.238
2009	136.6	7.107
2010	96.9	26.260
2011	178.0	6.502
2012	68.1	6.417
2013	315.6	10.584
2014	859.6	29.050
2015	494.3	84.105
2016	404.1	9.224
2017	493.7	22.852
2018	959.3	255.581
Mean ± 95% CI	426.6 ± 190.1	38.720 ± 20.645

10 Appendix 2. Lake Erie Committee announcement of yellow perch exploitation policies, February 12, 2019 (LEC 2019a).



Lake Erie Committee
REPRESENTING THE FISHERY MANAGEMENT AGENCIES OF LAKE ERIE

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Ann Arbor MI 48105-1563
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MICHIGAN DNR
NEW YORK DEC
OHIO DNR
ONTARIO MNR
PENNSYLVANIA F&BC

February 12, 2019

Dear LEPMAG, QFC and YPTG members,

The Lake Erie Committee (LEC) thanks you all for your hard work and advice during the development of the Yellow Perch management policies for Lake Erie.

The deliberations for Lake Erie Yellow Perch management have been ongoing for three years. The LEC truly appreciates the hard work and commitment made by everyone; taking time out of life and work schedules to attend meetings and conference calls all around the Lake Erie basin. Ultimately, through the LEPMAG you provided the LEC with thoughtful recommendations about how to move forward with future management of Yellow Perch.

The LEC thanks the QFC for guiding and facilitating the LEPMAG meetings. Developing updates to the assessment models and carrying out the Management Strategy Evaluations were also monumental tasks, and we thank you for that. We especially would like to thank Dr. Jones for his facilitation and thoughtful guidance throughout the process.

We also appreciate and thank the Yellow Perch Task Group members for their expert advice and input on all aspects of this work. The on-the-ground experience and expertise of the State, Federal, and Provincial agency biologists was key to a successful final product.

Finally, a big thank you to the stakeholder members of the LEPMAG. Your passion and dedication to the resource, along with your commitment to tough meeting schedules and long drives is not lost on the LEC. We are happy to say that LEC strongly believes that the results flowing from the LEPMAG represent the best balance of sustainability and resource user needs that we could achieve.

This great collaborative effort has resulted in the development of a new Yellow Perch assessment model, as well as advice on fishery-based performance metrics and recommendations for new harvest policies. Further, limit reference points are included that will help to ensure sustainability of this vibrant recreational and commercial fishery. Together, these reference points and exploitation rates will shape the forthcoming Lake Erie Yellow Perch Management Plan. Attached below, you will find an outline of the exploitation policies that the LEC will implement within that plan beginning in March 2019. Also attached are Q and A that are provided to answer specific questions and comments from the LEPMAG stakeholder members that we received as the results were shared. The LEC envisions future (less frequent) LEPMAG meetings for the purposes of information transfer and updates. We will be in touch soon to gauge your interest.

Thank you again,

Lake Erie Committee

http://www.glfc.org/lakecom/lec/lechome.php

Brian Locke (OMNRF, Chair), Travis Hartman (ODNR, Vice Chair) James Francis (MDNR), Jason Robinson (NYDEC), Kris Kuhn (PFBC).

YELLOW PERCH EXPLOITATION POLICIES – LAKE ERIE COMMITTEE

FEBRUARY 12, 2019

After careful consideration of the LEPMAG members' advice and survey response, input from the YPTG members and the LEC's desire for stable, long-term sustainable Yellow Perch fisheries, the LEC has decided to implement the following exploitation polices:

1) **F_{MSY} that will remain constant for the duration of the Yellow Perch Management Plan (a 5-year period)**

2) **Biomass Limit Reference Point:**
   MU1 =29 % B_{MSY}

   MU2 =28 % B_{MSY}

   MU3 =28% B_{MSY}

   MU4 =27% B_{MSY}

3) **All Management units at a Risk Tolerance level of P*=0.05**

4) **TAC constraint of 20%**

5) **Target Fishing Rates:**
   MU1: F=0.77

   MU2: F=0.70

   MU3: F=0.79

   MU4: F=0.40

The LEC will implement these policies starting this year and the results will be presented during the Great Lakes Fisheries Commission's Annual Lake Erie Committee meeting to be held March 29, 2019 in Ypsilanti Michigan. Further, these policies will form the core of the next five years of Yellow Perch management through the upcoming Yellow Perch Management Plan.

Thank you again,

LEC

- Brian Locke, Ontario Ministry of Natural Resources and Forestry, Chair
- Kris Kuhn, Pennsylvania Fish and Boat Commission
- Jim Francis, Michigan Department of Natural Resources

- Travis Hartman, Ohio Department of Natural Resources, Vice Chair
- Jason Robinson, New York State Department of Environmental Conservation

LEC Q&A ABOUT THE PLANNED YELLOW PERCH EXPLOITATION POLICY

* What does the decision mean for quota?

The table below presents the 2018 (Peterson-Reilly Model) Recommended Allowable Harvest (RAH) when applying the'08-'17 Yellow Perch Exploitation Policy and the new 2019 policy.

	'08-'18 Policy	2019 Policy
MU1	2.516	2.817
MU2	3.698	3.831
MU3	3.633	3.980
MU4	0.478	0.623

* Why did the LEC select the highest scenario in MU4 vs 'splitting the difference' in other MUs?

The LEC had already applied a more conservative approach in MU4 than the other MUs (i.e. Scenarios 10-11 excluded because F ≥0.9 AND Scenarios 5-9 excluded because they would result in 68-159% increase in RAH). Increases in MU4 are comparable to other MUs (see Table above).

* Why did the LEC select Scenario 5 in MU2 when Scenario 3 had an equal performance for OCFA target but better performance for the recreational fishery?

In MU2, Scenarios 1-3 were excluded as part of the broad brushstroke that excluded all scenarios more conservative than the current exploitation policy. Scenario 5 was selected instead of Scenario 4 because the trade-off among stakeholders was similar in both scenarios and F in Scenario 5 was consistent with F in MU 1.

* The method of plotting the scores in histograms is interesting but potentially misleading as the scores are not weighted by the number of representatives, e.g., the OCFA response was pooled across four persons, JG, KR, JH and TT.

The LEC recognizes that the LEPMAG members represent a wide variety of other people and interests that are not directly around the table. We took this into consideration as we worked through the survey results; balancing as best as we could.

* For MU3: The proposed split between Scenarios 2/3 is not acceptable. This decision is biased against the commercial fishery. It is also highly conservative from a risk to

spawning stock biomass (SSB) perspective. The anglers should be satisfied with P (Rec CPE < target) in the ranges of 36% (i.e., scenarios 6/7).

In MU3, Scenarios 6 & 7 were excluded as part of the broad brushstroke that excluded all scenarios where F ≥0.9. These scenarios would result in aggressive exploitation policies at almost double the RAH of the current policy. The performance metrics indicate that risk of SSB<Limit Reference Point is 0% even when fishing at 120% of FMSY. The lack of contrast in the SSB performance metric suggests that it is not the only factor that LEC must consider ensuring sustainability of the population.

Scenarios 2/3 were split to ensure consistency of exploitation rates across MU1-3.

* For MU4: Scenarios 1 to 6 are not acceptable. This is another case where the proposed decision is clearly biased against the commercial fishery and extremely conservative from a risk to SSB perspective. How can the LEC rationalize a decision that so deeply impacts the MU4 commercial fishery for the sake of a very modest improvement in recreational fishing success (for very old perch at that)?

As above, Scenarios 7-11 in MU4 would result in aggressive exploitation policies at almost double the RAH of the current policy. The performance metrics indicate that risk of SSB<Limit Reference Point is <10% even when fishing at 120% of FMSY. The lack of contrast in the SSB performance metric suggests that it is not the only factor that LEC must consider to ensure sustainability.

11 Appendix 3. 2018 July 17 LEC Announcement of 5-year extension of WMP 2015–2019

LAKE ERIE COMMITTEE

EXTENSION OF THE WALLEYE MANAGEMENT PLAN (2015-2019)

The Lake Erie Committee (LEC) is extending the Walleye Management Plan (WMP) an additional five (5) years. After a review of the available data and consultation with stakeholders in all of the Lake Erie jurisdictions, LEC determined that no change to the WMP is required. The current WMP is a five year plan with a commitment to evaluate the plans performance commencing at the end of the plan cycle in 2019. By extending the WMP, the plan performance evaluation would commence in 2024.

The LEC has decided to adjust the review period for the following reasons;

- The current WMP is working well with harvest policy adapting to annual fluctuations in Walleye abundance.
- Recruitment of strong year classes in 2014 and 2015 and moderate recruitment in 2017, minimize the risk to the Walleye fishery
- The Walleye sport and commercial fisheries are performing very well
- To allow LEC agencies to continue to shift effort towards completion of the development of a Yellow Perch Management Plan
- To allow for the completion of current research over the next 4 years that will contribute new information for incorporation into the next WMP including;
  - The extent of the east basin stock contribution
  - Migration rates from west to east basin
  - Composition of mixed stock fisheries
  - Refinement of estimates of natural mortality (M)

The LEC will continue to monitor data trends to ensure ongoing sustainability of the Walleye population and the fisheries that depend on them.

Sincerely,

Brian Locke

12 Appendix 4. Ontario License Conditions

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Appendix "B"

LAKE ERIE COMMERCIAL FOOD FISHING LICENCE CONDITIONS FOR THE YEAR 2019

THIS LICENCE IS VALID FOR THE USE OF GILL NETS AND TRAWLS

1.(a) While engaged in fishing, the licencee or designate shall submit an accurate and complete Daily Catch Report (DCR) prior to landing any fish, even when no fish are caught. This DCR shall be signed by the licencee or designate and submitted as stated by these conditions.

(b) If landing fish in totes under Subsection 9(b), the licencee or designate shall accurately and fully complete a Tote Shipping Label as provided by the Ontario Commercial Fisheries' Association (OCFA) and attach the white initial copy of the Tote Shipping Label to the white copy of the DCR and the bottom copy of the Tote Shipping Label to the back of the green copy of the DCR. All boats packing fish in totes are required to meet conditions specified in the tote agreement between the Ministry of Natural Resources and Forestry (Ministry) and the receiving processor.

(c) All fish named on Appendix "C" must be reported and landed or reported and released if live.

(d) (i) Any fish or wildlife species not listed on Appendix "C" or fish larger than the length restrictions listed on Appendix "C" are NO HARVEST PERMITTED species. This includes invasive species including, but not limited to Asian Carps, Eurasian Ruffe, Northern Snakehead, Rudd and Tench, as well as fish listed on the Species at Risk in Ontario (SARO) list as extirpated, endangered or threatened species under the Endangered Species Act, 2007.

(ii) Invasive fish and wildlife species may be possessed for the purpose of turning them over to the Ministry at the time of inspection. Any invasive species that are caught and are still alive are NOT to be released. Gobies caught incidental to Smelt harvest may be transported to the licencees/designates normal Lake Erie processing facility for disposal as long as there is no attempt to keep them alive.

(iii) Any no harvest permitted species, SARO species or wildlife species that are caught and are still alive must be released in a manner which causes the least harm to the fish or wildlife. Fish must be returned to the water immediately in accordance with the Ontario Fishery Regulations. Each released species must be recorded on the DCR in number of individuals released.

(iv) When no harvest permitted fish species, including invasive species and SARO species, are caught and are no longer alive, they must be separated from the catch and recorded on the DCR in number of individuals caught and turned over to a Port Observer or Conservation Officer at the time of inspection. If a Port Observer or Conservation Officer is not present, these

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Appendix "B"

LAKE ERIE COMMERCIAL FOOD FISHING LICENCE CONDITIONS FOR THE YEAR 2019

fish shall NOT be landed until a Port Observer or Conservation Officer is contacted for direction on disposal.

(e) The licencee or designate shall not fish in an area other than that which is described on the face of this licence.

(f) The licencee or designate of a Commercial Fishing Licence that authorizes the use of a trawl net, shall not trawl and lift a gill net on the same day, or possess fish taken by any other means.

(g) While trawling for Smelt, a licencee or designate may retain, in addition to Smelt, any other commercial fish species, except that the aggregate combined round weight of Yellow Perch, Walleye and Lake Whitefish cannot exceed twenty percent (20%) of the Smelt landed on that day.

2. (a) The vessel(s) named on this licence is/are the only vessel(s) that shall be used for commercial fishing, transporting or possession of commercial fish taken under the authority of this licence.

(b) The licencee or designate shall accurately maintain, on a daily basis, a bound log book with entries for each day's fishing activities. This shall include; the complete coordinates, in latitude and longitude, for the start and end of each continuous series of nets set and lifted; the dates on which nets are set and lifted; and the length of each net fished. Units of measure must be specified for coordinates and net length. The log book is to be used to document fishing by one vessel. The log book shall be retained and be available for inspection for two (2) years following the last date of entry in the log book.

(c) A specific page, indicating the day's date used in consecutive numerical or calendar order, shall be used for each day's fishing activities.

(d) No person shall deface or remove any pages from the log book.

(e) The logbook shall be kept on the vessel at all times and made available for inspection by a Port Observer or a Conservation Officer upon request.

3.(a) A licencee or designate licenced to use gill nets shall not fish for any species of fish or set, lift or possess a gill net with a mesh size less than 57 millimeters (2.25 inches) in extension measure as defined in these conditions.

(b) A licencee or designate licenced to use gill nets when fishing for Walleye and/or White Bass, shall not set or lift a gill net with a mesh size less than 89 millimeters (3.5 inches) in extension measure as defined in these conditions.

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LAKE ERIE COMMERCIAL FOOD FISHING LICENCE CONDITIONS FOR THE YEAR 2019

4. Any fish caught by sport fishing means shall not be possessed on board a vessel named on this licence at the same time commercially caught fish or commercial gear are on board.

5. All fish on a vessel used for commercial fishing or transporting commercially caught fish shall be in round form, except for Lake Whitefish or Burbot (Ling), which may be dressed. Burbot may also be filleted, but a minimum of two (2) square inches of skin must be left on for identification purposes.

6. All fish shall be landed at designated ports between the specified hours for the ports listed below, except as otherwise authorized by a Port Observer or Conservation Officer.

DESIGNATED PORTS AND TIMES:

Kingsville, Wheatley, Erieau, Port Stanley, Port Dover, Port Burwell, Port Maitland and Port Colborne 09:00 to 18:00 Hours.

7.(a) If a licencee or designate decides to move their fishing vessel, for any reason at any time, including changing port of landing, with or without landing fish and/or moving to another lake, that person shall inform a Port Observer or Conservation Officer before 13:00 hours on the day of departure. If landing fish, the licencee or designate shall inform the Ministry a minimum of two (2) hours prior to landing fish at one of the following designated phone numbers:

Wheatley (for Erieau and ports west of Erieau):	(519) 825-7040
Port Dover (for Port Stanley and ports east of Port Stanley):	(519) 583-3529

If a Port Observer or Conservation Officer cannot be reached by phone, a detailed message must be left at the designated phone number.

(b) When a commercial fishing vessel has not been fishing for a period of 96 hours on Lake Erie, the licencee or designate shall notify a Port Observer or Conservation Officer using one of the two designated phone numbers before setting any nets. If a commercial fishing vessel has not landed any fish for a period of 96 hours, the Port Observer or Conservation Officer must be notified within a minimum of five (5) hours prior to landing any fish on that day. If a Port Observer or Conservation Officer cannot be reached by phone, a detailed message must be left at the designated phone number.

8.(a) When a red flag is displayed at the designated port, the licencee/designate shall report to the Port Observer, Conservation Officer or Observer for sampling, weight verification and/or a vessel inspection.

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LAKE ERIE COMMERCIAL FOOD FISHING LICENCE CONDITIONS FOR THE YEAR 2019

(b) When a white flag is displayed at the designated port, the licencee/designate shall proceed to his/her normal place of unloading and wait for a Port Observer, Conservation Officer or Observer for inspection or sampling.

(c) When neither a red flag nor a white flag is displayed at a port during the specified hours for that port as identified in Condition 6, fish other than those identified in Condition 1(d)(iv), may be landed without inspection provided that the licencee/ designate deposits Copy 1 of the DCR in the receptacle provided by the Ministry immediately prior to landing the fish. If all the fish have been declared as fish taken home by the crew, the licencee/designate shall deposit Copies 1, 2 and 3 of the DCR in the receptacle provided by the Ministry immediately prior to landing the fish.

9.(a) Prior to landing any fish, all fish shall be removed from the nets and placed by species in separate receptacles. All fish of the same species must be packed to the same weight per receptacle. The weight per receptacle shall be as follows:

(i) SMELT:

272.2 kilograms (600 pounds)

(ii) SPECIES OTHER THAN SMELT:

45.4 kilograms (100 pounds)

(b) (i) Boats participating in the tote program, as defined by the tote agreement, will pack Yellow Perch, Walleye and Lake Whitefish in totes that are sealed with tamper-proof strapping or seals so that the top of the tote cannot be moved more than ½ inch from its sealed position. A fully completed Tote Shipping Label will be attached to the tote or seal. The label will specify all of the species inside the tote.

(ii) Yellow Perch, Walleye and Lake Whitefish may be placed in the same totes as Unlimited Quota Species only when the Yellow Perch, Walleye and Lake Whitefish are in separate packers or receptacles inside the top of a tote providing that the Yellow Perch, Walleye and Lake Whitefish are recorded on the DCR and the tote label and the tote is sealed. Where the quantity of quota fish is so small that placing each species in a separate packer inside the tote is impractical, Walleye, Yellow Perch or Lake Whitefish may be placed on top of the ice as long as they are not mixed with the unlimited quota fish. Unlimited Quota Species are listed on Appendix "C" of the licence.

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LAKE ERIE COMMERCIAL FOOD FISHING LICENCE CONDITIONS FOR THE YEAR 2019

(iii) For vessels that are too small or not equipped to handle totes onboard the vessel, fish may be off-loaded into totes at dockside. No tote containing quota fish may be moved from its loading position unless strapped and sealed, its' tote label attached to the DCR and the completed DCR placed in the black box or handed to a Port Observer or Conservation Officer.

(iv) Estimated weights must be included for all fish landed in sealed totes.

(v) Any species of fish not being landed in totes as per Condition 1(b) and 9(b) shall be reported accurately and completely on a DCR.

(c) Walleye on all Boats: Shall be further separated into the following size classes:

- Number 2: up to 38.1 centimeters (approximately 15 inches)
- Number 1: 38.1 centimeters to 53.3 centimeters (approximately 15 to 21 inches)
- Jumbo: 53.3 centimeters (approximately 21 inches) and larger
- White gills: Number 1 and Jumbo size class only

(d) Roe: Prior to landing, all roe shall be declared by species and weight before landing as specified in Condition 1(a).

(e) Those fish which remain after all receptacles have been packed according to this condition may be packed at less than the prescribed weight in one receptacle (part packer) for each class and species.

(f) All fish must be carried on the main deck of the vessel and, when conditions warrant, fish shall be iced prior to being removed from gill nets. For example, trays containing gill nets with fish in them require an appropriate amount of ice to cover them until such time as the fish are "picked" and separated as described in condition 9(e) and 9(g).

(g) All fish, with the exception of fish destined for discard, shall be iced immediately upon being removed from nets and placed in receptacles. Sufficient amounts of ice shall remain on the fish in receptacles until such time that the fish are landed.

10. All fish caught and reported shall be accompanied by Copies 2, 3, 4 and 5 of a completed DCR.

11. This licence is valid for an assigned quantity of fish by species as listed in the Appendix "C" assigned to this licence. Any fish harvested in excess of quota must be covered off by a transfer of quota from the same quota area sufficient to cover the excess quantity of fish or be subject to the following provisions. There will be no transfers of any quota between quota areas unless authorized in writing by the Lake Manager on a species by species basis.

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LAKE ERIE COMMERCIAL FOOD FISHING LICENCE CONDITIONS FOR THE YEAR 2019

(a) Initial Allocation

Over quota harvest by species at the end of the initial quota period, on the day quota was exceeded, will be subtracted from the final quota allocation for which this licence is valid. Additional Walleye over quota must be covered by a transfer prior to May 1st. Additional Yellow Perch over quota must be covered by a transfer prior to May 15th. It is the responsibility of the licence holder to ensure that quota for either species has not been exceeded by more than one day prior to the release of final quota or they will be subject to the penalties described in 11(b).

(b) Harvest following the day quota was exceeded will be assessed the following monetary penalties:

Between 1 and 500 pounds over quota – 2 x landed value
Greater than 500 pounds over quota – 5 x landed value

(c) Final Allocation

Over quota harvest by species remaining by February 1st following the year in which this licence is valid will be subject to these monetary penalties:

(i) On the day quota is exceeded, over quota harvest on that day is assessed a monetary penalty equal to the landed value of the fish,

(ii) Harvest following the day quota was exceeded will be assessed the following monetary penalties:

Between 1 and 500 pounds over quota – 2 x landed value
Greater than 500 pounds over quota – 5 x landed value

(d) All transfer of quota must take place by January 31st following the year in which this licence is valid.

(e) Payment is calculated on the basis of the average landed value of that fish species used for Royalty calculation purposes in the billing period immediately preceding the time of payment for the over quota harvest. The average landed value will be provided by the Lake Erie Management Unit.

(f) Licencees must make restitution to the Crown for over quota harvest incurred in the current fishing year. Final allocation will not be issued for the next year if restitution has not been made to the Crown.

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LAKE ERIE COMMERCIAL FOOD FISHING LICENCE CONDITIONS FOR THE YEAR 2019

12. (a) During the period commencing 00:01 hours on March 15th to May 1st at 12:00 hours inclusive, no gill nets shall be set or lifted or remain in the waters within the area bounded to the north by a line projected easterly from latitude 41 degrees 51 minutes 00 seconds (41 51.00) N, longitude 82 degrees 54 minutes 06 seconds (82 54.10) W to latitude 41 degrees 51 minutes 00 seconds (41 51.00) N, longitude 82 degrees 38 minutes 18 seconds (82 38.30) W, on the east from the latter location by a line projected southerly to the abandoned lighthouse on Pelee Island, then following the westerly shoreline southward to Fish Point and from Fish Point southerly to the intersection of the international boundary, then bounded on the south by a line projected by the latter point following the international boundary westerly to latitude 41 degrees 46 minutes 54 seconds (41 46.90) N, longitude 82 degrees 54 minutes 06 seconds (82 54.10) W, then from this point northerly to the place of beginning to form the westerly boundary.

(b) During the period commencing 00:01 hours on July 1st to August 31st inclusive, canned nets or kited nets within the top 10 feet of the water column, may only be set or lifted in Quota Area 1 within the area bounded on the east by the boundary between Quota Area 1 and 2 then south to the international boundary, then west along the boundary to latitude 41 degrees 40 minutes 35 seconds (41 40.58) N, longitude 82 degrees 34 minutes 54 seconds (82 34.90) W, bounded on the west by a line projected northerly from the latter point to latitude 41 degrees 51 minutes 08 seconds (51 08.13) N, longitude 82 degrees 34 minutes 59 seconds (82 34 .98) W, then northeasterly to the tip of Point Pelee National Park.

(c) During the period commencing 00:01 hours on July 1st to August 31st inclusive, no gill net containing more than 36 meshes in height shall be set or lifted or remain in the water in Quota Area 1 with a mesh size less than 89 mm (3.5 inches) in extension measure as defined in these conditions.

(d) During the period commencing 00:01 hours on June 1st to September 15th inclusive, no canned gill nets will be set for Walleye inside Long Point Bay west of a line which separates commercial fishing grids 167 and 168 at Long Point and proceeds north following Longitude 80 degrees 05 minutes 00 seconds (80 05.00) W to intersect the north shore of Lake Erie.

(e) Commercial fishing with gill nets is prohibited east of the line separating commercial grids 91 and 92 at the north shore of Lake Erie south to the international border on longitude 79 degrees 05 minutes 00 seconds.

(f) (i) During the period commencing 00:01 hours on July 1st to September 30th inclusive, no person shall use an overnight set in Quota Area 1.

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LAKE ERIE COMMERCIAL FOOD FISHING LICENCE CONDITIONS FOR THE YEAR 2019

(ii) If, during the months of June to September inclusive, in the opinion of the Lake Manager and after consultation with the OCFA and members of the Lake Erie fish processing industry, significant quantities of poor quality fish are being harvested through the use of overnight sets, the Lake Manager may prohibit the use of overnight sets throughout Quota Zone 2 and 3 in Lake Erie for a period of time determined by the Lake Manager.

(iii) Where the Lake Manager prohibits the use of overnight sets under Subsection 12(f)(ii), the Lake Manager shall give 24 hours' notice of the prohibition in a manner that will notify the persons affected by one or more of the following methods:

a) posting the notice,
b) giving written or oral notice or
c) transmitting or posting the notice by electronic means.

(iv) During the period when the use of overnight sets are prohibited under Subsection 12(f)(i) or (ii), all gill nets must be removed from the waters of Lake Erie prior to 17:00 hours and remain out of the water until 00:01 hours the following day.

(v) The prohibition on the use of overnight sets may be varied for any quota area in Lake Erie for a period of time determined by the Lake Manager in consultation with the OCFA and members of the Lake Erie fish processing industry.

(g) With the exception of nets set between March 15th and December 15th fishing with gill nets in any part of Lake Erie during the periods January 1st to March 31st and December 15th to December 31st will be subject to the following conditions:

i) a GPS tracking device (vessel monitoring system [VMS]) must be installed on each vessel engaged in fishing operations and remain functional from the time the vessel leaves the harbour until its' return to port on each day fishing,

(ii) each vessel must be covered by a valid service contract with a service provider that captures the output from the GPS tracking device in real time and archives data,

(iii) you must provide internet access codes to the Ministry to access the data captured by the service provider,

(iv) the vessel captain shall ensure that the GPS transponder (antenna), the unit itself (black box), or its power supply is not rendered inoperable, damaged or interfered with,

(v) if you or a designate receives a communication from a Conservation Officer or Ministry official that the vessel monitoring system on their vessel is not functioning, and upon direction from a Conservation Officer or Ministry official, the vessel must cease all fishing activities and immediately return to the port from which it left and have the VMS unit repaired by a qualified technician employed by the equipment supplier before conducting further fishing activities or leaving port for any other reason unless authorized by a Conservation Officer or Ministry official,

(h) During the periods January 1st to March 31st and December 15th to December 31st all gill nets must be retrieved within eight (8) days of being set.

(i) Despite clause 12(g), a licencee, who does not set gill nets in any part of Lake Erie during the period January 1st to March 15th, in the same year, may set gill nets in any part of Lake Erie after March 15th of that year without the requirements of clauses 12(g) (a-e).

(j) Any vessel carrying a gillnet on board the vessel at the same time as a trawl net during the period December 15th to March 31st is subject to the requirements of subsection 12(g).

(k) No person shall set a gill net within 1 kilometer of a trap net or trap net lead.

13. A licencee or designate shall not use or possess on a vessel a trawl net with a cod end mesh size less than 19.05 millimeters (0.75 inches) in extension measure.

14. A licencee or designate shall not use or possess a net that has been constructed or altered in a manner that is inconsistent with Conditions 3(a), 3(b), 12(c) and 13.

15.(a) The Eastern Basin Management Zone (EBMZ) is defined as all the Ontario waters in Lake Erie bounded in the west by a line which separates commercial fishing grids 167 and 168, commencing at the south shore of Long Point at longitude 80 degrees 05 minutes 00 seconds (80 05.00) W, then continuing in a due south direction to the intersection with the international boundary line, then continuing in an easterly direction following the international boundary to the Peace Bridge at Fort Erie, then in a westerly direction following the shore line of Lake Erie back to the point of origin, but excluding the waters of the Inner Bay of Long Point Bay. The eastern boundary of the Inner Bay of Long Point Bay is defined as a line extending from a point on Turkey Point (42 34.30 N by 80 08.00 W) to the tip of Bluff Bar (42 41.30 N by 80 19.70 W).

(b) No transfers of Yellow Perch quota are permitted into or out of the EBMZ as defined in 15(a).

(c) Licencee’s Smelt trawling in the EBMZ that do not have Yellow Perch quota in the EBMZ, will have by-catch harvest of Yellow Perch debited from that licence’s Quota Area 3 quota west of EBMZ.

(d) The licencee or designate will declare in the comment section on the DCR for efforts fishing in Grid 167 the location as either being north or south of Long Point.
e.g. Eff 1 – north of Long Point
e.g. Eff 2 – south of Long Point
e.g. Eff 3 – north of Long Point

16.(a) The Niagara Cap Area is defined as all the Ontario waters in Lake Erie bounded in the west by a line which separates commercial fishing grids 100 and 101 commencing at the north shore of Lake Erie at longitude 79º40’00” (79 40.00) W, then continuing in a due south direction to the intersection with the international boundary line, then continuing in an easterly direction following the international boundary line to the line separating commercial grids 107 and 108 at longitude 79º05’00” (79 05.00) W, then continuing due north to the shore of Lake Erie, then in a westerly direction following the shoreline of Lake Erie back to the point of origin.

(b) Licencee's Smelt trawling in the Niagara Cap Area that do not have Walleye Niagara Cap quota, will have by-catch harvest of Walleye debited from that licence's Quota Area 3 quota.

(c) No transfers of Walleye quota are permitted into or out of the Niagara Cap Area as defined in 16(a).

(d) To fish large mesh gill nets, 3.5” (89 mm) or greater in the Niagara Cap area the licencee must have elected to fish in the Niagara Cap Area for Walleye and have unharvested Walleye quota.

17. The licencee or designate shall not land fish on December 25th unless authorized by a Port Observer or Conservation Officer. Any nets set in the current fishing year shall be removed by December 31st and any fish caught shall be landed by 18:00 hours, no nets will be set until January 1st of the following year until 06:00hrs.

18. A licencee or designate shall immediately report any lost or stolen net(s) to a Conservation Officer.

«Licence_Number»

Appendix "B"

LAKE ERIE COMMERCIAL FOOD FISHING LICENCE CONDITIONS FOR THE YEAR 2019

DEFINITIONS:

Canned Net	A gill net that is suspended in the water column and has attached to it large floatation devices that are visible on the surface of the water.
Commercial Fish	Includes all fish listed on Appendix "C" for which harvest is permitted.
Conservation Officer	As appointed under the Fish and Wildlife Conservation Act, 1997.
Dressed Weight	Means the weight of the fish after the removal of the entrails and gills. When reporting catches in dressed weights, the conversion factor of 1.18 shall be used for Lake Whitefish.
Extension Measure	The distance between two knots which are located at diagonally opposite corners of a mesh as measured by a Selkirk Net Gauge or Selkirk-type net gauge.
GPS Tracker (VMS - Vessel Monitoring System)	Global positioning system installed on a vessel that allows vessel location (coordinates) to be transmitted to a web service at regular time intervals on a daily basis.
Inspection	Means inspection as defined in the Fisheries Act R.S.C. 1985, C. F.-14 as amended.
Invasive Species	A species that is not native to Ontario, or to a part of Ontario, and is harming the natural environment
Kited Net	A gill net that is raised off the bottom in the water column and is held in place by anchors or weights.
Land/Landed/Landing	Means remove or take fish off any commercial fishing vessel.
Person	Includes the holder of a commercial fishing licence, a company, corporation, partnership, sole proprietorship or designate.
Port Observer/Observer	As appointed under Sec. 44 (1) of the Ontario Fishery Regulations, 2007 (SOR/2007-237).
Real Time	Acquisition of data as it happens or as quickly as the technology allows.

«Licence_Number»

Appendix "B"

LAKE ERIE COMMERCIAL FOOD FISHING LICENCE CONDITIONS FOR THE YEAR 2019

River, Stream or Creek Mouth	Means the midpoint of a line drawn between the points of land that extend the farthest out into the lake (natural or man-made) immediately adjacent to either side of the river where the river meets the lake.
Round Weight	Means the weight of the fish before removal of the entrails, gills or head.
Times	All times are given in the military 24:00 hour format.
Turned Over/Turning Over	Means before removing fish from the fishing vessel, the licencee or designate must contact a Port Observer or Conservation Officer by any means at his/her disposal for direction, and until this is done, the fish are not to be removed from the vessel.
Walleye	Also known as Yellow Pickerel.

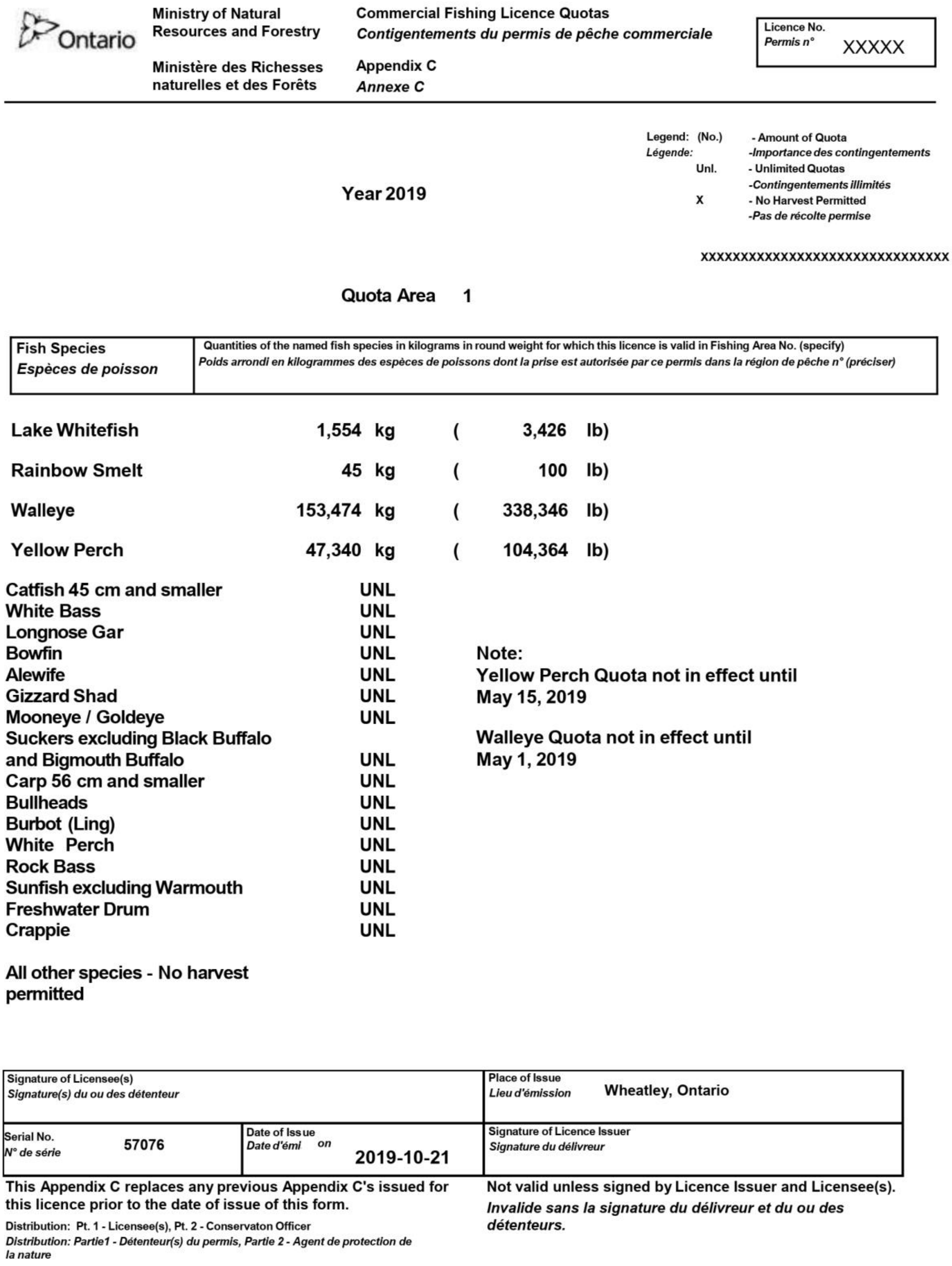
LAKE ERIE SPECIES AT RISK:

	Common Name	Scientific Name
Endangered	Eastern Sand Darter	*Ammocrypta pellucida*
	Northern Madtom	*Noturus stigmosus*
	River Darter	*Percina shumardi*
	Spotted Gar	*Lepisosteus oculatus*
	Warmouth	*Lepomis gulosus*
Threatened	Channel Darter	*Percina copelandi*
	Lake Chubsucker	*Erimyzon sucetta*
	Lake Sturgeon	*Acipenser fulvescens*
	Pugnose Shiner	*Notropis anogenus*
	Silver Chub	*Macrhybopsis storeriana*

I hereby acknowledge that I have read and understand the current licence conditions as outlined in the 2019 Commercial Fish Food Licence.

Signature of Licencee **Date**

Signature of Licence Issuer **Date**



Ontario

Ministry of Natural Resources and Forestry

Ministère des Richesses naturelles et des Forêts

Commercial Fishing Licence Quotas

Contigentements du permis de pêche commerciale

Appendix C

Annexe C

Licence No.
Permis n° XXXXX

Year 2019

Legend: (No.) - Amount of Quota
Légende: -*Importance des contingentements*
Unl. - Unlimited Quotas
-*Contingentements illimités*
X - No Harvest Permitted
-*Pas de récolte permise*

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Quota Area 1

Fish Species *Espèces de poisson*	Quantities of the named fish species in kilograms in round weight for which this licence is valid in Fishing Area No. (specify) *Poids arrondi en kilogrammes des espèces de poissons dont la prise est autorisée par ce permis dans la région de pêche n° (préciser)*

Lake Whitefish	1,554	kg	(	3,426	lb)
Rainbow Smelt	45	kg	(	100	lb)
Walleye	153,474	kg	(	338,346	lb)
Yellow Perch	47,340	kg	(	104,364	lb)

Catfish 45 cm and smaller	UNL
White Bass	UNL
Longnose Gar	UNL
Bowfin	UNL
Alewife	UNL
Gizzard Shad	UNL
Mooneye / Goldeye	UNL
Suckers excluding Black Buffalo and Bigmouth Buffalo	UNL
Carp 56 cm and smaller	UNL
Bullheads	UNL
Burbot (Ling)	UNL
White Perch	UNL
Rock Bass	UNL
Sunfish excluding Warmouth	UNL
Freshwater Drum	UNL
Crappie	UNL

Note:
Yellow Perch Quota not in effect until May 15, 2019

Walleye Quota not in effect until May 1, 2019

All other species - No harvest permitted

Signature of Licensee(s) *Signature(s) du ou des détenteur*		Place of Issue *Lieu d'émission* Wheatley, Ontario
Serial No. *N° de série* 57076	Date of Issue *Date d'émission* 2019-10-21	Signature of Licence Issuer *Signature du délivreur*

This Appendix C replaces any previous Appendix C's issued for this licence prior to the date of issue of this form.

Not valid unless signed by Licence Issuer and Licensee(s).
Invalide sans la signature du délivreur et du ou des détenteurs.

Distribution: Pt. 1 - Licensee(s), Pt. 2 - Conservaton Officer
Distribution: Partie1 - Détenteur(s) du permis, Partie 2 - Agent de protection de la nature

12.1 Conditions – delete if not applicable

To be drafted from Client and Peer Review Draft Report

The report shall document all conditions in separate tables. The CAB shall include rationale for exceptional circumstances in the summary of conditions in the Client and Peer Review Draft Report and all subsequent reports.

For reassessments, the CAB shall note:

- If and how any of the new conditions relate to previous conditions raised in the previous assessment or surveillance audits.
- If and why any conditions that were raised and then closed in the previous assessment are being raised again in the reassessment.
- If any conditions are carried over from a previous assessment, including an explanation of:
    - Which conditions are still open and being carried over.
    - Why those conditions are still open and being carried over.
    - Progress made in the previous assessment against these conditions.
    - Why recertification is being recommended despite outstanding conditions from the previous assessment.
- If any previous conditions were closed after the 4th Surveillance Audit and reassessment site visit (i.e. in Year 5), including the rationale for re-scoring and closing out of the condition.

Reference(s): FCP v2.1 Section 7.18

Table 47. Condition x of x (add as required).

Performance Indicator	e.g. 1.1.1
Score	State score for Performance Indicator
Justification	Cross reference to page number containing scoring template table or copy justification text here. If condition relates to a previous condition or one raised and closed in the previous assessment include information required here
Condition	State condition
Milestones	State milestones and resulting scores where applicable
Consultation on condition	Include details of any verification required to meet requirements in FCP v2.1 7.19.8

12.2 Client Action Plan

To be added from Public Comment Draft Report

The report shall include the Client Action Plan from the fishery client to address conditions.

Reference(s): FCP v2.1 Section 7.19

12.3 Surveillance

To be drafted from Client and Peer Review Draft Report

The report shall include the program for surveillance, timing of surveillance audits and a supporting rationale.

Reference(s): FCP v2.1 Section 7.28

Table 48. Fishery surveillance program.

Surveillance level	Year 1	Year 2	Year 3	Year 4
e.g. Level 5	e.g. On-site surveillance audit	e.g. On-site surveillance audit	e.g. On-site surveillance audit	e.g. On-site surveillance audit & re-certification site visit

Table 49. Timing of surveillance audit.

Year	Anniversary date of certificate	Proposed date of surveillance audit	Rationale
e.g. 1	e.g. May 2018	e.g. July 2018	e.g. Scientific advice to be released in June 2018, proposal to postpone audit to include findings of scientific advice

Table 50. Surveillance level rationale.

Year	Surveillance activity	Number of auditors	Rationale
e.g.3	e.g. On-site audit	e.g. 1 auditor on-site with remote support from 1 auditor	e.g. From client action plan it can be deduced that information needed to verify progress towards conditions 1.2.1, 2.2.3 and 3.2.3 can be provided remotely in year 3. Considering that milestones indicate that most conditions will be closed out in year 3, the CAB proposes to have an on-site audit with 1 auditor on-site with remote support – this is to ensure that all information is collected and because the information can be provided remotely.

12.1 Risk-Based Framework outputs – delete if not applicable

To be drafted at Client and Peer Review Draft Report stage

12.1.1 Productivity Susceptibility Analysis (PSA)

The PSA used for channel catfish and freshwater drum was provided in the Secondary Species background. Please refer to that section for full details.

12.1.2 Scale Intensity Consequence Analysis (SICA)

The Scale Intensity Consequence Analysis (SICA) has been completed. Please refer to the Ecosystem background section for full details.

12.2 Objection Procedure – delete if not applicable

To be added at Public Certification Report stage

The report shall include all written decisions arising from a 'Notice of Objection', if received and accepted by the Independent Adjudicator.

Reference(s): FCP v2.1 Annex PD

13 Template information and copyright

This document was drafted using the ‘MSC Reporting Template v1.1’. Note amendments have been made to formatting in order to comply with SAI Global’s corporate identity; however, content and structure follow that of the original template.

Template version control

Version	Date of publication	Description of amendment
1.0	17 December 2018	Date of issue
1.1	29 March 2019	Minor document changes for usability

A controlled document list of MSC program documents is available on the MSC website (www.msc.org).

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