

# Monterey Bay Aquarium Seafood Watch®

**Lake trout, Lake whitefish, Rainbow smelt,  
Walleye and Yellow perch**

*Salvelinus namaycush, Coregonus clupeaformis, Osmerus mordax, Sander vitreus, Perca flavescens*



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**Canada and U.S. Michigan, New York, Ohio,  
Pennsylvania (Lake Erie)**

**Set gillnets, Midwater trawls,  
Barriers, fences, weirs, corrals, etc.**

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## **Disclaimer**

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Seafood Watch Standard used in this assessment: Standard for Fisheries vF2

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## **About Seafood Watch**

Monterey Bay Aquarium's Seafood Watch® program evaluates the ecological sustainability of wild-caught and farmed seafood commonly found in the United States marketplace. Seafood Watch® defines sustainable seafood as originating from sources, whether wild-caught or farmed, which can maintain or increase production in the long-term without jeopardizing the structure or function of affected ecosystems. Seafood Watch® makes its science-based recommendations available to the public in the form of regional pocket guides that can be downloaded from [www.seafoodwatch.org](http://www.seafoodwatch.org). The program's goals are to raise awareness of important ocean conservation issues and empower seafood consumers and businesses to make choices for healthy oceans.

Each sustainability recommendation on the regional pocket guides is supported by a Seafood Report. Each report synthesizes and analyzes the most current ecological, fisheries and ecosystem science on a species, then evaluates this information against the program's conservation ethic to arrive at a recommendation of "Best Choices," "Good Alternatives" or "Avoid." The detailed evaluation methodology is available upon request. In producing the Seafood Reports, Seafood Watch® seeks out research published in academic, peer-reviewed journals whenever possible. Other sources of information include government technical publications, fishery management plans and supporting documents, and other scientific reviews of ecological sustainability. Seafood Watch® Research Analysts also communicate regularly with ecologists, fisheries and aquaculture scientists, and members of industry and conservation organizations when evaluating fisheries and aquaculture practices. Capture fisheries and aquaculture practices are highly dynamic; as the scientific information on each species changes, Seafood Watch®'s sustainability recommendations and the underlying Seafood Reports will be updated to reflect these changes.

Parties interested in capture fisheries, aquaculture practices and the sustainability of ocean ecosystems are welcome to use Seafood Reports in any way they find useful. For more information about Seafood Watch® and Seafood Reports, please contact the Seafood Watch® program at Monterey Bay Aquarium by calling 1-877-229-9990.

## **Guiding Principles**

Seafood Watch defines sustainable seafood as originating from sources, whether fished<sup>1</sup> or farmed, that can maintain or increase production in the long-term without jeopardizing the structure or function of affected ecosystems.

Based on this principle, Seafood Watch had developed four sustainability **criteria** for evaluating wildcatch fisheries for consumers and businesses. These criteria are:

- How does fishing affect the species under assessment?
- How does the fishing affect other, target and non-target species?
- How effective is the fishery's management?
- How does the fishing affect habitats and the stability of the ecosystem?

Each criterion includes:

- Factors to evaluate and score
- Guidelines for integrating these factors to produce a numerical score and **rating**

Once a rating has been assigned to each criterion, we develop an overall recommendation. Criteria ratings and the overall recommendation are color-coded to correspond to the categories on the Seafood Watch pocket guide and online guide:

**Best Choice/Green:** Are well managed and caught in ways that cause little harm to habitats or other wildlife.

**Good Alternative/Yellow:** Buy, but be aware there are concerns with how they're caught.

**Avoid/Red** Take a pass on these for now. These items are overfished or caught in ways that harm other marine life or the environment.

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<sup>1</sup> "Fish" is used throughout this document to refer to finfish, shellfish and other invertebrates

## **Summary**

The following Seafood Watch report provides recommendations for lake trout (*Salvelinus namaycush*), lake whitefish (*Coregonus clupeaformis*), walleye (*Sander vitreus*), yellow perch (*Perca flavescens*) and rainbow smelt (*Osmerus mordax*) caught throughout the Great Lakes of North America by U.S., Canadian, and tribal fisheries. Since commercial fishing began in the Great Lakes in the 1800s, the profile of commercially targeted and caught species has undergone dramatic changes in response to a suite of anthropogenic pressures over time. Particularly substantial declines in target species biomass occurred during the first half of the 20th century due to a combination of overfishing, habitat loss, chemical contamination, and the proliferation of invasive species that followed urban, agricultural, and industrial expansion throughout the Great Lakes region. In response to these dramatic declines, new management and assessment regimes were put into place in the mid-twentieth century, which have continued to evolve and expand. Because of these efforts, the current Great Lakes fishery more closely resembles the fishery of the early 1900s than it has in the past 75 years. Today's commercial fisheries are a mixture of recovered native species that have long been mainstays of the Great Lakes (e.g., lake trout, yellow perch, walleye, and lake whitefish) and non-native forage species (e.g., rainbow smelt).

**1. Lake trout (*Salvelinus namaycush*):** This long-lived species was once the dominant top predator in all of the Great Lakes, and a main target of the commercial fishery. Although it is moderately resilient to fishing pressure, the combined stress of overfishing and high levels of predation by the exotic sea lamprey served to drive lake trout populations into steep decline during the middle of the 20<sup>th</sup> century. By 1960, lake trout were nearly extirpated in all lakes except Lake Superior. At present, only Lake Superior has self-sustaining populations able to support a targeted commercial fishery for wild-caught lake trout. Restoration of lake trout populations remains a major management goal throughout the Great Lakes.

In Lake Erie, Lake Trout are not allowed to be harvested by commercial fishermen and any lake trout that show up at a market are not allowed to be sold. Furthermore, commercial fisheries that do accidentally catch lake trout are required to return them to the lake alive and this number is unreported.

In Lake Huron, stock status is considered poor, but rehabilitation efforts are in place and ongoing. Spawning and recruitment have been somewhat successful, and the abundance of spawning adults is increasing. Lake trout from Lake Huron are considered a '**Good Alternative**'.

Lake trout in Michigan waters of Lake Superior are a "**Good Alternative**" because populations are in recovery. Lake trout in Wisconsin waters of Lake Superior are "**Avoid**" primarily due to lack of available data. Lake trout in Minnesota waters of Lake Superior are "**Best Choice**" because of stable populations and well managed harvest. Lake trout in Canadian waters of Lake Superior are "**Good Alternative**" because of unlicensed fishing in a portion of those waters.

Lake trout populations in Lake Ontario hit a low point in 2005 after a significant decline in the 1990s. Mainly due to hatchery stocking program problems, lake trout populations have seen some increases in recent years. There is no commercial fishery for lake trout in Lake Ontario.

Lake trout in Lake Michigan waters are considered a "**Good Alternative**". Lake trout populations throughout the lake are still heavily maintained through stocking with little natural reproduction being evident.

**2. Walleye (*Sander vitreus*):** This dominant near-shore predator has been a target of Great Lakes commercial fisheries since the late 19<sup>th</sup> century. It is resilient to fishing pressure and tolerant of a wide variety

of environmental conditions. This has allowed walleye populations to recover quickly from environmental degradation, and the species has remained dominant in the commercial fishery.

The walleye recommendation for Lake Superior in Canada and Michigan is "**Good Alternative**" because populations are in recovery. In Wisconsin it is "**Avoid**" primarily due to lack of data.

The recommendation for Lake Huron is "**Good Alternative**". Commercial harvest of walleye is restricted throughout much of the lake in an effort to aid in stock recovery.

Today, walleye harvested by commercial fisheries are caught only in Canadian waters using gillnets. Walleye populations began to recover in Lake Erie as soon as nutrient abatement programs went into effect in the 1970s; however, after a period of recovery from 1970s to 1990s walleye populations underwent a second period of decline in the 1990s due to highly variable recruitment. At present, populations are still recovering and a better understanding is needed of what species-specific and environmental characteristics affect year class strength. Primarily due to this poor recruitment, walleye is recommended as a "**Good Alternative**."

There is a small gillnet and trap net fishery for walleye in Canadian waters of Lake Ontario. This comprised 8% of the total commercial catch in 2012, and both are given "**Good Alternative**" recommendations because impacts of the fishery on the target stock is very low, effective management is in place, and impacts on other species is moderate to low.

The walleye recommendation for Lake Michigan is "**Good Alternative**". Walleye in Lake Michigan are still in recovery following a dramatic decline during the 1990's.

**3. Yellow perch (*Perca flavescens*):** This near-shore species has an intermediate position in the aquatic food web and is often found in the same environments as walleye. It is broadly distributed in the Great Lakes and resilient to fishing pressure. Yellow perch abundance has been highly variable since the middle of the 20<sup>th</sup> century, due to the effects of habitat loss, interactions with invasive species, and overfishing, but has recovered quickly when stresses have been removed. The 1980s were a period of record productivity for the yellow perch fisheries throughout the Great Lakes, including Lake Michigan's Green Bay, but yellow perch entered a new period of decline in the 1990s. Currently, yellow perch population status is widely uncertain and variable, and populations are not at levels seen before their decline.

Lake Erie has the largest fishery for yellow perch for all the Great Lakes. In recent years, yellow perch commercial harvest has been showing a generally increasing trend. Overall, increasing populations (as evidenced by increased catch per unit effort throughout most of Lake Erie), an effective management regime, and inherently resilient life history characteristics make yellow perch caught in Lake Erie a "**Best Choice**" if caught in trapnets within Pennsylvania or New York waters and "**Good Alternative**" if caught in trapnets within Ohio waters or gillnets within Ontario waters.

In Lake Superior Canadian waters, yellow perch were over harvested and the fishery was closed in 2004. They are currently in recovery but have the recommendation of "**Good Alternative**" because of restrictions to harvest which allow for recovery. Lake Superior Michigan waters are "**good alternative**" because of stable populations and low harvest.

Yellow perch have a "**Good Alternative**" recommendation for Lake Huron. Yellow perch populations are still in a state of recovery following lake-wide declines in the 1980's to 1990's. Additionally, several years of poor year-class strength and recruitment have resulted in uncertain population status for yellow perch in US waters.

In Canadian waters of Lake Ontario, yellow perch is one of the two main targeted species along with lake

whitefish. Yellow perch in Canadian waters for both Gillnet and Trapnet fisheries receive a "**Good Alternative**" because the fishery impacts on stocks, impacts on other species, and effects on habitats and ecosystems are all moderate to low. Furthermore, effective management is in place.

In New York waters of Lake Ontario Yellow Perch is the main target species with a catch of 27.21 tonnes. In New York waters yellow perch received a "**Best Choice**" ranking because it is a small fishery and Yellow Perch have comprised >95% of the fishery since 2004, so its impacts on other species is minimal. In addition, effective management is in place, and the fisheries impacts on habitat, the target stock, and other species is low to moderate.

In Lake Michigan, the Yellow Perch recommendation is "**Good Alternative**", as stocks are still in a period of recovery following dramatic declines in harvest yield.

**4. Lake whitefish (*Coregonus clupeaformis*):** Lake whitefish have been a longtime target of the Great Lakes commercial fishery. As an epibenthic fish, this species occupies deep, cold waters rather than near-shore environments. Lake whitefish are a schooling fish caught primarily from Lake Michigan and Lake Huron, and the patchy distribution of its intermingling stocks complicates stock assessment and management. Like other deepwater fish, lake whitefish underwent substantial population declines in the middle of the 19th century, but was able to recover quickly after nutrient abatement and sea lamprey control measures were put in place in the 1970s. Stocks in Lake Huron, and Lake Superior are deemed moderate or low concern. Lake whitefish is currently the dominant deepwater benthic fish in the Great Lakes, as other native fish, such as the cisco, have not recovered as successfully. Their condition, growth, and catch rates became highly variable in the 1990s when their preferred prey, the amphipod *Diporeia*, disappeared in many lake areas in an apparent response to the proliferation of exotic zebra mussels. Lake whitefish have adjusted to these food web changes, first by changing their distribution to areas where *Diporeia* persisted, and more recently by changing their diets and utilizing alternate prey, including zebra mussels. In spite of decreased condition and changing catch rates, populations remain large, management is effective, and impacts of bycatch are low due to effort, placement, and size restrictions on gear.

In Lake Erie, there is no evidence of year-of-young or yearling whitefish in 2012 lake-wide surveys and assessments. Recruitment appears to be sparse which is thought to lead to continuing population declines. The recommendation lake whitefish from Lake Erie are "**Good Alternative**".

Lake Ontario lake whitefish are a "**Good Alternative**". Lake whitefish are only targeted in Canadian waters of Lake Ontario where they are a main target species. Impacts on other species, mainly lake trout, are the main concern.

Lake Whitefish in Lake Huron are also given a "**Good Alternative**" recommendation. Lake whitefish represent the largest and most valuable fishery in Lake Huron but concerns in regards to bycatch (mainly lake trout and potentially lake sturgeon) result in the score awarded.

The lake whitefish recommendation is "**Good alternative**" for Lake Superior Michigan waters because of historically stable populations. Lake Whitefish in Lake Superior Wisconsin waters are "**Avoid**" primarily due to a lack of available data. Lake Whitefish in Canadian waters in Lake Superior are "**Good Alternative**" because of unlicensed fishing in portions of their waters.

With the exception of individuals harvest with trapnets from Wisconsin waters, the Lake Whitefish recommendations for Lake Michigan are "**Good Alternative**". Those taken with trapnets from Wisconsin waters are considered a '**Best Choice**'.

**5. Rainbow smelt (*Osmerus mordax*):** This non-native forage species first arrived in the Great Lakes in the 1930s, and was seen as a nuisance as they had no commercial value, clogged nets, and competed with native species. In the mid-1960s, salmonine stocking programs were instituted with a number of motivations: to control non-native species like Rainbow Smelt and Alewife; to support increased recreational fishing; and to aid in the recovery of lake trout populations. The first two of these goals were met successfully, but resulted in complications for rainbow smelt management: introduced predators were now successfully controlling forage fish populations, but this forage was essential in feeding the predator community that now support highly lucrative recreational fisheries. Smelt had also become a favored prey of recovering native predators such as lake trout. At the same time, Smelt began to support a substantial commercial fishery. In the latter part of the 20<sup>th</sup> century, Rainbow Smelt stocks entered a period of highly variable recruitment, possibly as a response to excessive predation pressure and reduction of food availability in the water column associated with proliferation of zebra and quagga mussels. However, rainbow smelt is an invasive species that has negative impacts on native forage fish by competing for food and preying on juvenile fish.

Currently, the outlook for rainbow smelt stocks is unclear though management recognizes the inherent difficulty and complicated nature of managing rainbow smelt populations. This results in high uncertainty about stock status and fishery impacts. Overall, management recognizes that restoring the native predator-prey balance to the Great Lakes is important, but the recreational fisheries made possible in part by rainbow smelt presence in the Great Lakes are also highly valued.

In Lake Erie, rainbow smelt has become an important forage species and in recent years surveys are performed to determine their abundance. Rainbow smelt abundances reached their historic highs in 2012. In Lake Erie, the only fishery that targets rainbow smelt is a trawling fishery located in Ontario waters. The recommendation rainbow smelt in Lake Erie is "**Best Choice**".

Rainbow smelt are "**Good alternative**" in Michigan waters of Lake Superior because they are an invasive species. In Lake Superior Wisconsin waters they are "**Good Alternative**" because of a lack of available data. In Canadian waters of Lake Superior they are considered a "**Good Alternative**" because of unlicensed fishing in a portion of their waters. They are "**best choice**" in Minnesota because they are invasive and have minimal impacts on other species.

Rainbow smelt in Lake Huron is deemed a "**Good Alternative**", primarily due to concerns with bycatch. However, rainbow smelt is not a targeted species and has little commercial value.

There are no rainbow smelt commercial fisheries in Lake Ontario or Lake Michigan.



## Final Seafood Recommendations

| SPECIES/FISHERY  | CRITERION 1: IMPACTS ON THE SPECIES | CRITERION 2: IMPACTS ON OTHER SPECIES | CRITERION 3: MANAGEMENT EFFECTIVENESS | CRITERION 4: HABITAT AND ECOSYSTEM | OVERALL RECOMMENDATION          |
|--|-------------------------------------|---------------------------------------|---------------------------------------|------------------------------------|---------------------------------|
| Lake whitefish<br>Canada Lake Erie, Set gillnets, Canada   | Red (2.159)                         | Yellow (2.644)                        | Yellow (3.000)                        | Green (3.464)                      | <b>Good Alternative (2.775)</b> |
| Lake whitefish<br>Michigan Lake Erie, Barriers, fences, weirs, corrals, etc., United States of America   | Red (2.159)                         | Yellow (2.644)                        | Yellow (3.000)                        | Green (3.464)                      | <b>Good Alternative (2.775)</b> |
| Lake whitefish<br>Ohio Lake Erie, Barriers, fences, weirs, corrals, etc., United States of America       | Red (2.159)                         | Yellow (2.644)                        | Yellow (3.000)                        | Green (3.464)                      | <b>Good Alternative (2.775)</b> |
| Rainbow smelt<br>Canada Lake Erie, Midwater trawls, Canada   | Green (5.000)                       | Yellow (2.644)                        | Yellow (3.000)                        | Green (4.472)                      | <b>Best Choice (3.649)</b>      |
| Walleye<br>Canada Lake Erie, Set gillnets, Canada  | Green (3.831)                       | Red (2.159)                           | Yellow (3.000)                        | Green (3.464)                      | <b>Good Alternative (3.044)</b> |
| Yellow perch<br>Canada Lake Erie, Set gillnets, Canada   | Green (3.873)                       | Red (2.159)                           | Yellow (3.000)                        | Green (3.464)                      | <b>Good Alternative (3.053)</b> |
| Yellow perch<br>Ohio Lake Erie, Barriers, fences, weirs, corrals, etc., United States of America         | Green (3.873)                       | Red (2.159)                           | Yellow (3.000)                        | Green (3.464)                      | <b>Good Alternative (3.053)</b> |
| Yellow perch<br>Canada Lake Erie, Barriers, fences, weirs, corrals, etc., Canada                         | Green (3.873)                       | Yellow (2.644)                        | Yellow (3.000)                        | Green (3.464)                      | <b>Best Choice (3.211)</b>      |
| Yellow perch<br>Pennsylvania Lake Erie, Barriers, fences, weirs, corrals, etc., United States of America | Green (3.873)                       | Yellow (2.644)                        | Yellow (3.000)                        | Green (3.464)                      | <b>Best Choice (3.211)</b>      |

|   |                  |               |                |               |                                |
|---|------------------|---------------|----------------|---------------|--------------------------------|
| Yellow perch<br>New York Lake Erie,<br>Barriers, fences, weirs,<br>corrals, etc., United<br>States of America | Green<br>(3.873) | Green (5.000) | Yellow (3.000) | Green (3.464) | <b>Best Choice<br/>(3.766)</b> |
|---|------------------|---------------|----------------|---------------|--------------------------------|

## Summary

Overall recommendations for Lake Erie:

Lake whitefish population age structure is dominated by the 2003 year class. There is no evidence of year-of-young or yearling whitefish in 2012 lake-wide surveys and assessments. Recruitment appears to be sparse (or absent) which is thought to lead to continuing population declines. Lake whitefish are harvested from Ohio and Michigan with trapnets and from Ontario with gillnets (CWTG 2013). The recommendations for all Lake Whitefish fisheries in Lake Erie are 'Good Alternative' because of the uncertain and potentially declining stocks of Lake Whitefish in Lake Erie waters.

Walleye commercial harvest levels in 2012 (1414.09 tonnes) are below long-term average (1975-2011) (2543.88 tonnes). Population estimates of walleye ages 2 and older are also showing a declining trend (WTG 2013). Walleye are harvested only from Ontario waters of Lake Erie using gillnet. The recommendation for this walleye fishery in Lake Erie is 'Good Alternative'.

Yellow perch commercial harvest has been showing a generally increasing trend in recent years despite estimates that yellow perch abundances will decline. The set TAC reflects predicted yellow perch abundances and is appropriately decreased when abundances are estimated to decrease the following year. Yellow perch are harvested in New York, Ohio, and Pennsylvania waters of Lake Erie using trapnets, and in Ontario waters of Lake Erie using gillnets and trapnets (YPTG 2013). The recommendation for yellow perch fisheries in Lake Erie is 'Good Alternative' if caught in Canadian gillnets or Ohio trap nets these fisheries make up 99% of the yellow perch harvest in Lake Erie. The remaining 1% of yellow perch fisheries harvest is from Canada, Pennsylvania, and New York trap net and is rated 'Best Choice'.

Rainbow smelt historic commercial harvest trends are not available since this species is a non-native species and has not been closely monitored for many years. Rainbow smelt has become an important forage species and in recent years surveys are performed to determine their abundance. Rainbow smelt abundances reached their historic highs in 2012 (FTG 2013). The only fishery that targets rainbow smelt is a trawling fishery located in Ontario waters. The recommendation for rainbow smelt fisheries in Lake Erie is 'Best Choice'.

Lake Trout fisheries do not exist in Lake Erie. Lake Trout caught are returned to the lake as unreported. For this reason, lake trout are not included in this Lake Erie assessment since Lake Trout caught in Lake Erie are not allowed to be sold at market.

## Eco-Certification Information

No elements of the fisheries considered here are eco-certified or part of fisheries improvement projects (FIPs).

## Scoring Guide

Scores range from zero to five where zero indicates very poor performance and five indicates the fishing operations have no significant impact.

Final Score = geometric mean of the four Scores (Criterion 1, Criterion 2, Criterion 3, Criterion 4).

- **Best Choice/Green** = Final Score >3.2, and no Red Criteria, and no Critical scores
- **Good Alternative/Yellow** = Final score >2.2-3.2, and neither Harvest Strategy (Factor 3.1) nor Bycatch Management Strategy (Factor 3.2) are Very High Concern<sup>2</sup>, and no more than one Red Criterion, and no Critical scores
- **Avoid/Red** = Final Score ≤2.2, or either Harvest Strategy (Factor 3.1) or Bycatch Management Strategy (Factor 3.2) is Very High Concern or two or more Red Criteria, or one or more Critical scores.

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<sup>2</sup> Because effective management is an essential component of sustainable fisheries, Seafood Watch issues an Avoid recommendation for any fishery scored as a Very High Concern for either factor under Management (Criterion 3).

# **Introduction**

## **Scope of the analysis and ensuing recommendation**

This report evaluated the commercial harvest of lake whitefish (*Coregonus clupeaformis*), lake trout (*Salvelinus namaycush*), yellow perch (*Perca flavescens*), walleye (*Sander vitreus*), and rainbow smelt (*Osmerus mordax*) in the Laurentian Great Lakes.

Fishing gears examined in this region include gillnets, trapnets, and trawls utilized by commercially licensed fisherman from Michigan, Ohio, Pennsylvania, New York, and Ontario.

## **Species Overview**

Lake trout are found in the northern parts of North America, principally in Canada, throughout Alaska, and in the Laurentian Great Lakes, preferring cool water temperatures of 45-55 °F (Froese & Pauly 2012). During the spring and fall, lake trout may be found at depths of 10 to 15 ft but move to depths of 100-200 ft waters during the summer and winter. Lake trout are the largest of the charr (a sub-grouping within Salmonidae), reaching lengths of up to 50 inches, and typically weighing 15 to 40 lbs (Froese & Pauly 2012). Once in the dominant predator in Lake Huron, introduction of sea lamprey, habitat alterations, and overfishing have resulted in dramatic declines of this once economically valuable fish.

Lake whitefish (member of the family Salmonidae) are found inland lakes throughout Canada, Alaska, and the northern part of the United States. Lake whitefish are schooling fish, which prefer cool waters at depths of up to 200 ft. Lake whitefish typically achieve lengths of 20-30 inches and weigh upwards of 20 lbs. Lake whitefish represent the highest commercial yield of any fishery in the Great Lakes (Froese & Pauly 2012).

Yellow perch are found throughout freshwater lakes in North America. Yellow perch are utilized as both a food fish and a game fish making them a source of great value. Yellow perch prefer water temperatures of 66-70°F and are generally taken at depths of > 45 ft (Froese & Pauly 2012). They average 4-10 inches in length and achieve weights of 4-10 oz (Froese & Pauly 2012).

Walleye (the largest member of the perch family) are also utilized as both a food fish and a game fish. They are found throughout most of Canada and the Northern United States. Walleye are voracious near shore predators, reaching lengths of 20-30 inches and weighing up to 20 lbs. They prefer temperatures of 55-68°F and are seldom found at depths of >50 ft (Froese & Pauly 2012).

Rainbow smelt are native to the Atlantic Coast and throughout the Northern portions of the Atlantic Ocean and Arctic Ocean. They were introduced into inland lakes, escaped, and made their way into the Great Lakes in the early 1900's. The rainbow smelt is slender and cylindrical, achieving lengths of 7 to 9 inches and weighs of ~3 oz. The commercial fishery for rainbow smelt has greatly declined in Lake Huron where they are now currently caught only as bycatch with other, more valuable species (Froese & Pauly 2012).

The Lake Erie fishery has been active since the early 19th century, when settlements were established and local fish trading became common. Lake Erie has always been one of the most productive commercial fisheries in the Great Lakes. Annual catches some years exceeded the combined production of all the other lakes. The diverse habitats, from warm shallow waters of the western basin to the colder, deep waters of the eastern basin, are the reason for Lake Erie's large fisheries. Early fisheries (pre-1900) focused on blue pike, walleye, sauger, lake whitefish, and lake trout. Lake trout had been a substantial commercial fishery in the deeper waters of the eastern basin during the 19th century. By the late 1800s, lake trout populations were declining. By 1930, the lake trout commercial fishery was insignificant and lake trout were completely extirpated from Lake Erie by the 1970s.

Lake herring commercial fishery history in Lake Erie is very similar to that of Lake trout. Hundreds of millions of pounds of Lake herring was harvested between the 1880s and the 1970s. Lake herring populations had severe declines in the first half of the 20th century and completely collapsed in 1920. By 1950, herring were no longer part of the Lake Erie commercial fishery. Lake herring declines were initially driven by overfishing and later exacerbated by eutrophication. Blue pike fisheries drastically reduced in 1950 and collapsed shortly after that. This species is no longer found in the Great Lakes.

The decline of these species resulted in Lake Erie fishery efforts to be directed towards lake whitefish. Lake whitefish are cold-water species at the edge of their southern range in Lake Erie. Intensified fishing efforts contributed to lake whitefish declining populations and changing environmental conditions in the lake produces greater year class strength variability which has hastened their decline.

Eutrophication has negatively impacted even warm-water mesotrophic species. Walleye populations were already stressed due to the loss of tributary-spawning stocks experienced fluctuating substantially by the middle of the 20th century. For example, a peak catch of 16 million pounds in 1956 was followed by a dramatic decline to 1 million pounds in 1962. Irregularity of year classes has added to the instability of walleye populations. In addition to eutrophication, the loss of *Hexagenia* mayflies, an important food item, greatly affected food supplies for fish.

Yellow perch, another mesotrophic species, has been an important Lake Erie fishery species for a long time. Yellow perch importance increased as lake whitefish and lake herring declined. This led to high catches exceeding 10 million pounds in the 1930s. Similar to walleye, yellow perch year class strength became variable beginning in the 1950s. Fishing intensity and some strong year classes have resulted in later peaks in commercial catch. However, overall population declines continued into the middle of the 20th century with a high catch of 33.7 million pounds in 1969 followed by substantial declines until management actions to improve water quality improved in the late 1970s.

During the 1960s, all valuable populations were declining which increased fishing intensity for the invasive rainbow smelt. However, rainbow smelt were infected by the parasite *Glugea hertwigi* which caused steep declines in rainbow smelt catch in the 1960s as well.

The fisheries targeting the species mentioned above are managed by the Great Lakes Fishery Commission (GLFC) under the Joint Strategic Plan for Management of Great Lakes Fisheries, which was originally enacted in 1981. It was reviewed in 1986 and amended in 1997 in an effort to adopt practices to better coordinate fishery and environmental management issues. During this time tribal fisherman (CORA and GLIFWC) and USGS representatives were offered seats on the Council of Lake Committees (GLFC 2007).

## **Production Statistics**

None of the species evaluated in this report are considered important on a global scale. Most of the harvest remains in the region and is insignificant compared to global landings of other fish in other fisheries (FAO 2014). In 2012, commercial harvest for Lake Erie for the five species considered in this report were the following (from largest to smallest): 4892.35 tonnes of Yellow Perch, 1,586.361 tonnes of Walleye, 338.2753 tonnes Rainbow Smelt, 154.8445 tonnes Lake Whitefish. (2012 data from GLFC).

Historic trends: Lake whitefish harvest has been decreasing since 2008 (Fig.4, CWTG 2013). Walleye harvest has been increasing in short term but is currently about one-fourth the historic high harvest rate (Fig. 1, CWTG 2013). Yellow perch harvest rates in management units 1 and 2 have a decreasing trend while management

units 3 and 4 have an increasing trend (Fig. 13, YPTG 2013). Rainbow smelt are a non-native species and their historic harvest rates are not compiled. However, their recent abundance can be found in Fig. 3 (FTG 2013).

Ohio commercial harvest rates broken down by species can be seen in Table 3 (OH DNR 2013). Michigan commercial harvest (in pounds) broken down by species can be seen in Table 2 (MI DNR 2013).

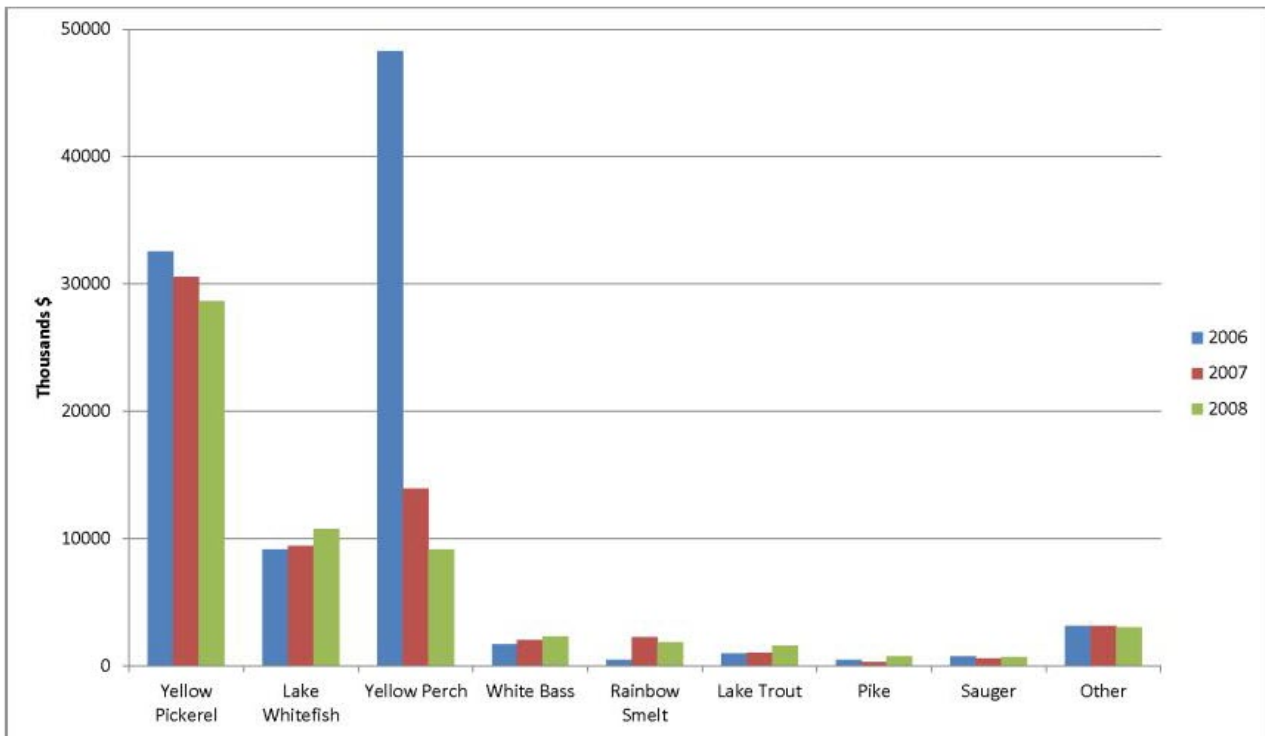
| Lake      | Fishery      | Species        | Landing (tonnes) | Gear     |
|-----------|--------------|----------------|------------------|----------|
| Lake Erie | Ontario      | Lake Whitefish | 97.545           | Gillnet  |
| Lake Erie | Michigan     | Lake Whitefish | 2.91932          | Trap net |
| Lake Erie | Ohio         | Lake Whitefish | 54.3798          | Trap net |
| Lake Erie | Ontario      | Rainbow Smelt  | 3380             | Trawl    |
| Lake Erie | Ontario      | Walleye        | ~3158            | Gillnet  |
| Lake Erie | Ontario      | Yellow Perch   | 3122             | Gillnet  |
| Lake Erie | Ontario      | Yellow Perch   | 0.05             | Trap net |
| Lake Erie | Ontario      | Yellow Perch   | 7.27             | Trawl    |
| Lake Erie | New York     | Yellow Perch   | 8                | Trap net |
| Lake Erie | Ohio         | Yellow Perch   | 797              | Trap net |
| Lake Erie | Pennsylvania | Yellow Perch   | 42               | Trap net |

Landings Data for 2012 Commercial fisheries.

### **Importance to the US/North American market.**

Commercial fisheries for lake trout in the Great Lakes are generally small and restricted for the most part to Lake Superior, Lake Huron, and Lake Michigan. Although some lake trout are caught in Canadian waters of Lake Superior, this species is not a primary freshwater export for Canada.

The majority of walleye sold in the US comes from Canadian sources, primarily from Lake Erie. Walleye is one of Canada's largest freshwater fish exports, together with yellow perch and lake whitefish, and is the recently most valuable in terms of price per pound



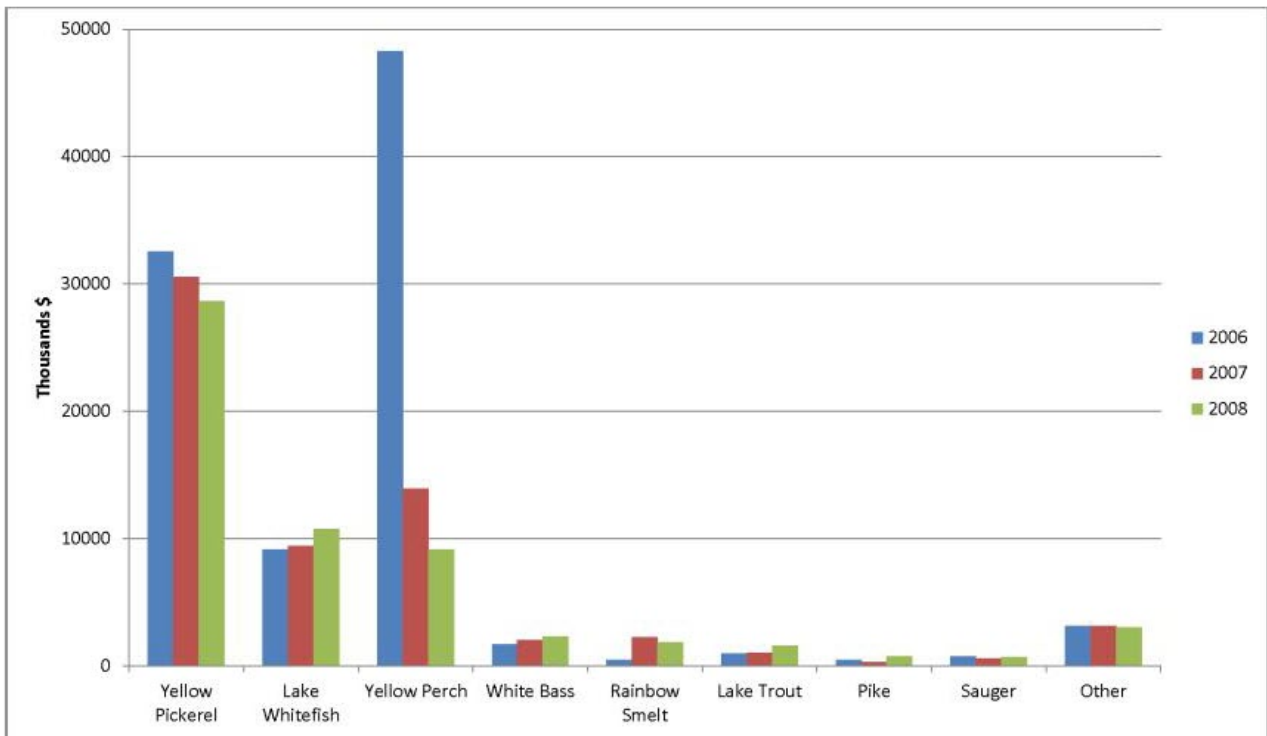
Commercial landing values of Canadian Freshwater Fisheries.

The US imports about 6.6 million pounds of fresh and frozen walleye annually from Canada, primarily as frozen fillets, but also as fresh whole fish, fresh fillets, and frozen block (DFO 2011). Approximately 90% is from Great Lakes sources, with about 87% coming from Lake Erie and about 3% from Lake Huron.

The largest market for yellow perch in the United States is in the Great Lakes region, where fresh perch fillets can attain the highest price per pound. US demand for yellow perch makes it one of Canada's largest and most valuable freshwater fishery exports, together with walleye and lake whitefish.

The demand for yellow perch in the Great Lakes region has been estimated to reach about 50-100 million pounds annually (Hinshaw 2006). Currently, close to two million pounds are commercially harvested within the US, primarily from Ohio waters of Lake Erie. Nearly twice that, just under four million pounds, is imported, nearly all of it from Canadian commercial Great Lakes fisheries operating in Ontario ((Hinshaw 2006),(Baldwin et al. 2009),(DFO 2011)).

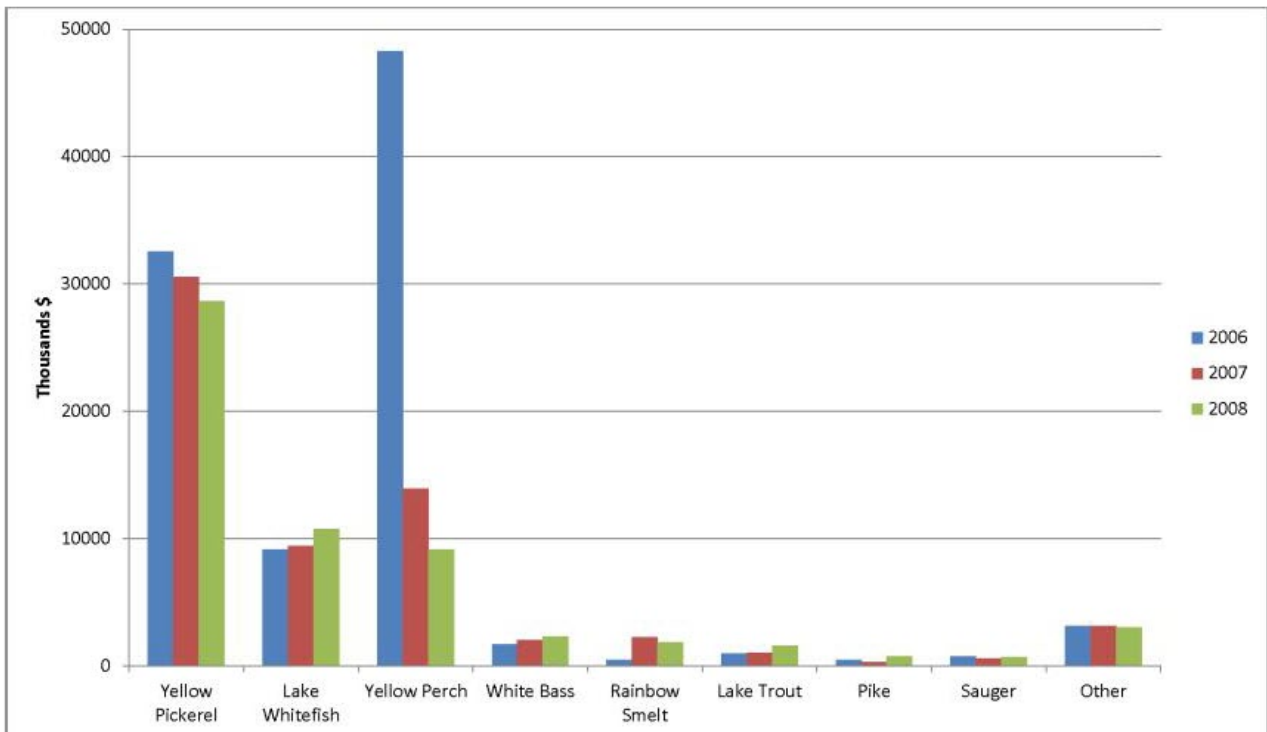
The largest exports of whitefish from Canada are from the Northwest Territories, Manitoba, Saskatchewan, and Alberta. Great Lakes catches traditionally focused on domestic wholesale markets but competition from Canadian wholesalers from northwest regions of Canada are influencing prices and increasing competition with Great Lakes fish. Partly as a result of this competition and also because of declining quota and the need to get greater return from less available product, the lake whitefish market is currently exploring better branding and value-added products. Lake whitefish is one of the three largest freshwater exports, by both weight and value, from Canada



Commercial landing values of Canadian Freshwater Fisheries.

These fish are primarily sold in US markets.

Great Lakes rainbow smelt are the fifth largest Canadian freshwater fish export by value.



Commercial landing values of Canadian Freshwater Fisheries.

The majority of Canadian-caught freshwater smelt are exported frozen to Japan, with some going to the US.

A portion of the Lake Erie catch is also exported fresh to the US.



## **Common and market names.**

Lake trout, *Salvelinus namaycush*, is also known as Great Lakes trout, laker, namaycush, togue, grey trout, mountain trout, mackinaw, lake char/charr, touladi, and salmon trout.

Walleye, *Sander vitreus*, is also known as yellow pickerel, pickerel (Canada), yellow pike, yellow walleye, and dore (France, Canada).

Yellow perch, *Perca flavescens*, is also known as lake perch, ringed perch, raccoon perch, Ned, yellow Ned, redfin, and redfin perch.

Lake whitefish, *Coregonus clupeaformis*, is also known as common whitefish, Sault whitefish, whitefish, eastern whitefish, Great Lakes whitefish, inland whitefish, gizzard fish, grande coregone (French), and Attikumaig(Chippewa).

Rainbow smelt, *Osmerus mordax*, is also known as American smelt, leefish, freshwater smelt, and frost fish.

## **Primary product forms**

Lake trout may be marketed fresh, frozen, or smoked. Though "smoked lake trout" is typically siscowet, or oily lake trout, a substantial portion of the larger lean lake trout sold is also smoked. Smaller fish are primarily marketed fresh or frozen, as whole dressed fish.

Walleye is available fresh as whole fish (head on or off, dressed) or fillets (skin on or off), and frozen as fillets or fingers (7-12 cm strips).

Yellow perch can be found fresh or frozen, sold primarily as scaled, skin-on fillets.

Whitefish is available fresh or frozen as whole dressed fish or fillets. New value-added products growing in market share include frozen vacuum-packed fillets and prepared foods such as spreads. Lake whitefish roe is also successfully marketed as "golden caviar." Canadian whitefish catches from outside the Great Lakes are marketed by the Freshwater Fish Marketing Corporation (FFMC), which produces three main whitefish products: minced block, whole fresh, and whole frozen whitefish.

Rainbow smelt can be found on the US market as fresh or frozen whole fish.

## Assessment

This section assesses the sustainability of the fishery(s) relative to the Seafood Watch Criteria for Fisheries, available at <http://www.seafoodwatch.org>.

### Criterion 1: Impacts on the species under assessment

*This criterion evaluates the impact of fishing mortality on the species, given its current abundance. The inherent vulnerability to fishing rating influences how abundance is scored, when abundance is unknown.*

*The final Criterion 1 score is determined by taking the geometric mean of the abundance and fishing mortality scores. The Criterion 1 rating is determined as follows:*

- Score >3.2=Green or Low Concern
- Score >2.2 and ≤3.2=Yellow or Moderate Concern
- Score ≤2.2=Red or High Concern

*Rating is Critical if Factor 1.3 (Fishing Mortality) is Critical*

#### Criterion 1 Summary

| LAKE WHITEFISH   |                        |                    |                        |            |
|--|------------------------|--------------------|------------------------|------------|
| Region   Method  | Inherent Vulnerability | Abundance          | Fishing Mortality      | Score      |
| Canada/Lake Erie Set gillnets   Canada   | 2.00: Medium           | 2.00: High Concern | 2.33: Moderate Concern | Red (2.16) |
| Michigan/Lake Erie Barriers, fences, weirs, corrals, etc.   United States of America | 2.00: Medium           | 2.00: High Concern | 2.33: Moderate Concern | Red (2.16) |
| Ohio/Lake Erie Barriers, fences, weirs, corrals, etc.   United States of America     | 2.00: Medium           | 2.00: High Concern | 2.33: Moderate Concern | Red (2.16) |

| RAINBOW SMELT                             |                        |                        |                        |              |
|---|------------------------|------------------------|------------------------|--------------|
| Region   Method                           | Inherent Vulnerability | Abundance              | Fishing Mortality      | Score        |
| Canada/Lake Erie Midwater trawls   Canada | 2.00: Medium           | 5.00: Very Low Concern | 5.00: Very Low Concern | Green (5.00) |

| WALLEYE                                |                        |                   |                   |              |
|--|------------------------|-------------------|-------------------|--------------|
| Region   Method                        | Inherent Vulnerability | Abundance         | Fishing Mortality | Score        |
| Canada/Lake Erie Set gillnets   Canada | 2.00: Medium           | 4.00: Low Concern | 3.67: Low Concern | Green (3.83) |

| YELLOW PERCH   |                        |                        |                        |              |
|--|------------------------|------------------------|------------------------|--------------|
| Region   Method  | Inherent Vulnerability | Abundance              | Fishing Mortality      | Score        |
| Canada/Lake Erie Set gillnets   Canada   | 3.00: Low              | 3.00: Moderate Concern | 5.00: Very Low Concern | Green (3.87) |
| Ohio/Lake Erie Barriers, fences, weirs, corrals, etc.   United States of America         | 3.00: Low              | 3.00: Moderate Concern | 5.00: Very Low Concern | Green (3.87) |
| Canada/Lake Erie Barriers, fences, weirs, corrals, etc.   Canada                         | 3.00: Low              | 3.00: Moderate Concern | 5.00: Very Low Concern | Green (3.87) |
| Pennsylvania/Lake Erie Barriers, fences, weirs, corrals, etc.   United States of America | 3.00: Low              | 3.00: Moderate Concern | 5.00: Very Low Concern | Green (3.87) |
| New York/Lake Erie Barriers, fences, weirs, corrals, etc.   United States of America     | 3.00: Low              | 3.00: Moderate Concern | 5.00: Very Low Concern | Green (3.87) |

The four key species outlined in the scope of this Lake Erie assessment are Lake Whitefish, Rainbow Smelt, Walleye, and Yellow Perch. Lake trout are not included, because lake trout harvest is not allowed in Lake Erie. In Ontario, Lake Whitefish are harvested in both gillnets and trap nets, Rainbow Smelt are harvested by midwater trawls, Walleye are harvested with gillnets, and Yellow Perch are harvested with gillnets and trap nets. In Michigan, commercial fisheries only target Lake Whitefish with trap nets. In Ohio, commercial fisheries target Lake Whitefish and Yellow Perch with trap nets. In New York and Pennsylvania, commercial fisheries target Yellow Perch with trap nets.

Inherent vulnerability scores are derived from the “vulnerability” score provided on fishbase, which is based on several inherent biological characteristics of the species (e.g., age at maturity, maximum age, fecundity, etc.). The FishBase vulnerability score is derived from Cheung et al. (2005) and is found at [www.fishbase.org](http://www.fishbase.org) on the species’ page. This score is used to determine a risk-based score for Factor 1.2 (abundance of the stock) only in cases where the abundance is otherwise unknown. Attributes that affect susceptibility of the species to the fishery, e.g. its attraction to fishing gear and spatial overlap with the fishery, are germane to the degree of fishing mortality experienced by the species and therefore are considered under Factor 1.3 (fishing mortality) in cases where fishing mortality is unknown and a risk-based score is needed.

## Criterion 1 Assessment

### SCORING GUIDELINES

## Factor 1.1 - Inherent Vulnerability

- *Low*—The FishBase vulnerability score for species is 0-35, OR species exhibits life history characteristics that make it resilient to fishing, (e.g., early maturing).
- *Medium*—The FishBase vulnerability score for species is 36-55, OR species exhibits life history characteristics that make it neither particularly vulnerable nor resilient to fishing, (e.g., moderate age at sexual maturity (5-15 years), moderate maximum age (10-25 years), moderate maximum size, and middle of food chain).
- *High*—The FishBase vulnerability score for species is 56-100, OR species exhibits life history characteristics that make it particularly vulnerable to fishing, (e.g., long-lived (>25 years), late maturing (>15 years), low reproduction rate, large body size, and top-predator). Note: The FishBase vulnerability scores is an index of the inherent vulnerability of marine fishes to fishing based on life history parameters: maximum length, age at first maturity, longevity, growth rate, natural mortality rate, fecundity, spatial behaviors (e.g., schooling, aggregating for breeding, or consistently returning to the same sites for feeding or reproduction) and geographic range.

## Factor 1.2 - Abundance

- *5 (Very Low Concern)*—Strong evidence exists that the population is above target abundance level (e.g., biomass at maximum sustainable yield, BMSY) or near virgin biomass.
- *4 (Low Concern)*—Population may be below target abundance level, but it is considered not overfished
- *3 (Moderate Concern)* —Abundance level is unknown and the species has a low or medium inherent vulnerability to fishing.
- *2 (High Concern)*—Population is overfished, depleted, or a species of concern, OR abundance is unknown and the species has a high inherent vulnerability to fishing.
- *1 (Very High Concern)*—Population is listed as threatened or endangered.

## Factor 1.3 - Fishing Mortality

- *5 (Very Low Concern)*—Highly likely that fishing mortality is below a sustainable level (e.g., below fishing mortality at maximum sustainable yield, FMSY), OR fishery does not target species and its contribution to the mortality of species is negligible ( $\leq 5\%$  of a sustainable level of fishing mortality).
- *3.67 (Low Concern)*—Probable (>50%) chance that fishing mortality is at or below a sustainable level, but some uncertainty exists, OR fishery does not target species and does not adversely affect species, but its contribution to mortality is not negligible, OR fishing mortality is unknown, but the population is healthy and the species has a low susceptibility to the fishery (low chance of being caught).
- *2.33 (Moderate Concern)*—Fishing mortality is fluctuating around sustainable levels, OR fishing mortality is unknown and species has a moderate-high susceptibility to the fishery and, if species is depleted, reasonable management is in place.
- *1 (High Concern)*—Overfishing is occurring, but management is in place to curtail overfishing, OR fishing mortality is unknown, species is depleted, and no management is in place.
- *0 (Critical)*—Overfishing is known to be occurring and no reasonable management is in place to curtail overfishing.

## LAKE WHITEFISH

### Factor 1.1 - Inherent Vulnerability

CANADA/LAKE ERIE, SET GILLNETS, CANADA  
MICHIGAN/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
OHIO/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

## Medium

The lake whitefish, a member of the family Salmonidae, has long comprised the mainstay of the commercial catch in the Great Lakes. This schooling, planktivorous fish can live >25 years, and reaches sexual maturity at about 2 years of age. Lake whitefish are characteristic broadcast spawners.

The fishbase vulnerability score for Lake Whitefish is 48 (Froese & Pauley 2012). Therefore, Lake whitefish inherent vulnerability is listed as "medium".

## Factor 1.2 - Abundance

CANADA/LAKE ERIE, SET GILLNETS, CANADA

MICHIGAN/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

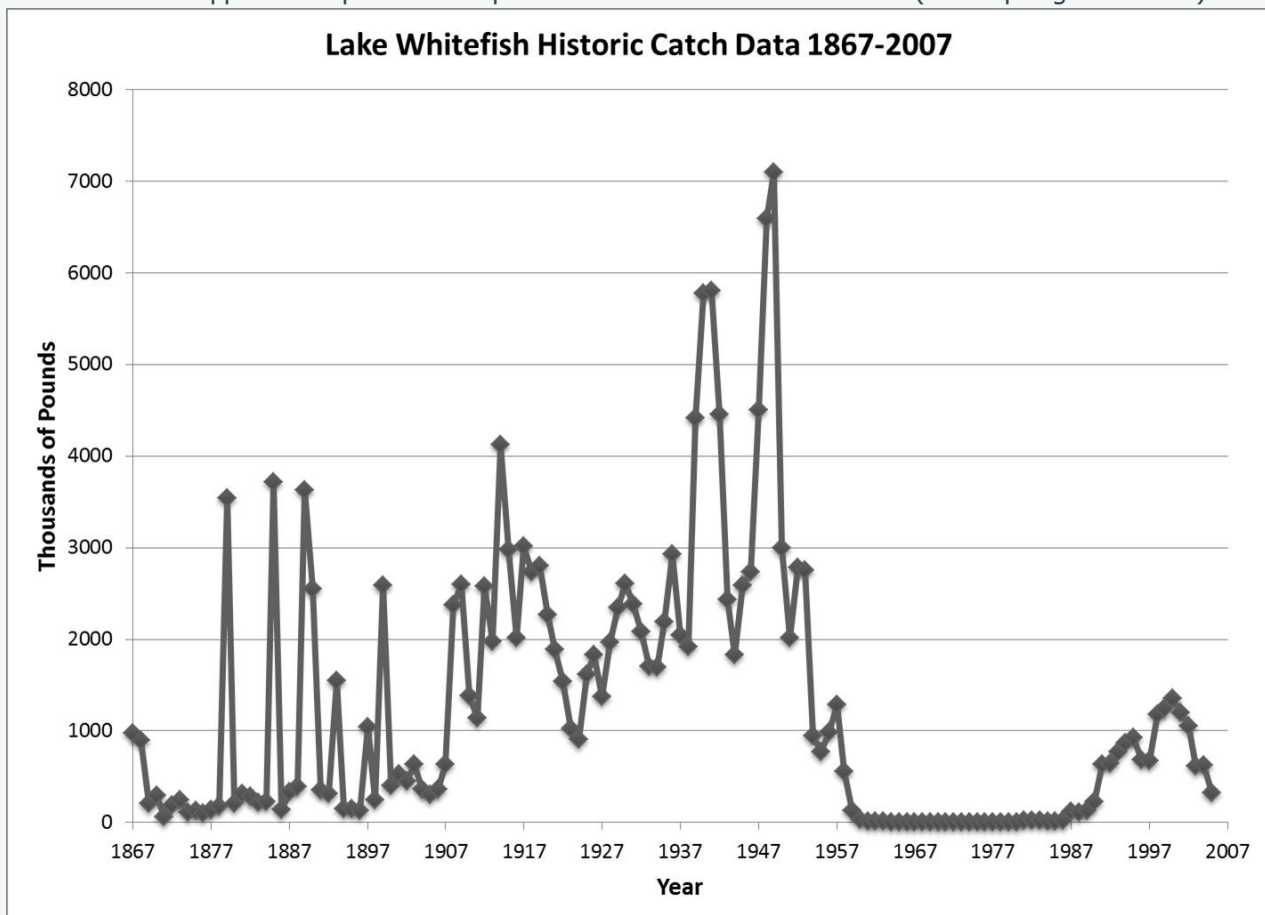
OHIO/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

### High Concern

This fishery is given a 'High Concern' because there is a greater than 50% chance that the stock is below the point where recruitment is impaired.

### Justification:

Like other deepwater fish, lake whitefish underwent substantial population declines in the middle of the 19th century, but was able to recover quickly after nutrient abatement and sea lamprey control measures were put in place in the 1970s. In some areas (including Lake Erie), lake whitefish condition, growth, and catch rates became highly variable in the 1990s when their preferred prey, the amphipod *Diporeia*, disappeared in many lake areas in an apparent response to the proliferation of exotic zebra mussels (Vanderploeg et al. 2002).



Historic Lake Whitefish Catch data

Lake whitefish catch per unit effort (CPUE) is reported as a catch rate (kg/km) in Ontario and catch rate (lbs/lift) in Ohio and Pennsylvania waters. Records for these CPUE trends are well documented. In Ontario waters, 2012 catch rates were 3rd historic lowest at 87 kg/km

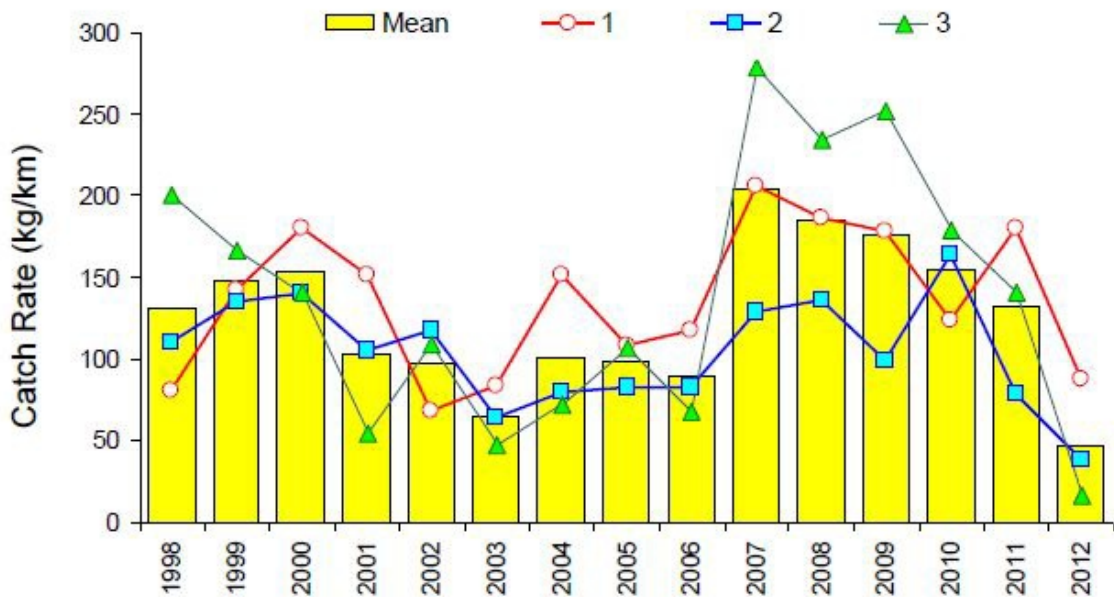


FIGURE 2.3. Ontario annual commercial large mesh gill net catch rates targeting lake whitefish by quota zone, 1998 - 2012. Bars represent averages of catch rates across quota zones. Quota zone 1 refers to the west basin, zone 2 extends eastward to the middle of the central basin. The eastern portion remaining is quota zone 3.

Ontario annual commercial large mesh gill net catch rates targeting lake whitefish by quota zone, 1998-2012. Bars represent averages of catch rates across quota zones. Quota zone 1 refers to the west basin, zone 2 extends eastwards to the middle of the central basin. The eastern portion remaining is quota zone 3 (CWTG 2013).

In Ohio and Pennsylvania waters, 2012 catch rates were 2nd highest since 1996.

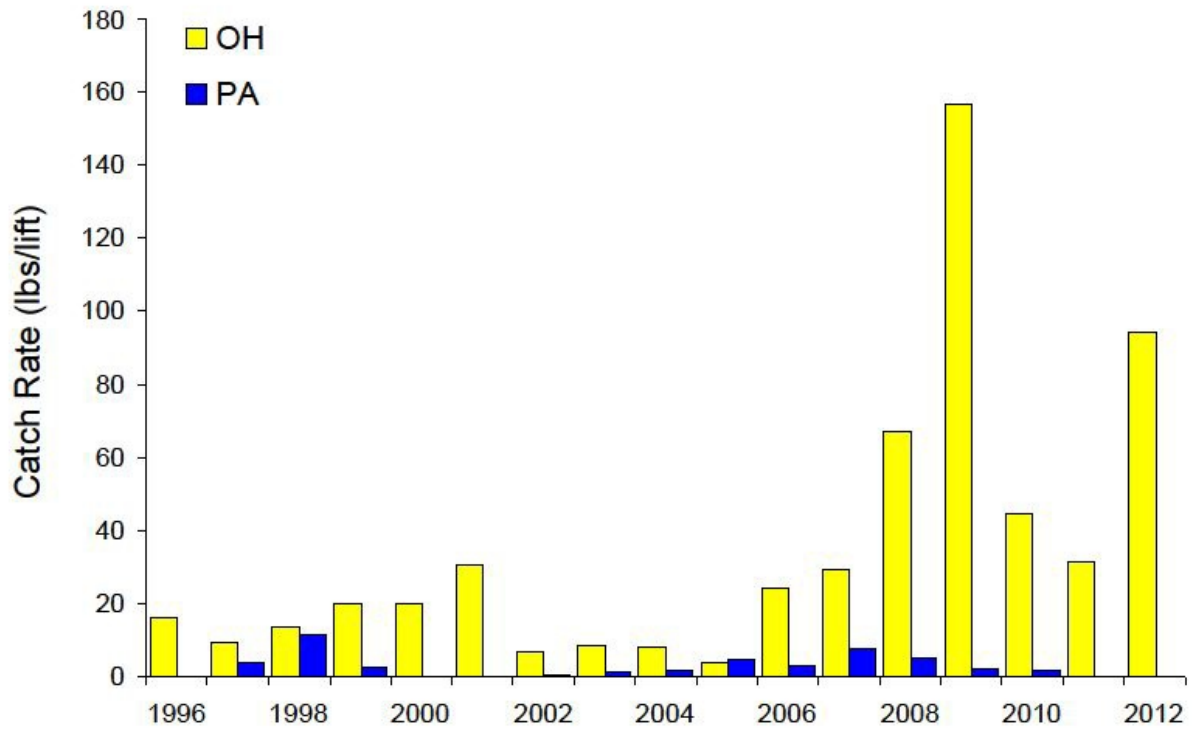


FIGURE 2.5. Ohio and Pennsylvania lake whitefish commercial trap net catch rates (pounds per lift), 1996-2012. There was no lake whitefish harvest in Pennsylvania in 2011 and 2012.

Ohio and Pennsylvania lake whitefish commercial trap net catch rates (pounds per lift) 1996-2012. There was no lake whitefish harvest in Pennsylvania in 2011 and 2012 (CWTG 2013).

Due to these variable CPUEs from different locations in Lake Erie, CPUE is inconclusive in suggesting whether stock is depleted.

Lake whitefish populations appear to be steadily declining since the strong 2003 year class based on fishery-independent surveys. 2012 lake-wide surveys showed lake whitefish population to range from age 3 to 24; there is no evidence of year-of-young or yearling whitefish either. Lake whitefish population will continue to decline with sparse (or absence) of recruitment (CWTG 2013). Recruitment appears to have declined in recent years, as evidenced by an age structure that is skewing to fish age 7+. Age composition of lake whitefish caught commercially in 2012 show that the 2003 cohort (age 9) is being heavily relied upon for commercial harvests (CWTG 2013, Figure 2.7). This supports that lake whitefish populations are having low recruitment rates and the last abundant recruitment year was 2003.

### Factor 1.3 - Fishing Mortality

CANADA/LAKE ERIE, SET GILLNETS, CANADA  
 MICHIGAN/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
 OHIO/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

#### Moderate Concern

The Lake Whitefish fisheries in Lake Erie are ranked as 'Moderate Concern' because F is unknown but effective management is in place.

#### Justification:

Commercial catches in Lake Erie waters have been fluctuating greatly since the 1970s when Lake Whitefish underwent substantial stock declines due to sea lamprey predation. The loss of their preferred prey, the amphipod *Diporeia*, in the 1990s caused populations to become even further variable (Vanderploeg et al. 2002).

While state, federal, and provincial agencies closely monitor Lake Whitefish stock statuses, there are currently no quotas for Lake Whitefish harvest. Lake Whitefish harvests from Lake Erie make up a very small percentage of the total Great Lakes harvest.

## RAINBOW SMELT

### **Factor 1.1 - Inherent Vulnerability**

CANADA/LAKE ERIE, MIDWATER TRAWLS, CANADA

#### **Medium**

Rainbow smelt are an introduced species in the Great Lakes and serve as forage fish for many native species. Rainbow smelt can live for >7 years and reach maturity in 1-2 years. They are plantivorous fishes, prey on zooplankton, and larvae of other fish species. Spawning is typically initiated shortly after ice out, and takes place in streams and rivers. Rainbow smelt are broadcast spawners.

The fishbase vulnerability score for rainbow smelt is 38 (Froese & Pauley 2012). Therefore, rainbow smelt inherent vulnerability is classified as "medium".

### **Factor 1.2 - Abundance**

CANADA/LAKE ERIE, MIDWATER TRAWLS, CANADA

#### **Very Low Concern**

Rainbow smelt are invasive to the Great Lakes. For this reason, it is listed as "very low concern" for stock status.

Despite their non-native status, rainbow smelt are an important forage species for many offshore piscivores in Lake Erie (FTG 2013). Due to their importance as a forage species, rainbow smelt are well studied and their population abundance is documented in the annual Report of the Lake Erie Forage Task Group. In 2012, surveys in both U.S. and Canadian water showed that forage species abundances was above average. When looking at specifically rainbow smelt, densities decreased in most management units except in Canadian waters in the Eastern Basin of Lake Erie (FTG 2013).

Acoustic studies in the Eastern basin of Lake Erie have been determining the abundance of rainbow smelt since 1993. In 2012, the study showed that forage fish the size of rainbow smelt (probably not exclusively rainbow smelt) was the highest it has been at 17,182 fish/hectare. The lowest abundance was observed in 2007 as 5,015 fish/hectare (FTG 2013).

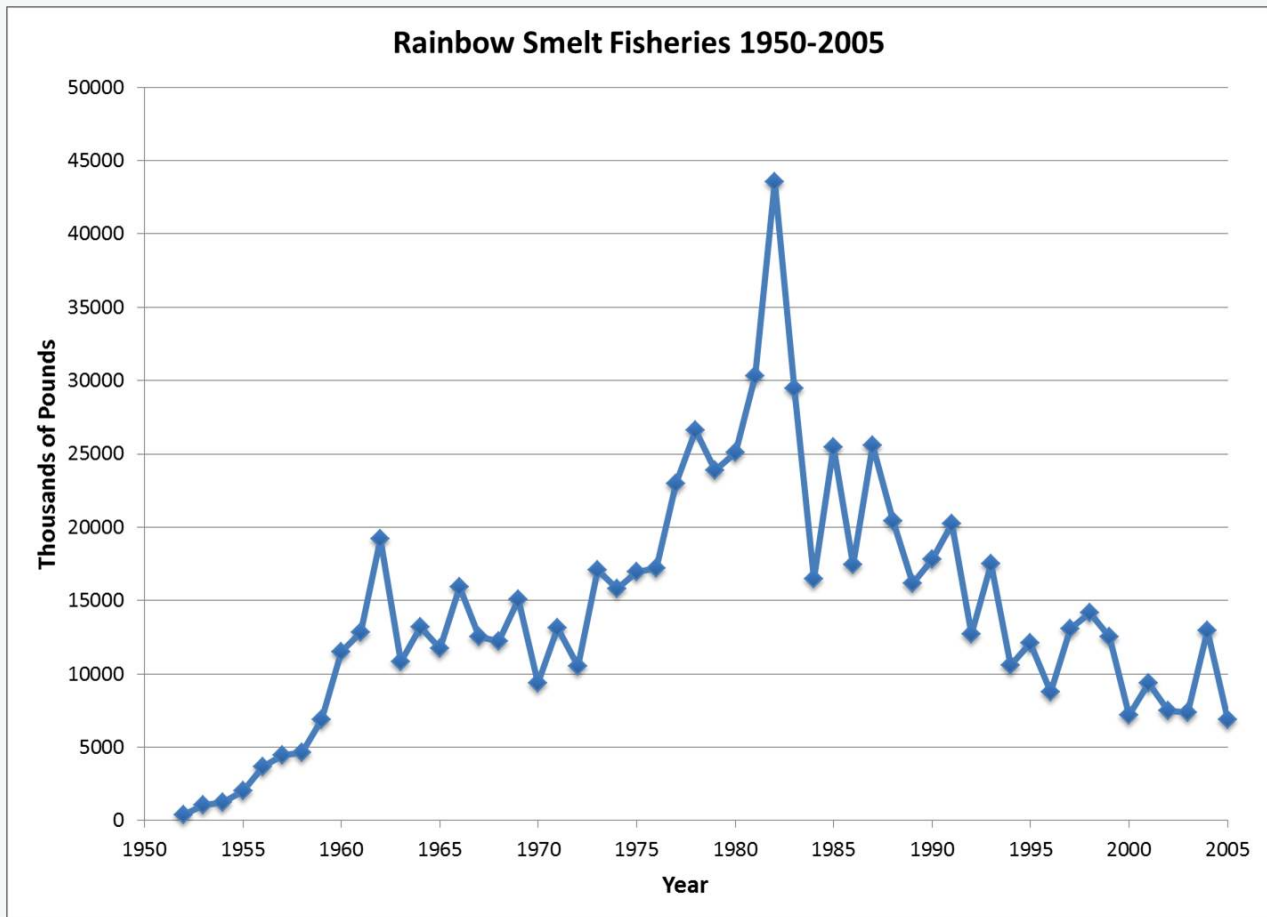
For the central basin of Lake Erie, the same acoustic studies have been performed since 2004. In 2012, these acoustic studies showed that rainbow smelt sized forage fish were at their highest abundances for years 2010-2012. The densities in some locations reached 57,000 fish/hectare (FTG 2013).



For the western basin of Lake Erie, the same acoustic studies have been performed since 2000. In 2012, these acoustic studies showed that rainbow smelt sized forage fish were at their highest at an average abundance of 17,182 fish/hectare (FTG 2013).

For all three basins of Lake Erie, the abundance of rainbow smelt is estimated to be either average or high for the time frame of 2000-2012. Therefore, a "very low" concern ranking would be appropriate even if rainbow smelt were not a non-native species.

**Justification:**



Rainbow Smelt Historic Catch Data

**Factor 1.3 - Fishing Mortality**

CANADA/LAKE ERIE, MIDWATER TRAWLS, CANADA

**Very Low Concern**

Rainbow smelt is a non-native species so the fishing mortality status is of "very low concern".

In Lake Erie, the only rainbow smelt fisheries exist in Canadian waters and use mid-water trawls. In 2012, the harvest by trawls was 7,451,770 pounds (FTG 2013) (OMNR 2013).

**WALLEYE**

## Factor 1.1 - Inherent Vulnerability

CANADA/LAKE ERIE, SET GILLNETS, CANADA

### Medium

The walleye is the largest member of the perch family, and are considered the dominate near shore predator. Walleye can live >25 years with males maturing at age 2-4 and females maturing at age 3-6. In the spring, walleye migrate to tributary streams to lay eggs over gravel and rock reefs.

The fishbase vulnerability score for walleye is 40 (Froese & Pauley 2012). Therefore, walleye inherent vulnerability is classified as "medium".

## Factor 1.2 - Abundance

CANADA/LAKE ERIE, SET GILLNETS, CANADA

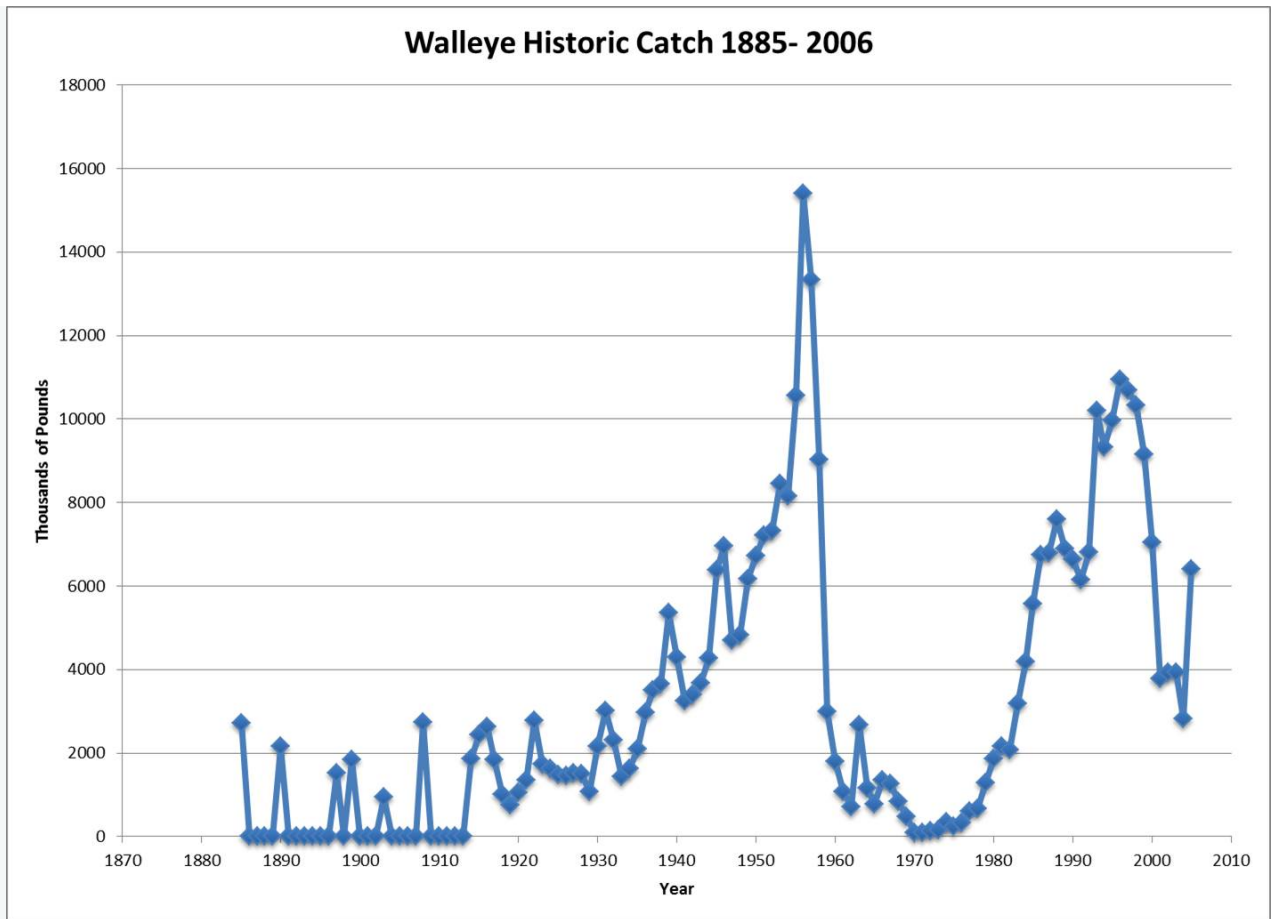
### Low Concern

This fishery is given a 'Low Concern' because it is above the limit reference point and may be below a target reference point.

### Justification:

Commercial fisheries that target walleye only exists in Canadian waters of Lake Erie. Walleye are a migratory species that migrate from west to east through all three basins: Western, Central, and Eastern. The Lake Erie Committee manages and allocates TAC each year for the Western and Central basins of Lake Erie (WTG 2013).

The probability of the projected spawner biomass in 2014 (17.351 million kg) falling below the limit reference point (SSB20% = 8.561 million kg), given 2013 catch levels was less than 5% (WTG 2013). The target reference point (TRP), or maximum fishing rate, is F60%MSY. In 2012, this was 0.296. This resulted in a Recommended Allowable Harvest (RAH) between 2.419 (minimum) to 3.356 (maximum) million walleye (WTG 2013). Therefore, the fishery is above the limit reference point and is given a 'low concern' ranking.



### Walleye Historic Catch Data

Only 74% of the 2012 TAC was fished.

The walleye population in Lake Erie is very closely monitored by two different groups the Walleye Task Group on the Lake Erie Committee and the Lake Erie Percid Management Advisory Group.

## Factor 1.3 - Fishing Mortality

CANADA/LAKE ERIE, SET GILLNETS, CANADA

### Low Concern

It is >50% likely that the current fishing mortality levels are set so that mortality does not affect rehabilitation of this fishery. For that reason, the fishing mortality is given a "low concern".

The walleye fishery is well managed and Total Allowable Catch (TAC) levels are set to allow for an appropriate projected spawning stock biomass to continue on. TACs are allocated to each state or province by surface area of water. The target reference point (TRP), or maximum fishing rate, is set at F60%MSY. This results in a Recommended Allowable Harvest (RAH) which is then allocated as Total Allowable Catch (TAC) limits.

Only 74% of the 2012 TAC was fished. However, current Lake Erie walleye abundance estimates (22,183,226

fish) are near their historic low, which occurred in 1981 (WTG 2013, Table 8).

## YELLOW PERCH

### **Factor 1.1 - Inherent Vulnerability**

CANADA/LAKE ERIE, SET GILLNETS, CANADA  
OHIO/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
CANADA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA  
PENNSYLVANIA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
NEW YORK/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

#### **Low**

The yellow perch inhabits shallow, near shore areas where they dine primarily on immature insects, larger invertebrates (such as crayfish), and the eggs and young of other fish. Male perch reach sexual maturity at 3 years of age while females mature at age 4. Yellow perch often live for 9-10 years. Yellow perch spawn in the spring, laying eggs in gelatinous strings over dense vegetation, roots, and fallen trees.

The fishbase vulnerability score is 31 for yellow perch (Froese & Pauley 2012). Therefore, the yellow perch inherent vulnerability is classified as "low".

### **Factor 1.2 - Abundance**

CANADA/LAKE ERIE, SET GILLNETS, CANADA  
OHIO/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
CANADA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA  
PENNSYLVANIA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
NEW YORK/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

#### **Moderate Concern**

##### **Justification:**

Like other fisheries in Lake Erie, the Yellow Perch fishery experienced variability beginning in the 1950s. Fishing intensity for yellow perch increased as other important Lake Erie fisheries declined in the 1950s. However, the nutrient abatement and sea lamprey control measures in the 1970s improved all Lake Erie fisheries in the 1970s and removed some of the high fishing pressure on yellow perch fisheries.

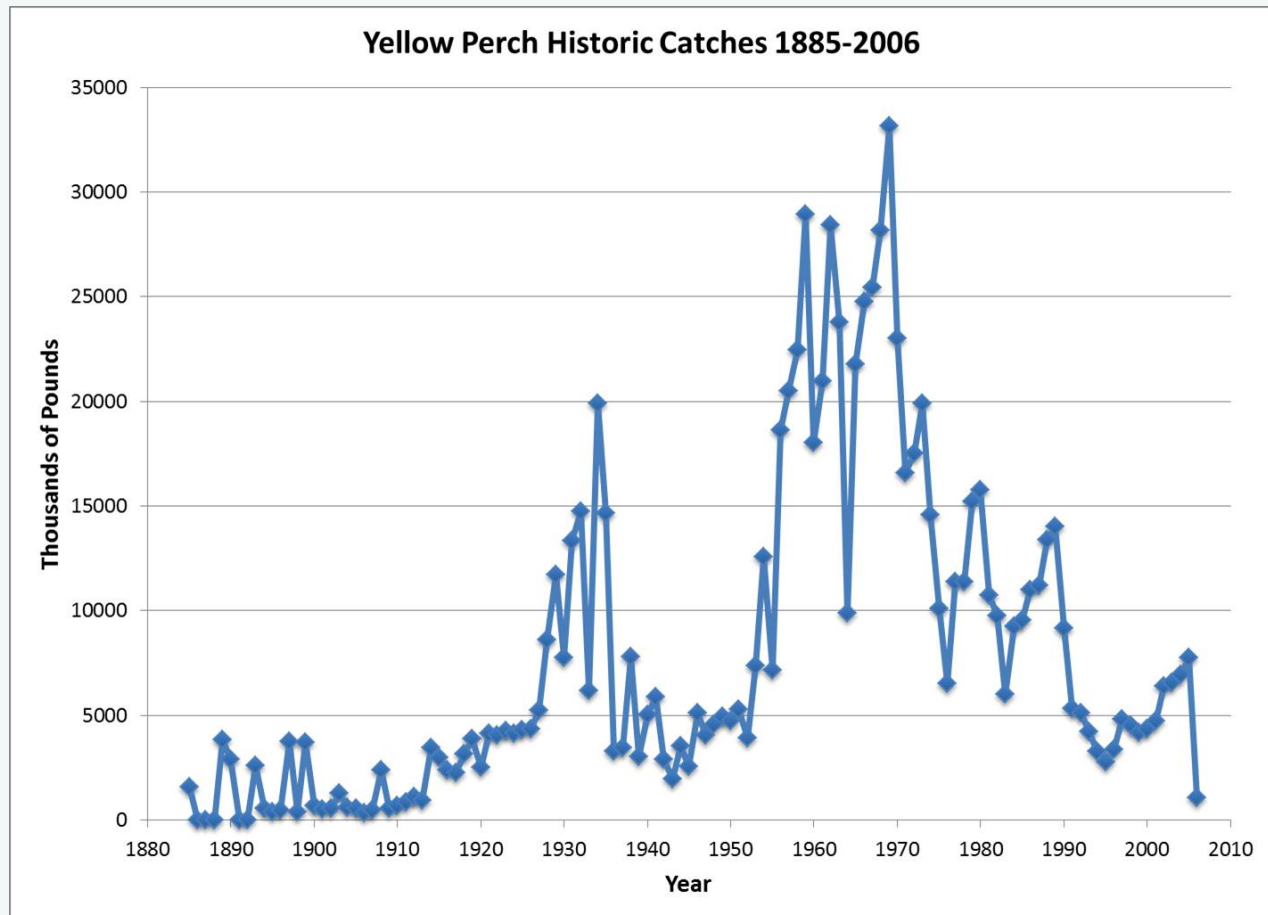
In Ontario waters, yellow perch are targeted by small mesh gillnets and caught as by-catch in large mesh gillnets and trap nets. Looking at the catch per unit effort (CPUE) for this commercial fishery, 2012 CPUE increased in Management Unit (MU)-2 (9.5%), MU-3 (28.8%), and MU-4 (13.2%) compared to 2011 CPUE. MU-1 experienced a slight decrease (12.7%) in 2012 (YPTG 2013). Long term data for CPUE trends of yellow perch in Lake Erie was not immediately available. However looking at readily available data for CPUE since 2000, the 2012 CPUE in MU-3 and MU-4 are greater than the 2000-2011 average. 2012 CPUE in MU-1 and MU-2 are less than the 2000-2011 average. This CPUE data for yellow perch caught in Canadian waters of Lake Erie show that CPUE is slightly increasing or remaining constant. However, CPUE is not the best indicator of a fishery's status.

In 2012, commercial fisheries in all the four management units in Ontario waters harvested very close to their maximum total allowable catch (TAC) (YPTG 2013). For management units in U.S. waters, commercial

fisheries contributed much smaller portions toward the TAC since there are very few commercial fisheries in U.S. waters. This information on the percent harvested of TAC allocated reflects that the yellow perch fishery is not being overfished since fishermen in Ontario waters are not struggling to reach their maximum limits.

The yellow perch populations in Lake Erie do not appear to be experiencing any problems with recruitment since the TAC levels have been increasing in recent year which are based upon population predictions and recruitment rates (YPTG 2013).

Unfortunately, there is no direct evidence that suggest whether yellow perch populations in Lake Erie are either below or above reference points since reference points are not a commonly used metric in Great Lakes fisheries. For this reason, this fishery is ranked as being of 'Moderate Concern'.



Yellow Perch Historic Catch

### Factor 1.3 - Fishing Mortality

CANADA/LAKE ERIE, SET GILLNETS, CANADA  
 OHIO/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
 CANADA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA  
 PENNSYLVANIA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
 NEW YORK/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

**Very Low Concern**

Yellow Perch fisheries in Lake Erie are ranked as 'Very Low Concern' since it is highly likely that fishing mortality is at or below a sustainable level that will allow the population to maintain its current level or rebuild it depleted. Total Allowable Catch (TAC) set for yellow perch has not been exceeded.

**Justification:**

Statistical catch-at-age analysis and recruitment estimates are performed each year by the Lake Erie Perch Task Group, created by the Great Lakes Fishery Commission Lake Erie Committee. These estimates are used to determine population abundance and biomass estimates to monitor status of stocks and determining allowable harvest. The Yellow Perch Management Plan stipulates that fishing rates that are ½ of Fmsy can support viable sport and commercial fisheries without excessive biological risk. Target fishing rates then are applied to population estimates to determine recommended allowable harvest and TACs for each management unit (Lake Erie Yellow Perch Management Plan).

One-half of Fmsy is considered able to support viable sport and commercial fisheries without excessive biological risk. The results of this are used to find the min, mean, and max Recommended Allowable Harvest (RAH). The Total Allowable Catch (TAC) for each management unit which is determined by jurisdictional surface area of water.

For example: Following the 2012 year, this model estimated yellow perch abundances to decline in all management units (Lake Erie Committee 2013). 2013 Lake Erie yellow perch TAC decreased to 12.237 million pounds, a 10.3% decrease from the 2012 TAC of 13.637 million pounds (Lake Erie Committee 2013).

## **Criterion 2: Impacts on other species**

All main retained and bycatch species in the fishery are evaluated in the same way as the species under assessment were evaluated in Criterion 1. Seafood Watch® defines bycatch as all fisheries-related mortality or injury to species other than the retained catch. Examples include discards, endangered or threatened species catch, and ghost fishing.

To determine the final Criterion 2 score, the score for the lowest scoring retained/bycatch species is multiplied by the discard rate score (ranges from 0-1), which evaluates the amount of non-retained catch (discards) and bait use relative to the retained catch. The Criterion 2 rating is determined as follows:

- Score >3.2=Green or Low Concern
- Score >2.2 and ≤3.2=Yellow or Moderate Concern
- Score ≤2.2=Red or High Concern

Rating is Critical if Factor 2.3 (Fishing Mortality) is Critical

### **Criterion 2 Summary**

Only the lowest scoring main species is/are listed in the table and text in this Criterion 2 section; a full list and assessment of the main species can be found in Appendix A.

| LAKE WHITEFISH - CANADA/LAKE ERIE - SET GILLNETS - CANADA |                        |                       |                       |                |       |
|---|------------------------|-----------------------|-----------------------|----------------|-------|
| Subscore:   | 2.644                  | Discard Rate:         | 1.00                  | C2 Rate:       | 2.644 |
| Species   | Inherent Vulnerability | Abundance             | Fishing Mortality     | Subscore       |       |
| Bigmouth buffalo  | 2.00:Medium            | 3.00:Moderate Concern | 2.33:Moderate Concern | Yellow (2.644) |       |
| Channel Catfish   | 2.00:Medium            | 3.00:Moderate Concern | 2.33:Moderate Concern | Yellow (2.644) |       |
| Freshwater drum   | 2.00:Medium            | 3.00:Moderate Concern | 2.33:Moderate Concern | Yellow (2.644) |       |
| White bass  | 2.00:Medium            | 3.00:Moderate Concern | 2.33:Moderate Concern | Yellow (2.644) |       |
| Walleye   | 2.00:Medium            | 4.00:Low Concern      | 3.67:Low Concern      | Green (3.831)  |       |
| Yellow perch  | 3.00:Low               | 3.00:Moderate Concern | 5.00:Very Low Concern | Green (3.873)  |       |
| Common carp   | 2.00:Medium            | 5.00:Very Low Concern | 5.00:Very Low Concern | Green (5.000)  |       |
| White perch   | 1.00:High              | 5.00:Very Low Concern | 5.00:Very Low Concern | Green (5.000)  |       |

**LAKE WHITEFISH - MICHIGAN/LAKE ERIE - BARRIERS, FENCES, WEIRS, CORRALS, ETC. - UNITED STATES OF AMERICA**

| <b>Subscore:</b> | <b>2.644</b>                  | <b>Discard Rate:</b>  | <b>1.00</b>              | <b>C2 Rate:</b> | <b>2.644</b> |
|------------------|-------------------------------|-----------------------|--------------------------|-----------------|--------------|
| <b>Species</b>   | <b>Inherent Vulnerability</b> | <b>Abundance</b>      | <b>Fishing Mortality</b> | <b>Subscore</b> |              |
| Bigmouth buffalo | 2.00:Medium                   | 3.00:Moderate Concern | 2.33:Moderate Concern    | Yellow (2.644)  |              |
| Channel Catfish  | 2.00:Medium                   | 3.00:Moderate Concern | 2.33:Moderate Concern    | Yellow (2.644)  |              |
| Freshwater drum  | 2.00:Medium                   | 3.00:Moderate Concern | 2.33:Moderate Concern    | Yellow (2.644)  |              |
| White bass       | 2.00:Medium                   | 3.00:Moderate Concern | 2.33:Moderate Concern    | Yellow (2.644)  |              |
| Common carp      | 2.00:Medium                   | 5.00:Very Low Concern | 5.00:Very Low Concern    | Green (5.000)   |              |
| White perch      | 1.00:High                     | 5.00:Very Low Concern | 5.00:Very Low Concern    | Green (5.000)   |              |

**LAKE WHITEFISH - OHIO/LAKE ERIE - BARRIERS, FENCES, WEIRS, CORRALS, ETC. - UNITED STATES OF AMERICA**

| <b>Subscore:</b> | <b>2.644</b>                  | <b>Discard Rate:</b>  | <b>1.00</b>              | <b>C2 Rate:</b> | <b>2.644</b> |
|------------------|-------------------------------|-----------------------|--------------------------|-----------------|--------------|
| <b>Species</b>   | <b>Inherent Vulnerability</b> | <b>Abundance</b>      | <b>Fishing Mortality</b> | <b>Subscore</b> |              |
| Bigmouth buffalo | 2.00:Medium                   | 3.00:Moderate Concern | 2.33:Moderate Concern    | Yellow (2.644)  |              |
| Channel Catfish  | 2.00:Medium                   | 3.00:Moderate Concern | 2.33:Moderate Concern    | Yellow (2.644)  |              |
| Freshwater drum  | 2.00:Medium                   | 3.00:Moderate Concern | 2.33:Moderate Concern    | Yellow (2.644)  |              |
| White bass       | 2.00:Medium                   | 3.00:Moderate Concern | 2.33:Moderate Concern    | Yellow (2.644)  |              |
| Yellow perch     | 3.00:Low                      | 3.00:Moderate Concern | 5.00:Very Low Concern    | Green (3.873)   |              |
| Common carp      | 2.00:Medium                   | 5.00:Very Low Concern | 5.00:Very Low Concern    | Green (5.000)   |              |
| White perch      | 1.00:High                     | 5.00:Very Low Concern | 5.00:Very Low Concern    | Green (5.000)   |              |



**RAINBOW SMELT - CANADA/LAKE ERIE - MIDWATER TRAWLS - CANADA**

| <b>Subscore:</b> | <b>2.644</b>                  | <b>Discard Rate:</b>  | <b>1.00</b>              | <b>C2 Rate:</b> | <b>2.644</b> |
|------------------|-------------------------------|-----------------------|--------------------------|-----------------|--------------|
| <b>Species</b>   | <b>Inherent Vulnerability</b> | <b>Abundance</b>      | <b>Fishing Mortality</b> | <b>Subscore</b> |              |
| Bigmouth buffalo | 2.00:Medium                   | 3.00:Moderate Concern | 2.33:Moderate Concern    | Yellow (2.644)  |              |
| Channel Catfish  | 2.00:Medium                   | 3.00:Moderate Concern | 2.33:Moderate Concern    | Yellow (2.644)  |              |
| Freshwater drum  | 2.00:Medium                   | 3.00:Moderate Concern | 2.33:Moderate Concern    | Yellow (2.644)  |              |
| White bass       | 2.00:Medium                   | 3.00:Moderate Concern | 2.33:Moderate Concern    | Yellow (2.644)  |              |
| Common carp      | 2.00:Medium                   | 5.00:Very Low Concern | 5.00:Very Low Concern    | Green (5.000)   |              |
| White perch      | 1.00:High                     | 5.00:Very Low Concern | 5.00:Very Low Concern    | Green (5.000)   |              |

**WALLEYE - CANADA/LAKE ERIE - SET GILLNETS - CANADA**

| <b>Subscore:</b> | <b>2.159</b>                  | <b>Discard Rate:</b>  | <b>1.00</b>              | <b>C2 Rate:</b> | <b>2.159</b> |
|------------------|-------------------------------|-----------------------|--------------------------|-----------------|--------------|
| <b>Species</b>   | <b>Inherent Vulnerability</b> | <b>Abundance</b>      | <b>Fishing Mortality</b> | <b>Subscore</b> |              |
| Lake whitefish   | 2.00:Medium                   | 2.00:High Concern     | 2.33:Moderate Concern    | Red (2.159)     |              |
| Bigmouth buffalo | 2.00:Medium                   | 3.00:Moderate Concern | 2.33:Moderate Concern    | Yellow (2.644)  |              |
| Channel Catfish  | 2.00:Medium                   | 3.00:Moderate Concern | 2.33:Moderate Concern    | Yellow (2.644)  |              |
| Freshwater drum  | 2.00:Medium                   | 3.00:Moderate Concern | 2.33:Moderate Concern    | Yellow (2.644)  |              |
| White bass       | 2.00:Medium                   | 3.00:Moderate Concern | 2.33:Moderate Concern    | Yellow (2.644)  |              |
| Yellow perch     | 3.00:Low                      | 3.00:Moderate Concern | 5.00:Very Low Concern    | Green (3.873)   |              |
| Common carp      | 2.00:Medium                   | 5.00:Very Low Concern | 5.00:Very Low Concern    | Green (5.000)   |              |
| White perch      | 1.00:High                     | 5.00:Very Low Concern | 5.00:Very Low Concern    | Green (5.000)   |              |

**YELLOW PERCH - CANADA/LAKE ERIE - BARRIERS, FENCES, WEIRS, CORRALS, ETC. - CANADA**

| <b>Subscore:</b> | <b>2.644</b>                  | <b>Discard Rate:</b>  | <b>1.00</b>              | <b>C2 Rate:</b> | <b>2.644</b> |
|------------------|-------------------------------|-----------------------|--------------------------|-----------------|--------------|
| <b>Species</b>   | <b>Inherent Vulnerability</b> | <b>Abundance</b>      | <b>Fishing Mortality</b> | <b>Subscore</b> |              |
| Bigmouth buffalo | 2.00:Medium                   | 3.00:Moderate Concern | 2.33:Moderate Concern    | Yellow (2.644)  |              |
| Channel Catfish  | 2.00:Medium                   | 3.00:Moderate Concern | 2.33:Moderate Concern    | Yellow (2.644)  |              |
| Freshwater drum  | 2.00:Medium                   | 3.00:Moderate Concern | 2.33:Moderate Concern    | Yellow (2.644)  |              |
| White bass       | 2.00:Medium                   | 3.00:Moderate Concern | 2.33:Moderate Concern    | Yellow (2.644)  |              |
| Common carp      | 2.00:Medium                   | 5.00:Very Low Concern | 5.00:Very Low Concern    | Green (5.000)   |              |
| White perch      | 1.00:High                     | 5.00:Very Low Concern | 5.00:Very Low Concern    | Green (5.000)   |              |

**YELLOW PERCH - CANADA/LAKE ERIE - SET GILLNETS - CANADA**

| <b>Subscore:</b> | <b>2.159</b>                  | <b>Discard Rate:</b>  | <b>1.00</b>              | <b>C2 Rate:</b> | <b>2.159</b> |
|------------------|-------------------------------|-----------------------|--------------------------|-----------------|--------------|
| <b>Species</b>   | <b>Inherent Vulnerability</b> | <b>Abundance</b>      | <b>Fishing Mortality</b> | <b>Subscore</b> |              |
| Lake whitefish   | 2.00:Medium                   | 2.00:High Concern     | 2.33:Moderate Concern    | Red (2.159)     |              |
| Bigmouth buffalo | 2.00:Medium                   | 3.00:Moderate Concern | 2.33:Moderate Concern    | Yellow (2.644)  |              |
| Channel Catfish  | 2.00:Medium                   | 3.00:Moderate Concern | 2.33:Moderate Concern    | Yellow (2.644)  |              |
| Freshwater drum  | 2.00:Medium                   | 3.00:Moderate Concern | 2.33:Moderate Concern    | Yellow (2.644)  |              |
| White bass       | 2.00:Medium                   | 3.00:Moderate Concern | 2.33:Moderate Concern    | Yellow (2.644)  |              |
| Walleye          | 2.00:Medium                   | 4.00:Low Concern      | 3.67:Low Concern         | Green (3.831)   |              |
| Common carp      | 2.00:Medium                   | 5.00:Very Low Concern | 5.00:Very Low Concern    | Green (5.000)   |              |
| White perch      | 1.00:High                     | 5.00:Very Low Concern | 5.00:Very Low Concern    | Green (5.000)   |              |

**YELLOW PERCH - NEW YORK/LAKE ERIE - BARRIERS, FENCES, WEIRS, CORRALS, ETC. - UNITED STATES OF AMERICA**

|                              |                               |                      |                          |                 |              |
|------------------------------|-------------------------------|----------------------|--------------------------|-----------------|--------------|
| <b>Subscore:</b>             | <b>5.000</b>                  | <b>Discard Rate:</b> | <b>1.00</b>              | <b>C2 Rate:</b> | <b>5.000</b> |
| <b>Species</b>               | <b>Inherent Vulnerability</b> | <b>Abundance</b>     | <b>Fishing Mortality</b> | <b>Subscore</b> |              |
| No other main species caught |                               |                      |                          |                 |              |

**YELLOW PERCH - OHIO/LAKE ERIE - BARRIERS, FENCES, WEIRS, CORRALS, ETC. - UNITED STATES OF AMERICA**

|                  |                               |                       |                          |                 |              |
|------------------|-------------------------------|-----------------------|--------------------------|-----------------|--------------|
| <b>Subscore:</b> | <b>2.159</b>                  | <b>Discard Rate:</b>  | <b>1.00</b>              | <b>C2 Rate:</b> | <b>2.159</b> |
| <b>Species</b>   | <b>Inherent Vulnerability</b> | <b>Abundance</b>      | <b>Fishing Mortality</b> | <b>Subscore</b> |              |
| Lake whitefish   | 2.00:Medium                   | 2.00:High Concern     | 2.33:Moderate Concern    | Red (2.159)     |              |
| Bigmouth buffalo | 2.00:Medium                   | 3.00:Moderate Concern | 2.33:Moderate Concern    | Yellow (2.644)  |              |
| Channel Catfish  | 2.00:Medium                   | 3.00:Moderate Concern | 2.33:Moderate Concern    | Yellow (2.644)  |              |
| Freshwater drum  | 2.00:Medium                   | 3.00:Moderate Concern | 2.33:Moderate Concern    | Yellow (2.644)  |              |
| White bass       | 2.00:Medium                   | 3.00:Moderate Concern | 2.33:Moderate Concern    | Yellow (2.644)  |              |
| Common carp      | 2.00:Medium                   | 5.00:Very Low Concern | 5.00:Very Low Concern    | Green (5.000)   |              |
| White perch      | 1.00:High                     | 5.00:Very Low Concern | 5.00:Very Low Concern    | Green (5.000)   |              |

**YELLOW PERCH - PENNSYLVANIA/LAKE ERIE - BARRIERS, FENCES, WEIRS, CORRALS, ETC. - UNITED STATES OF AMERICA**

|                  |                               |                       |                          |                 |              |
|------------------|-------------------------------|-----------------------|--------------------------|-----------------|--------------|
| <b>Subscore:</b> | <b>2.644</b>                  | <b>Discard Rate:</b>  | <b>1.00</b>              | <b>C2 Rate:</b> | <b>2.644</b> |
| <b>Species</b>   | <b>Inherent Vulnerability</b> | <b>Abundance</b>      | <b>Fishing Mortality</b> | <b>Subscore</b> |              |
| Bigmouth buffalo | 2.00:Medium                   | 3.00:Moderate Concern | 2.33:Moderate Concern    | Yellow (2.644)  |              |
| Channel Catfish  | 2.00:Medium                   | 3.00:Moderate Concern | 2.33:Moderate Concern    | Yellow (2.644)  |              |
| Freshwater drum  | 2.00:Medium                   | 3.00:Moderate Concern | 2.33:Moderate Concern    | Yellow (2.644)  |              |
| White bass       | 2.00:Medium                   | 3.00:Moderate Concern | 2.33:Moderate Concern    | Yellow (2.644)  |              |

|             |             |                       |                       |               |
|-------------|-------------|-----------------------|-----------------------|---------------|
| Common carp | 2.00:Medium | 5.00:Very Low Concern | 5.00:Very Low Concern | Green (5.000) |
| White perch | 1.00:High   | 5.00:Very Low Concern | 5.00:Very Low Concern | Green (5.000) |

There are no bycatch species in these fisheries that are discarded dead in significant amounts. Most species harvested have commercial value (even if they are not a targeted species) and are thus kept and sold portside. The only exceptions are lake sturgeon, which are listed as threatened or endangered throughout the region, and lake trout.

Commercial fisheries in Lake Erie are not allowed to harvest lake trout, because it is in recovery. There have been no reported captures of lake trout in Lake Erie. Lake Trout that are caught are returned to the lake unharmed and not documented. Therefore, lake trout are not assessed here. Lake sturgeon landings are prohibited throughout the Great Lakes, but they are occasionally incidentally captured in gillnets. However, there is a general concensus throughout the fishery community (scientists and fishermen) that gillnets most often do not harm lake sturgeon. Fishing methods utilized in Lake Erie (gillnets and trapnets) are not believed to have significant impacts on lake sturgeon and most fish that are incidentally caught with such gears are returned to the water alive ((Threader and Broussaeu 1986),(Hayes and Caroffino 2012), Pers. comm. MDNR). The capture rates of lake sturgeon in both these fisheries are also extremely low. Therefore, the Great Lakes fisheries are deemed not to impact lake sturgeon populations, and lake sturgeon are not included in the assessment.

**Criterion 2 Assessment**

SCORING GUIDELINES

**Factor 2.1 - Inherent Vulnerability**

*(same as Factor 1.1 above)*

**Factor 2.2 - Abundance**

*(same as Factor 1.2 above)*

**Factor 2.3 - Fishing Mortality**

*(same as Factor 1.3 above)*

BIGMOUTH BUFFALO

**Factor 2.1 - Inherent Vulnerability**

CANADA/LAKE ERIE, MIDWATER TRAWLS, CANADA  
 CANADA/LAKE ERIE, SET GILLNETS, CANADA  
 MICHIGAN/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
 OHIO/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
 CANADA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA  
 PENNSYLVANIA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

**Medium**

The bigmouth buffalo, a member of the family Catostomidae, is found in slow moving waters of rivers, lakes, and streams. It is a filter-feeder that feeds on small crustacean zooplankton and migrates upstream to spawn

in the spring where females adhere eggs to aquatic plants. Bigmouth buffalo are found throughout North America ranging from Southern Canada down through the Ohio and Mississippi river basins.

The fishbase vulnerability score for bigmouth buffalo is 64 (Froese & Pauley 2012). Therefore, bigmouth buffalo inherent vulnerability is listed as "High". When assessed using the productivity calculation method from the Seafood Watch criteria, they scored 2.16 which is considered medium vulnerability to fishing. Based on life history traits, bigmouth buffalo is scored as having "Medium" inherent vulnerability, as calculated using the Seafood Watch criteria.

## Factor 2.2 - Abundance

CANADA/LAKE ERIE, MIDWATER TRAWLS, CANADA  
MICHIGAN/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
OHIO/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
PENNSYLVANIA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

### Moderate Concern

This species is not assessed in Lake Erie. There is no evidence to suggest that this stock is either above or below reference points and the inherent vulnerability score is "Medium".

Therefore, bigmouth buffalo abundance is ranked as "Modern Concern" in Lake Erie.

CANADA/LAKE ERIE, SET GILLNETS, CANADA  
CANADA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA

### Moderate Concern

This species is not assessed in Lake Erie. There is no evidence to suggest that this stock is either above or below reference points and the inherent vulnerability score is "Medium".

Therefore, bigmouth buffalo abundance is ranked as "Modern Concern" in Lake Erie.

—

## Factor 2.3 - Fishing Mortality

CANADA/LAKE ERIE, MIDWATER TRAWLS, CANADA  
CANADA/LAKE ERIE, SET GILLNETS, CANADA  
MICHIGAN/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
OHIO/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
CANADA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA  
PENNSYLVANIA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

### Moderate Concern

Bigmouth Buffalo in Lake Erie are not assessed as a species, so it is unknown whether fishing mortality is at a sustainable level. There is no set quota for bigmouth buffalo. The overall harvest reported of bigmouth buffalo is a small percentage of overall commercial harvest in the lake. They comprise about 5% of the total Lake Erie commercial harvest in 2012. It is thought that eutrophication of Lake Erie has led to this species becoming more abundant which has led to its harvest rate increasing.

Bigmouth Buffalo in Lake Erie are given a fishing mortality score of "Moderate" because this species is not assessed and it is unknown whether fishing mortality is at a sustainable level.

## Factor 2.4 - Discard Rate

CANADA/LAKE ERIE, MIDWATER TRAWLS, CANADA

< 20%

Discard rates for all fisheries in Lake Erie are estimated to be less than 20%.

### Justification:

Discard data is not well documented for the fisheries in Lake Erie. However, discards from trawls in Canadian water appear to be low since most fish caught can be subsequently sold. Trawls not appear to afflict any one species in a particular adverse way.

Species of concern in Lake Erie that could be impacted by trawls are Lake Sturgeons and Lake Trout. There is a general consensus throughout the fishery community (scientists and fishermen) that trawls most often do not harm lake sturgeon since they are able to out swim trawls. Lake sturgeon are released alive and unharmed following capture in a trawl.

Lake trout are considered a cool-water species and inhabit deep waters of Lake Erie. Commercial fisheries targetting rainbow smelt using trawls in Ontario waters are not collecting fish in areas where lake trout are likely to be found. There are no reported lake trout taken in this rainbow smelt trawl fishery. Therefore, it is thought that the bycatch of lake trout is extremely low for this particular fishery.

In 2012, there were no reported lake trout or lake sturgeon caught by commercial fisheries in Canadian waters of Lake Erie (OMNR 2013).

CANADA/LAKE ERIE, SET GILLNETS, CANADA

< 20%

Discard rates for fisheries in Lake Erie are all estimated to be less than 20%.

### Justification:

Discard data is not well documented for the fisheries in Lake Erie. However, discards from gillnets in Canadian water appear to be low since most fish caught can be subsequently sold. Gillnets not appear to afflict any one species in a particularly adverse way.

Species of concern in Lake Erie that could be impacted by gillnets are Lake Sturgeons and Lake Trout. There is a general consensus throughout the fishery community (scientists and fishermen) that gillnets most often do not harm lake sturgeon. Lake sturgeon are released alive and unharmed following capture in a gillnet. In 2012, there were no reported lake trout or lake sturgeon caught by commercial fisheries (OMNR 2013).

MICHIGAN/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
OHIO/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
PENNSYLVANIA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

< 20%

The discard rate for all fisheries in Lake Erie is estimated to be less than 20%.

### Justification:

In US waters of Lake Erie (Michigan, Ohio, Pennsylvania, and New York), trap nets are the only gear type used by commercial fisheries since gillnets have been prohibited in US waters since the late 1980s. In 2012, Michigan and New York both had only three active commercial fishing licenses for the waters of Lake Erie. (The data on active commercial fishing licenses for Ohio and Pennsylvania could not be easily found.)

Unfortunately, discard data is not well documented for the fisheries in Lake Erie. However, discards from trap nets appear to be low since most fish caught can be subsequently sold and those not targeted are released unharmed. The 2012 harvest list includes: common carp, buffalo, freshwater drum, channel catfish, white bass, quillback, yellow perch, and gizzard shad (MI DNR 2013). Most of the species in that list are not ideal commercial species but this list illustrates that bycatch is very low due to the fact that non-target species are able to be sold at market.

Species of concern in Lake Erie that could be impacted by trap nets are Lake Sturgeon and Lake Trout. There is a general consensus throughout the fishery community (scientists and fishermen) that trap nets most often do not harm Lake Sturgeon. Lake Sturgeon are released alive and unharmed following capture in a trap net. In 2012, there were no reported Lake Sturgeon or Lake Trout caught by commercial fisheries (OMNR 2013).

Trap nets do not appear to afflict any one species in a particular adverse way.

In 2012, there were no reported lake trout or lake sturgeon caught by commercial fisheries (OMNR 2013).

#### CANADA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA

**< 20%**

Discard rates for fisheries in Lake Erie are all estimated to be less than 20%.

#### **Justification:**

Discard data is not well documented for the fisheries in Lake Erie. However, discards from trapnets appear to be low since most fish caught can be subsequently sold and those unable to be sold are returned alive to the lake. Trapnets not appear to afflict any one species in a particular adverse way.

Species of concern in Lake Erie that could be impacted by trapnets are Lake Sturgeons and Lake Trout. There is a general concensus throughout the fishery community (scientists and fishermen) that trap nets most often do not harm lake sturgeon. Lake sturgeon are released alive and unharmed following capture in a trap net.

In 2012, there were no reported lake trout or lake sturgeon caught by commercial fisheries (OMNR 2013).

### CHANNEL CATFISH

#### **Factor 2.1 - Inherent Vulnerability**

CANADA/LAKE ERIE, MIDWATER TRAWLS, CANADA

CANADA/LAKE ERIE, SET GILLNETS, CANADA

MICHIGAN/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

OHIO/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

CANADA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA

PENNSYLVANIA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

#### **Medium**

The channel catfish, a member of the family Ictaluridae, inhabits rivers, streams, and lakes throughout North

America, including Canada, Mexico, and the United States. They feed on smaller fish, aquatic insects, clams, small crustaceans, and sometimes small mammals.

The fishbase vulnerability score for channel catfish is 72 (Froese & Pauley 2012). When assessed using the productivity calculation method from the Seafood Watch criteria, channel catfish scored 2.25 which is considered medium vulnerability to fishing. Based on channel catfish life history traits, it is scored as having "Medium" inherent vulnerability, as calculated using the Seafood Watch criteria.

## Factor 2.2 - Abundance

CANADA/LAKE ERIE, MIDWATER TRAWLS, CANADA  
CANADA/LAKE ERIE, SET GILLNETS, CANADA  
MICHIGAN/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
OHIO/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
CANADA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA  
PENNSYLVANIA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

### Moderate Concern

This species is not assessed in Lake Erie. There is no evidence to suggest that this stock is either above or below reference points and the inherent vulnerability score is "Medium".

Therefore, channel catfish abundance is ranked as "Modern Concern" in Lake Erie.

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## Factor 2.3 - Fishing Mortality

CANADA/LAKE ERIE, MIDWATER TRAWLS, CANADA  
CANADA/LAKE ERIE, SET GILLNETS, CANADA  
MICHIGAN/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
OHIO/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
CANADA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA  
PENNSYLVANIA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

### Moderate Concern

Channel Catfish in Lake Erie are not assessed as a species, so it is unknown whether fishing mortality is at a sustainable level. There is no set quota for channel catfish. The overall harvest reported of channel catfish is a small percentage of overall commercial harvest in the lake. They comprise about 6% of the total Lake Erie commercial harvest in 2012. It is thought that eutrophication of Lake Erie has led to this species becoming more abundant which has led to its harvest rate increasing.

Channel catfish in Lake Erie are given a fishing mortality score of "Moderate" because this species is not assessed and it is unknown whether fishing mortality is at a sustainable level.

## Factor 2.4 - Discard Rate

CANADA/LAKE ERIE, MIDWATER TRAWLS, CANADA

< 20%



Discard rates for all fisheries in Lake Erie are estimated to be less than 20%.

**Justification:**

Discard data is not well documented for the fisheries in Lake Erie. However, discards from trawls in Canadian water appear to be low since most fish caught can be subsequently sold. Trawls not appear to afflict any one species in a particular adverse way.

Species of concern in Lake Erie that could be impacted by trawls are Lake Sturgeons and Lake Trout. There is a general consensus throughout the fishery community (scientists and fishermen) that trawls most often do not harm lake sturgeon since they are able to out swim trawls. Lake sturgeon are released alive and unharmed following capture in a trawl.

Lake trout are considered a cool-water species and inhabit deep waters of Lake Erie. Commercial fisheries targeting rainbow smelt using trawls in Ontario waters are not collecting fish in areas where lake trout are likely to be found. There are no reported lake trout taken in this rainbow smelt trawl fishery. Therefore, it is thought that the bycatch of lake trout is extremely low for this particular fishery.

In 2012, there were no reported lake trout or lake sturgeon caught by commercial fisheries in Canadian waters of Lake Erie (OMNR 2013).

CANADA/LAKE ERIE, SET GILLNETS, CANADA

**< 20%**

Discard rates for fisheries in Lake Erie are all estimated to be less than 20%.

**Justification:**

Discard data is not well documented for the fisheries in Lake Erie. However, discards from gillnets in Canadian water appear to be low since most fish caught can be subsequently sold. Gillnets not appear to afflict any one species in a particularly adverse way.

Species of concern in Lake Erie that could be impacted by gillnets are Lake Sturgeons and Lake Trout. There is a general consensus throughout the fishery community (scientists and fishermen) that gillnets most often do not harm lake sturgeon. Lake sturgeon are released alive and unharmed following capture in a gillnet. In 2012, there were no reported lake trout or lake sturgeon caught by commercial fisheries (OMNR 2013).

MICHIGAN/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
OHIO/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
PENNSYLVANIA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

**< 20%**

The discard rate for all fisheries in Lake Erie is estimated to be less than 20%.

**Justification:**

In US waters of Lake Erie (Michigan, Ohio, Pennsylvania, and New York), trap nets are the only gear type used by commercial fisheries since gillnets have been prohibited in US waters since the late 1980s. In 2012, Michigan and New York both had only three active commercial fishing licenses for the waters of Lake Erie. (The data on active commercial fishing licenses for Ohio and Pennsylvania could not be easily found.)

Unfortunately, discard data is not well documented for the fisheries in Lake Erie. However, discards from trap nets appear to be low since most fish caught can be subsequently sold and those not targeted are released

unharmed. The 2012 harvest list includes: common carp, buffalo, freshwater drum, channel catfish, white bass, quillback, yellow perch, and gizzard shad (MI DNR 2013). Most of the species in that list are not ideal commercial species but this list illustrates that bycatch is very low due to the fact that non-target species are able to be sold at market.

Species of concern in Lake Erie that could be impacted by trap nets are Lake Sturgeon and Lake Trout. There is a general consensus throughout the fishery community (scientists and fishermen) that trap nets most often do not harm Lake Sturgeon. Lake Sturgeon are released alive and unharmed following capture in a trap net. In 2012, there were no reported Lake Sturgeon or Lake Trout caught by commercial fisheries (OMNR 2013).

Trap nets do not appear to afflict any one species in a particular adverse way.

In 2012, there were no reported lake trout or lake sturgeon caught by commercial fisheries (OMNR 2013).

#### CANADA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA

**< 20%**

Discard rates for fisheries in Lake Erie are all estimated to be less than 20%.

#### **Justification:**

Discard data is not well documented for the fisheries in Lake Erie. However, discards from trapnets appear to be low since most fish caught can be subsequently sold and those unable to be sold are returned alive to the lake. Trapnets not appear to afflict any one species in a particular adverse way.

Species of concern in Lake Erie that could be impacted by trapnets are Lake Sturgeons and Lake Trout. There is a general concensus throughout the fishery community (scientists and fishermen) that trap nets most often do not harm lake sturgeon. Lake sturgeon are released alive and unharmed following capture in a trap net.

In 2012, there were no reported lake trout or lake sturgeon caught by commercial fisheries (OMNR 2013).

### FRESHWATER DRUM

#### **Factor 2.1 - Inherent Vulnerability**

CANADA/LAKE ERIE, MIDWATER TRAWLS, CANADA

CANADA/LAKE ERIE, SET GILLNETS, CANADA

MICHIGAN/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

OHIO/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

CANADA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA

PENNSYLVANIA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

#### **Medium**

The freshwater drum, a member of the family Sciaenidae, inhabits waters with clean sand and gravel substrates. They move into shallow waters during the summer and spawn for a seven week period through June and July. Sexual maturity is reached around four years of age for males and five or six for females.

The fishbase vulnerability score for freshwater drum is 37 (Froese & Pauley 2012). Therefore, freshwater drum inherent vulnerability is listed as "Medium".

#### **Factor 2.2 - Abundance**

CANADA/LAKE ERIE, MIDWATER TRAWLS, CANADA  
CANADA/LAKE ERIE, SET GILLNETS, CANADA  
MICHIGAN/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
OHIO/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
CANADA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA  
PENNSYLVANIA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

### **Moderate Concern**

This species is not assessed in Lake Erie. There is no evidence to suggest that this stock is either above or below reference points and the inherent vulnerability score is "Medium".

Therefore, freshwater drum abundance is ranked as "Modern Concern" in Lake Erie.

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## **Factor 2.3 - Fishing Mortality**

CANADA/LAKE ERIE, MIDWATER TRAWLS, CANADA  
CANADA/LAKE ERIE, SET GILLNETS, CANADA  
MICHIGAN/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
OHIO/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
CANADA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA  
PENNSYLVANIA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

### **Moderate Concern**

Freshwater drum in Lake Erie are not assessed as a species, so it is unknown whether fishing mortality is at a sustainable level. There is no set quota for freshwater drum. The overall harvest reported of freshwater drum is a small percentage of overall commercial harvest in the lake. They comprise about 8% of the total Lake Erie commercial harvest in 2012.

Freshwater drum in Lake Erie are given a fishing mortality score of "Moderate" because this species is not assessed and it is unknown whether fishing mortality is at a sustainable level.

## **Factor 2.4 - Discard Rate**

CANADA/LAKE ERIE, MIDWATER TRAWLS, CANADA

**< 20%**

Discard rates for all fisheries in Lake Erie are estimated to be less than 20%.

### **Justification:**

Discard data is not well documented for the fisheries in Lake Erie. However, discards from trawls in Canadian water appear to be low since most fish caught can be subsequently sold. Trawls not appear to afflict any one species in a particular adverse way.

Species of concern in Lake Erie that could be impacted by trawls are Lake Sturgeons and Lake Trout. There is a general consensus throughout the fishery community (scientists and fishermen) that trawls most often do not harm lake sturgeon since they are able to out swim trawls. Lake sturgeon are released alive and unharmed following capture in a trawl.

Lake trout are considered a cool-water species and inhabit deep waters of Lake Erie. Commercial fisheries targetting rainbow smelt using trawls in Ontario waters are not collecting fish in areas where lake trout are likely to be found. There are no reported lake trout taken in this rainbow smelt trawl fishery. Therefore, it is thought that the bycatch of lake trout is extremely low for this particular fishery.

In 2012, there were no reported lake trout or lake sturgeon caught by commercial fisheries in Canadian waters of Lake Erie (OMNR 2013).

#### CANADA/LAKE ERIE, SET GILLNETS, CANADA

##### < 20%

Discard rates for fisheries in Lake Erie are all estimated to be less than 20%.

##### **Justification:**

Discard data is not well documented for the fisheries in Lake Erie. However, discards from gillnets in Canadian water appear to be low since most fish caught can be subsequently sold. Gillnets not appear to afflict any one species in a particularly adverse way.

Species of concern in Lake Erie that could be impacted by gillnets are Lake Sturgeons and Lake Trout. There is a general concensus throughout the fishery community (scientists and fishermen) that gillnets most often do not harm lake sturgeon. Lake sturgeon are released alive and unharmed following capture in a gillnet. In 2012, there were no reported lake trout or lake sturgeon caught by commercial fisheries (OMNR 2013).

#### MICHIGAN/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA OHIO/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA PENNSYLVANIA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

##### < 20%

The discard rate for all fisheries in Lake Erie is estimated to be less than 20%.

##### **Justification:**

In US waters of Lake Erie (Michigan, Ohio, Pennsylvania, and New York), trap nets are the only gear type used by commercial fisheries since gillnets have been prohibited in US waters since the late 1980s. In 2012, Michigan and New York both had only three active commercial fishing licenses for the waters of Lake Erie. (The data on active commercial fishing licenses for Ohio and Pennsylvania could not be easily found.)

Unfortunately, discard data is not well documented for the fisheries in Lake Erie. However, discards from trap nets appear to be low since most fish caught can be subsequently sold and those not targeted are released unharmed. The 2012 harvest list includes: common carp, buffalo, freshwater drum, channel catfish, white bass, quillback, yellow perch, and gizzard shad (MI DNR 2013). Most of the species in that list are not ideal commercial species but this list illustrates that bycatch is very low due to the fact that non-target species are able to be sold at market.

Species of concern in Lake Erie that could be impacted by trap nets are Lake Sturgeon and Lake Trout. There is a general consensus throughout the fishery community (scientists and fishermen) that trap nets most often do not harm Lake Sturgeon. Lake Sturgeon are released alive and unharmed following capture in a trap net. In 2012, there were no reported Lake Sturgeon or Lake Trout caught by commercial fisheries (OMNR 2013).

Trap nets do not appear to afflict any one species in a particular adverse way.

In 2012, there were no reported lake trout or lake sturgeon caught by commercial fisheries (OMNR 2013).

CANADA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA

**< 20%**

Discard rates for fisheries in Lake Erie are all estimated to be less than 20%.

**Justification:**

Discard data is not well documented for the fisheries in Lake Erie. However, discards from trapnets appear to be low since most fish caught can be subsequently sold and those unable to be sold are returned alive to the lake. Trapnets not appear to afflict any one species in a particular adverse way.

Species of concern in Lake Erie that could be impacted by trapnets are Lake Sturgeons and Lake Trout. There is a general concensus throughout the fishery community (scientists and fishermen) that trap nets most often do not harm lake sturgeon. Lake sturgeon are released alive and unharmed following capture in a trap net.

In 2012, there were no reported lake trout or lake sturgeon caught by commercial fisheries (OMNR 2013).

**WHITE BASS**

**Factor 2.1 - Inherent Vulnerability**

CANADA/LAKE ERIE, MIDWATER TRAWLS, CANADA

CANADA/LAKE ERIE, SET GILLNETS, CANADA

MICHIGAN/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

OHIO/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

CANADA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA

PENNSYLVANIA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

**Medium**

The white bass, a member of the family Moronidae, is native to the Great Lakes and is common in other large reservoirs and rivers in the Great Lakes basin. To reproduce, they find their home spawning ground, which can range from a small tributary to lake shores that experience wind current. Adult white bass are piscivores eating other small fish.

The fishbase vulnerability score for white bass is 42 (Froese & Pauley 2012). Therefore, white bass inherent vulnerability is listed as "medium".

**Factor 2.2 - Abundance**

CANADA/LAKE ERIE, MIDWATER TRAWLS, CANADA

CANADA/LAKE ERIE, SET GILLNETS, CANADA

MICHIGAN/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

OHIO/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

CANADA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA

PENNSYLVANIA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

**Moderate Concern**

This species is not assessed in Lake Erie. There is no evidence to suggest that this stock is either above or below reference points and the inherent vulnerability score is "Medium".

Therefore, white bass abundance is ranked as "Modern Concern" in Lake Erie.

### Factor 2.3 - Fishing Mortality

CANADA/LAKE ERIE, MIDWATER TRAWLS, CANADA  
CANADA/LAKE ERIE, SET GILLNETS, CANADA  
MICHIGAN/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
OHIO/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
CANADA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA  
PENNSYLVANIA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

#### Moderate Concern

White Bass in Lake Erie are not assessed as a species, so it is unknown whether fishing mortality is at a sustainable level. There is no set quota for white bass. The overall harvest reported of white bass is a small percentage of overall commercial harvest in the lake. They comprise about 10% of the total Lake Erie commercial harvest in 2012.

White bass in Lake Erie are given a fishing mortality score of "Moderate" because this species is not assessed and it is unknown whether fishing mortality is at a sustainable level.

### Factor 2.4 - Discard Rate

CANADA/LAKE ERIE, MIDWATER TRAWLS, CANADA

< 20%

Discard rates for all fisheries in Lake Erie are estimated to be less than 20%.

#### Justification:

Discard data is not well documented for the fisheries in Lake Erie. However, discards from trawls in Canadian water appear to be low since most fish caught can be subsequently sold. Trawls not appear to afflict any one species in a particular adverse way.

Species of concern in Lake Erie that could be impacted by trawls are Lake Sturgeons and Lake Trout. There is a general consensus throughout the fishery community (scientists and fishermen) that trawls most often do not harm lake sturgeon since they are able to out swim trawls. Lake sturgeon are released alive and unharmed following capture in a trawl.

Lake trout are considered a cool-water species and inhabit deep waters of Lake Erie. Commercial fisheries targeting rainbow smelt using trawls in Ontario waters are not collecting fish in areas where lake trout are likely to be found. There are no reported lake trout taken in this rainbow smelt trawl fishery. Therefore, it is thought that the bycatch of lake trout is extremely low for this particular fishery.

In 2012, there were no reported lake trout or lake sturgeon caught by commercial fisheries in Canadian waters of Lake Erie (OMNR 2013).

CANADA/LAKE ERIE, SET GILLNETS, CANADA

< 20%

Discard rates for fisheries in Lake Erie are all estimated to be less than 20%.

**Justification:**

Discard data is not well documented for the fisheries in Lake Erie. However, discards from gillnets in Canadian water appear to be low since most fish caught can be subsequently sold. Gillnets not appear to afflict any one species in a particularly adverse way.

Species of concern in Lake Erie that could be impacted by gillnets are Lake Sturgeons and Lake Trout. There is a general consensus throughout the fishery community (scientists and fishermen) that gillnets most often do not harm lake sturgeon. Lake sturgeon are released alive and unharmed following capture in a gillnet. In 2012, there were no reported lake trout or lake sturgeon caught by commercial fisheries (OMNR 2013).

MICHIGAN/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
OHIO/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
PENNSYLVANIA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

**< 20%**

The discard rate for all fisheries in Lake Erie is estimated to be less than 20%.

**Justification:**

In US waters of Lake Erie (Michigan, Ohio, Pennsylvania, and New York), trap nets are the only gear type used by commercial fisheries since gillnets have been prohibited in US waters since the late 1980s. In 2012, Michigan and New York both had only three active commercial fishing licenses for the waters of Lake Erie. (The data on active commercial fishing licenses for Ohio and Pennsylvania could not be easily found.)

Unfortunately, discard data is not well documented for the fisheries in Lake Erie. However, discards from trap nets appear to be low since most fish caught can be subsequently sold and those not targeted are released unharmed. The 2012 harvest list includes: common carp, buffalo, freshwater drum, channel catfish, white bass, quillback, yellow perch, and gizzard shad (MI DNR 2013). Most of the species in that list are not ideal commercial species but this list illustrates that bycatch is very low due to the fact that non-target species are able to be sold at market.

Species of concern in Lake Erie that could be impacted by trap nets are Lake Sturgeon and Lake Trout. There is a general consensus throughout the fishery community (scientists and fishermen) that trap nets most often do not harm Lake Sturgeon. Lake Sturgeon are released alive and unharmed following capture in a trap net. In 2012, there were no reported Lake Sturgeon or Lake Trout caught by commercial fisheries (OMNR 2013).

Trap nets do not appear to afflict any one species in a particular adverse way.

In 2012, there were no reported lake trout or lake sturgeon caught by commercial fisheries (OMNR 2013).

CANADA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA

**< 20%**

Discard rates for fisheries in Lake Erie are all estimated to be less than 20%.

**Justification:**

Discard data is not well documented for the fisheries in Lake Erie. However, discards from trapnets appear to be low since most fish caught can be subsequently sold and those unable to be sold are returned alive to the lake. Trapnets not appear to afflict any one species in a particular adverse way.

Species of concern in Lake Erie that could be impacted by trapnets are Lake Sturgeons and Lake Trout. There

is a general consensus throughout the fishery community (scientists and fishermen) that trap nets most often do not harm lake sturgeon. Lake sturgeon are released alive and unharmed following capture in a trap net.

In 2012, there were no reported lake trout or lake sturgeon caught by commercial fisheries (OMNR 2013).



## **Criterion 3: Management Effectiveness**

*Management is separated into management of retained species (harvest strategy) and management of non-retained species (bycatch strategy).*

*The final score for this criterion is the geometric mean of the two scores. The Criterion 3 rating is determined as follows:*

- *Score >3.2=Green or Low Concern*
- *Score >2.2 and ≤3.2=Yellow or Moderate Concern*
- *Score ≤2.2 or either the Harvest Strategy (Factor 3.1) or Bycatch Management Strategy (Factor 3.2) is Very High Concern = Red or High Concern*

*Rating is Critical if either or both of Harvest Strategy (Factor 3.1) and Bycatch Management Strategy (Factor 3.2) ratings are Critical.*

### **Criterion 3 Summary**

| <b>Region / Method</b>   | <b>Harvest Strategy</b> | <b>Bycatch Strategy</b> | <b>Score</b>   |
|--|-------------------------|-------------------------|----------------|
| Canada / Lake Erie / Midwater trawls / Canada  | 3.000                   | 0.000                   | Yellow (3.000) |
| Canada / Lake Erie / Barriers, fences, weirs, corrals, etc. / Canada                         | 3.000                   | 0.000                   | Yellow (3.000) |
| Canada / Lake Erie / Set gillnets / Canada   | 3.000                   | 0.000                   | Yellow (3.000) |
| Michigan / Lake Erie / Barriers, fences, weirs, corrals, etc. / United States of America     | 3.000                   | 0.000                   | Yellow (3.000) |
| New York / Lake Erie / Barriers, fences, weirs, corrals, etc. / United States of America     | 3.000                   | 0.000                   | Yellow (3.000) |
| Ohio / Lake Erie / Barriers, fences, weirs, corrals, etc. / United States of America         | 3.000                   | 0.000                   | Yellow (3.000) |
| Pennsylvania / Lake Erie / Barriers, fences, weirs, corrals, etc. / United States of America | 3.000                   | 0.000                   | Yellow (3.000) |

### **Criterion 3 Assessment**

#### **SCORING GUIDELINES**

#### **Factor 3.1 - Harvest Strategy**

*Seven subfactors are evaluated: Management Strategy, Recovery of Species of Concern, Scientific Research/Monitoring, Following of Scientific Advice, Enforcement of Regulations, Management Track Record, and Inclusion of Stakeholders. Each is rated as 'ineffective,' 'moderately effective,' or 'highly effective.'*

- *5 (Very Low Concern)—Rated as 'highly effective' for all seven subfactors considered*
- *4 (Low Concern)—Management Strategy and Recovery of Species of Concern rated 'highly effective' and all*

other subfactors rated at least 'moderately effective.'

- 3 (Moderate Concern)—All subfactors rated at least 'moderately effective.'
- 2 (High Concern)—At minimum, meets standards for 'moderately effective' for Management Strategy and Recovery of Species of Concern, but at least one other subfactor rated 'ineffective.'
- 1 (Very High Concern)—Management exists, but Management Strategy and/or Recovery of Species of Concern rated 'ineffective.'
- 0 (Critical)—No management exists when there is a clear need for management (i.e., fishery catches threatened, endangered, or high concern species), OR there is a high level of Illegal, unregulated, and unreported fishing occurring.

### Factor 3.1 Summary

| FACTOR 3.1 - MANAGEMENT OF FISHING IMPACTS ON RETAINED SPECIES                               |                      |                      |                  |                  |                  |                      |                  |
|--|----------------------|----------------------|------------------|------------------|------------------|----------------------|------------------|
| Region / Method  | Strategy             | Recovery             | Research         | Advice           | Enforce          | Track                | Inclusion        |
| Canada / Lake Erie / Midwater trawls / Canada  | Moderately Effective | Moderately Effective | Highly Effective | Highly Effective | Highly Effective | Moderately Effective | Highly Effective |
| Canada / Lake Erie / Barriers, fences, weirs, corrals, etc. / Canada                         | Moderately Effective | Moderately Effective | Highly Effective | Highly Effective | Highly Effective | Moderately Effective | Highly Effective |
| Canada / Lake Erie / Set gillnets / Canada   | Moderately Effective | Moderately Effective | Highly Effective | Highly Effective | Highly Effective | Moderately Effective | Highly Effective |
| Michigan / Lake Erie / Barriers, fences, weirs, corrals, etc. / United States of America     | Moderately Effective | Moderately Effective | Highly Effective | Highly Effective | Highly Effective | Moderately Effective | Highly Effective |
| New York / Lake Erie / Barriers, fences, weirs, corrals, etc. / United States of America     | Moderately Effective | Moderately Effective | Highly Effective | Highly Effective | Highly Effective | Moderately Effective | Highly Effective |
| Ohio / Lake Erie / Barriers, fences, weirs, corrals, etc. / United States of America         | Moderately Effective | Moderately Effective | Highly Effective | Highly Effective | Highly Effective | Moderately Effective | Highly Effective |
| Pennsylvania / Lake Erie / Barriers, fences, weirs, corrals, etc. / United States of America | Moderately Effective | Moderately Effective | Highly Effective | Highly Effective | Highly Effective | Moderately Effective | Highly Effective |

#### Subfactor 3.1.1 – Management Strategy and Implementation

*Considerations: What type of management measures are in place? Are there appropriate management goals, and is there evidence that management goals are being met? To achieve a highly effective rating, there must be appropriate management goals, and evidence that the measures in place have been successful at maintaining/rebuilding species.*

CANADA / LAKE ERIE, MIDWATER TRAWLS, CANADA

CANADA / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA

CANADA / LAKE ERIE, SET GILLNETS, CANADA

MICHIGAN / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

NEW YORK / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

OHIO / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

PENNSYLVANIA / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

### **Moderately Effective**

The Great Lakes span jurisdictions in two countries, several states, one province, and a number of tribal lands, thus management of the shared fishery resources is complex and dynamic. The main coordinating body of fishery management in the region is the Great Lakes Fishery Commission (GLFC), an inter-jurisdictional agency established in 1954 by the governments of the US and Canada (Beamish 2001). The Commission consists of four Canadian and four American commissioners, who are appointed by their respective governments and supported by a secretariat in Ann Arbor, Michigan. Within the Great Lakes Fishery Commission, each lake has a Lake Committee that undertakes research and makes recommendations on sea lamprey control (the original motivation for the Commission), lake trout rehabilitation, stocking events, and other lake-specific management actions for each of the Great Lakes. Lake Committees are comprised of members of the actual management bodies for each lake. The GLFC and the Lake Committees do not manage the lakes, but rather serve as a platform to help bring together the multiple management agencies involved in the Great Lakes fisheries to better coordinate research, enforcement, stocking, quotas, and other management issues.

Tribe-licensed fisheries in the Great Lakes are managed by two management agencies: the Chippewa-Ottawa Resource Authority (CORA) and the Great Lakes Indian Fish and Wildlife Commission (GLIFWC). In 1976 the Michigan Supreme Court reaffirmed that treaties signed in 1836 and 1855 reserved some tribal fishing rights outside state regulation. This finding led to the 1985 Consent Order and the 2000 Consent Decree, now in effect. The Consent Decree establishes biological monitoring and law enforcement within CORA-managed tribal fisheries, with an Executive Council and Technical Fishery Committee comprising state, tribal, and federal biologists. Since the 2000 Consent Decree, these fisheries are managed on a species-specific rather than region-specific basis, with emphasis on restoring lake trout communities (CORA 2007)(GLIFWC 2007). There are no tribal fisheries in Lake Erie.

Lake Erie management agencies include the Michigan Department of Natural Resources, the Ohio Department of Natural Resources, the Pennsylvania Fish and Boat Commission, the Department of Environmental Conservation in New York, the Ontario Ministry of Natural Resources, the United States Coast Guard, the U.S. Fish and Wildlife, and the U.S. Geological Survey. Some fish stock surveys and water quality monitoring in the Great Lakes region are undertaken by the US Geological Service's Great Lakes Science Center, NOAA's Great Lakes Environmental Research Laboratory (GLERL), and the US Environmental Protection Agency (EPA). Furthermore, fisheries independent research conducted by local agencies and universities are also undertaken.

Stock assessments are conducted by the federal, state, and provincial agencies involved in fisheries research and management within each lake. For example, these include bottom monofilament gillnet assessments to look at the production and relative abundance of yearlings, bottom trawls to estimate age-2 recruits, surveys of recreational anglers, and sampling from commercial fishery harvests to determine age and condition of individual fish. Overall, Lake Erie conducts yearly surveys to estimate the population size projections for that year and the following year. Daily catch reports, annual catch per unit effort, annual harvest trends, and stock condition trends (length to weight ratios, size at maturity, and size at harvest) are all monitored and evaluated by these survey methods, and shared with Lake Technical Committees. The Lake Erie Committee uses the

information from these assessments to propose changes to yearly quotas, which are ultimately set and agreed on by Lake Erie's management agencies.

For these listed reasons, the management strategy and implementation for Lake Erie is ranked as "Moderately Effective".

### **Subfactor 3.1.2 – Recovery of Species of Concern**

*Considerations: When needed, are recovery strategies/management measures in place to rebuild overfished/threatened/ endangered species or to limit fishery's impact on these species and what is their likelihood of success? To achieve a rating of Highly Effective, rebuilding strategies that have a high likelihood of success in an appropriate timeframe must be in place when needed, as well as measures to minimize mortality for any overfished/threatened/endangered species.*

CANADA / LAKE ERIE, MIDWATER TRAWLS, CANADA

CANADA / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA

CANADA / LAKE ERIE, SET GILLNETS, CANADA

MICHIGAN / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

NEW YORK / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

OHIO / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

PENNSYLVANIA / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

#### **Moderately Effective**

The Lake Erie fish community has had many alterations in the past few decades. Loss of native species, invasion of exotic species, and loss/reduction of important predators have dramatically shifted the food web. Lake Trout (*salvelinus namaycush*), sauger (*Stizostedion canadense*), blue pike (*Stizostedion vitreum glaucum*), lake herring (*Coregonus artedii*), lake whitefish (*Coregonus clupeaformis*), and lake sturgeon (*Acipenser fulvescens*) are among the native fish species that have experienced either complete extirpation or significantly reduced numbers from Lake Erie (Ryan et al. 2003).

The Lake Erie Committee has established Fish Community Objectives for all relevant fish stocks that are currently harvested as target or incidental catch in Lake Erie (Markham et al. 2008), (Ryan et al. 2003). These objectives define target yields and conditions for each species that are believed to represent restored stocks capable of sustaining desired annual harvest demands and/or allowing fish community structures to return to pre-collapse levels (Ryan et al. 2003).

Efforts to facilitate recovery of fish stocks have included: the prohibition of gillnet use by US fishermen, changes in mesh size, placement, and effort of gillnets used by tribal and Canadian fishermen, gradual shift to less lethal trapnets, restriction on the take of lake trout throughout including prohibited harvest of lake trout by US Fishermen (Ryan et al. 2003), (Markham et al. 2008), (personal comm. DNR, OMNR). While strong efforts have been made to facilitate recovery of fish populations, the chronic infusion of invasive species has in some cases swamped management efforts, thus potentially hampering rehabilitation efforts.

Lake Whitefish are currently depleted in Lake Erie and have been since the substantial population declines experienced in the middle of the 19th century by most Lake Erie fisheries. Nutrient abatement and sea lamprey controls put into place in the 1970s have showed some amounts of success. However, Lake Whitefish are still considered depleted due to little evidence of year-of-young or yearling recruitment (CWTG 2013). It has been suggested that the carrying capacity for Lake Whitefish has been lowered due to the introduction of invasive dreissenid mussels that removed Lake Whitefish's primary prey, *Diporeia* spp (Ebener et al. 2008). Fishery managers have already had conservative harvest management strategies in place for Lake Whitefish (Ebener et al. 2008). Unfortunately, the introduced invasive dreissenid mussels have only spread since their

first introduction and have drastically altered the ecosystem throughout all the Great Lakes, especially in Lake Erie since the lake is shallow and very productive. Since it is not completely known what is restricting Lake Whitefish recruitment, there is not a firm timeline for rebuilding this fishery.

Recovery of species of concern is "Moderately Effective" because there are measures in place to recover depleted species, but the likelihood of these succeeding in a reasonable timeframe is uncertain.

### **Subfactor 3.1.3 – Scientific Research and Monitoring**

*Considerations: How much and what types of data are collected to evaluate the health of the population and the fishery's impact on the species? To achieve a Highly Effective rating, population assessments must be conducted regularly and they must be robust enough to reliably determine the population status.*

CANADA / LAKE ERIE, MIDWATER TRAWLS, CANADA

CANADA / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA

CANADA / LAKE ERIE, SET GILLNETS, CANADA

MICHIGAN / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

NEW YORK / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

OHIO / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

PENNSYLVANIA / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

#### **Highly Effective**

There is a high level of scientific research and monitoring that occurs throughout the Lake Erie basin. Such activities include regular stock assessments and discussion of gear modifications and impact (Ryan et al. 2003). Much of this work is carried out by the various state and provincial agencies that make up the Lake Erie Standing Technical Committee, which provides the Lake Erie Committee with technical information, management alternatives, and biological guidelines used in making fishery management decisions. In addition to this committee, a number of independent and academic institutions also conduct research in the region including testing gear modifications, analysis of stock vulnerabilities to various disturbances, and engaging in tagging studies to monitor fish populations (Beamish 2008). Harvest quotas and fishing restrictions are assessed yearly and changes are made that reflect current pressures on the commercial fishery including previous year landings, new relevant scientific findings, and current economic demand for fishery products (Beamish 2008). All of this results in a wealth of fishery data available to the Lake Erie Committee in order to ensure the fishery is managed effectively.

Formalized stock assessments are generated on an annual or semi-annual basis for Walleye, Yellow Perch, Lake Whitefish, Rainbow Smelt, and Lake Trout throughout Lake Erie. There are committees charged with these responsibilities are the Yellow Perch Task Group, Walleye Task Group, Cold Water Task Group, and Forage Fish Task Group (YPTG 2013) (WTG 2013)(CWTG 2013)(FTG 2013). In addition, remnant lake sturgeon stocks are constantly monitored and management efforts are guiding both government and independent scientific research and suggestions (Hayes & Carroffino 2012). The Status of Lake Erie report, which is typically generated every 5 years, outlines the trends in catch and stock status and makes recommendations based on estimated stock statuses (Tyson et al 2009).

Rainbow smelt are the only non-native species in Lake Erie that have their stock assessed yearly by the Lake Erie Forage Task Group (FTG 2013). Rainbow smelt make up a very minor portion of the overall catch in Lake Erie and are targeted by one commercial trawling fishery in Ontario.

These assessments mainly use CPUE as an indicator of biomass or stock abundance, and target reference points are absent. However, these assessments are long term and robust and are coupled with species body-condition and age/weight assessments, and there is good probability they are good indicators of stock status and fish community health. For these reasons, scientific research and monitoring for Lake Erie is ranked as "Highly Effective".

### **Subfactor 3.1.4 – Management Record of Following Scientific Advice**

*Considerations: How often (always, sometimes, rarely) do managers of the fishery follow scientific recommendations/advice (e.g. do they set catch limits at recommended levels)? A Highly Effective rating is given if managers nearly always follow scientific advice.*

CANADA / LAKE ERIE, MIDWATER TRAWLS, CANADA  
CANADA / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA  
CANADA / LAKE ERIE, SET GILLNETS, CANADA  
MICHIGAN / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
NEW YORK / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
OHIO / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
PENNSYLVANIA / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

#### **Highly Effective**

The Great Lakes Fishery Commission takes scientific advice into account when setting quotas and developing management strategies throughout the Great Lakes. With the enactment of the Joint Strategic Plan for Management of Great Lakes Fisheries, quotas and stock assessments are evaluated by representatives both state and provincial agencies and assessed based on proposed ecological impacts to the fishery and surrounding ecosystems. Additionally, scientific advice is elicited to help determine stock status on most of the species listed in this report. Serving on each lake technical committee and present at the lake committee technical hearings are representatives from the research divisions of DNR and OMNR agencies whose sole propose is to provide information on projected stock status, discuss potential adverse trends afflicting stocks of interest (including spread of VHS and lamprey control efforts), and to advice on future directions. The Great Lakes Fishery Commission is implementing scientific advice on a regular basis (pers. comm. DNR and OMNR officials). Independent research conducted by universities throughout the Great Lakes routinely finds its way to these meetings and significant results are discussed. Owing to the fragile nature of the Great Lakes fishery which appears to only recently be recovering from a period of low yield and decreased stock abundances, scientific advice is relied upon heavily to ensure the fishery continues to recover.

### **Subfactor 3.1.5 – Enforcement of Management Regulations**

*Considerations: Do fishermen comply with regulations, and how is this monitored? To achieve a Highly Effective rating, there must be regular enforcement of regulations and verification of compliance.*

CANADA / LAKE ERIE, MIDWATER TRAWLS, CANADA  
CANADA / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA  
CANADA / LAKE ERIE, SET GILLNETS, CANADA  
MICHIGAN / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
NEW YORK / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
OHIO / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
PENNSYLVANIA / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

#### **Highly Effective**

The Great Lakes Fishery Commission (GLFC) created the Great Lakes Law Enforcement Committee with the goal to “protect, enhance and promote the safe and wise use of the natural resources in the Great Lakes for present and future generations” (GLFC Website 2014). This committee is comprised of representatives from the fishery management agencies representing all states and provinces bordering the Great Lakes. These management agencies include State Departments of Natural Resources (DNR), the Department of Environmental Conservation in New York (NYSDEC), the Pennsylvania Fish and Boat Commission, the Ontario Ministry of Natural Resources (OMNR), the United States Coast Guard, and the tribal/ first nation authorities Chippewa Ottawa Resource Authority (CORA) and the Great Lakes Indian Fish & Wildlife Commission (GLIFWC) when applicable.

Specialists from the coast guard and both the Ontario Ministry of Natural Resources (OMNR) and DNR routinely board commercial fishing vessels to inspect harvest and fishing gear to ensure that fisherman are following the required guidelines.

Portside inspections are carried out by DNR, which enforces fisheries legislation including minimum landing sizes, retention of prohibited species, gear restriction, etc. Coastguard also randomly inspects deployed gears and conservation officers of the DNR to ensure that gears are properly marked, placed in authorized areas, and are utilizing legal mesh sizes (DNR Website 2005). The U.S. coast guard and the conservation officers of the DNRE carry out patrols and monitoring of illegal fishing.

Actions of the Great Lakes Law Enforcement Committee are guided by policies and recommendations enacted by the governing Council of Lake Committees. These include supporting investigations crossing jurisdiction lines, supporting development and dissemination of information on fisheries forensic sciences, and sharing of law enforcement intelligence information, and enforcing quota and harvest regulations (GLFC Website 2014).

### **Subfactor 3.1.6 – Management Track Record**

*Considerations: Does management have a history of successfully maintaining populations at sustainable levels or a history of failing to maintain populations at sustainable levels? A Highly Effective rating is given if measures enacted by management have been shown to result in the long-term maintenance of species overtime.*

CANADA / LAKE ERIE, MIDWATER TRAWLS, CANADA

CANADA / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA

CANADA / LAKE ERIE, SET GILLNETS, CANADA

MICHIGAN / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

NEW YORK / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

OHIO / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

PENNSYLVANIA / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

#### **Moderately Effective**

The fish stocks in the Great Lakes have been subject to fishing pressures for centuries. Historic overfishing, the introduction of non-native species (sea lamprey, alewives, zebra mussels, etc), and habitat alteration and destruction have resulted in many of the fish stocks becoming greatly diminished or depleted. Comprehensive management of the Great Lakes began during the middle of the 20th century with the formation of the Great Lakes Fishery Commission (GLFC), after many of the commercially important stocks were already decimated. Implementation of legislation to promote improved conditions throughout the Great Lakes (Great Lake Water Quality Agreement 1972), as well as the development of more effective invasive control efforts, have resulted in the increased stock abundance of many target species. State (DNR), provincial (OMNR), and tribal (CORA) management agencies have made substantial progress in rehabilitation, restoration, and prevention efforts. However, stocks of once commercially valuable lake trout are still far below historic levels (though improving)

even after rigorous re-stocking and rehabilitation attempts over the last several decades. Additionally, systemic issues that occur between agencies (difference in regional priorities and interests, jurisdictional disputes, etc.) can impede or delay action and response to new threats or obstacles to the fishery. Such delays in action may interfere with current restoration attempts, as new threats such as invasive species and productivity changes continue to plague the fishery.

While current management strategies have proven effective in halting and in some cases reversing the downward trends in abundance of many stocks throughout the Great Lakes, it is too early to determine whether this management system will prevail in the face of mounting ecological pressures.

### **Subfactor 3.1.7 – Stakeholder Inclusion**

*Considerations: Are stakeholders involved/included in the decision-making process? Stakeholders are individuals/groups/organizations that have an interest in the fishery or that may be affected by the management of the fishery (e.g., fishermen, conservation groups, etc.). A Highly Effective rating is given if the management process is transparent and includes stakeholder input.*

CANADA / LAKE ERIE, MIDWATER TRAWLS, CANADA  
CANADA / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA  
CANADA / LAKE ERIE, SET GILLNETS, CANADA  
MICHIGAN / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
NEW YORK / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
OHIO / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
PENNSYLVANIA / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

#### **Highly Effective**

Agencies at the state, federal, and provincial level work with local stakeholders since they are the managing agencies with the delegated authority to invoke management actions (e.g. harvest restrictions, size limits, stocking, etc...). For example, Ontario has formed a provincial system of Fisheries Management Zone councils comprised almost entirely of mixed user groups. These groups meet regularly to hear from Ontario Ministry of Natural Resources (OMNR), research elements, and provide feedback for proposed management decisions. This ground level engagement is conducted by individual managing agencies, which include US state and federal agencies and Canadian provincial agencies.

Bringing together these managing agencies in Great Lakes region is The Great Lakes Fishery Commission (GLFC). The GLFC is comprised of representatives from all parties that have a stake in the commercial fishery including US state and federal agencies, Canadian agencies, and tribal/first nation representatives. The GLFC has a good track record of including stakeholders in the development of legislation, harvest restrictions, and enforcement regulations throughout the Great Lakes fisheries since there are representatives participating from managing agencies that reach out to their local stakeholders regularly. Furthermore, stakeholders representing recreational fishery interests are also present at local lake committee meetings. The U.S. fishery is largely managed for the benefit of the recreational fishing industry and as such their interests are acknowledge and incorporating in Great Lakes management ((DesJardine et al. 1995),(Riley 2013)).

Each lake committee is required to make regular reports to the Council of Lake Committees (CLC). These reports generate the development of new legislation which is made public and to local, state, provincial, and federal agencies who are invited to submit comments and suggestions. Findings, reports, and suggested management strategies are made public and opened to criticism which shows transparency of the process (GLFC 2007).



## Factor 3.2 - Bycatch Strategy

### SCORING GUIDELINES

Four subfactors are evaluated: Management Strategy and Implementation, Scientific Research and Monitoring, Record of Following Scientific Advice, and Enforcement of Regulations. Each is rated as 'ineffective,' 'moderately effective,' or 'highly effective.' Unless reason exists to rate Scientific Research and Monitoring, Record of Following Scientific Advice, and Enforcement of Regulations differently, these rating are the same as in 3.1.

- 5 (Very Low Concern)—Rated as 'highly effective' for all four subfactors considered
- 4 (Low Concern)—Management Strategy rated 'highly effective' and all other subfactors rated at least 'moderately effective.'
- 3 (Moderate Concern)—All subfactors rated at least 'moderately effective.'
- 2 (High Concern)—At minimum, meets standards for 'moderately effective' for Management Strategy but some other factors rated 'ineffective.'
- 1 (Very High Concern)—Management exists, but Management Strategy rated 'ineffective.'
- 0 (Critical)—No bycatch management even when overfished, depleted, endangered or threatened species are known to be regular components of bycatch and are substantially impacted by the fishery

| FACTOR 3.2 - BYCATCH STRATEGY  |          |                      |          |          |                |
|--|----------|----------------------|----------|----------|----------------|
| Region / Method  | All Kept | Critical             | Strategy | Research | Advice Enforce |
| Canada / Lake Erie / Midwater trawls / Canada  | Yes      | All Species Retained |          |          |                |
| Canada / Lake Erie / Barriers, fences, weirs, corrals, etc. / Canada                         | Yes      | All Species Retained |          |          |                |
| Canada / Lake Erie / Set gillnets / Canada   | Yes      | All Species Retained |          |          |                |
| Michigan / Lake Erie / Barriers, fences, weirs, corrals, etc. / United States of America     | Yes      | All Species Retained |          |          |                |
| New York / Lake Erie / Barriers, fences, weirs, corrals, etc. / United States of America     | Yes      | All Species Retained |          |          |                |
| Ohio / Lake Erie / Barriers, fences, weirs, corrals, etc. / United States of America         | Yes      | All Species Retained |          |          |                |
| Pennsylvania / Lake Erie / Barriers, fences, weirs, corrals, etc. / United States of America | Yes      | All Species Retained |          |          |                |

### Subfactor 3.2.3 – Scientific Research and Monitoring

*Considerations: Is bycatch in the fishery recorded/documented and is there adequate monitoring of bycatch to measure fishery's impact on bycatch species? To achieve a Highly Effective rating, assessments must be conducted to determine the impact of the fishery on species of concern, and an adequate bycatch data collection program must be in place to ensure bycatch management goals are being met*

### Subfactor 3.2.4 – Management Record of Following Scientific Advice

*Considerations: How often (always, sometimes, rarely) do managers of the fishery follow scientific recommendations/advice (e.g., do they set catch limits at recommended levels)? A Highly Effective rating is given if managers nearly always follow scientific advice.*

### **Subfactor 3.2.5 – Enforcement of Management Regulations**

*Considerations: Is there a monitoring/enforcement system in place to ensure fishermen follow management regulations and what is the level of fishermen's compliance with regulations? To achieve a Highly Effective rating, there must be consistent enforcement of regulations and verification of compliance.*

## **Criterion 4: Impacts on the habitat and ecosystem**

*This Criterion assesses the impact of the fishery on seafloor habitats, and increases that base score if there are measures in place to mitigate any impacts. The fishery's overall impact on the ecosystem and food web and the use of ecosystem-based fisheries management (EBFM) principles is also evaluated. Ecosystem Based Fisheries Management aims to consider the interconnections among species and all natural and human stressors on the environment.*

*The final score is the geometric mean of the impact of fishing gear on habitat score (plus the mitigation of gear impacts score) and the Ecosystem Based Fishery Management score. The Criterion 2 rating is determined as follows:*

- *Score >3.2=Green or Low Concern*
- *Score >2.2 and ≤3.2=Yellow or Moderate Concern*
- *Score ≤2.2=Red or High Concern*

*Rating cannot be Critical for Criterion 4.*

### **Criterion 4 Summary**

| <b>Region / Method</b>   | <b>Gear Type and Substrate</b> | <b>Mitigation of Gear Impacts</b> | <b>EBFM</b>       | <b>Score</b>  |
|--|--------------------------------|-----------------------------------|-------------------|---------------|
| Canada / Lake Erie / Midwater trawls / Canada  | 5.00: None                     | 0.00: Not Applicable              | 4.00: Low Concern | Green (4.472) |
| Canada / Lake Erie / Barriers, fences, weirs, corrals, etc. / Canada                         | 3.00: Low Concern              | 0.00: No Effective Mitigation     | 4.00: Low Concern | Green (3.464) |
| Canada / Lake Erie / Set gillnets / Canada   | 3.00: Low Concern              | 0.00: No Effective Mitigation     | 4.00: Low Concern | Green (3.464) |
| Michigan / Lake Erie / Barriers, fences, weirs, corrals, etc. / United States of America     | 3.00: Low Concern              | 0.00: No Effective Mitigation     | 4.00: Low Concern | Green (3.464) |
| New York / Lake Erie / Barriers, fences, weirs, corrals, etc. / United States of America     | 3.00: Low Concern              | 0.00: No Effective Mitigation     | 4.00: Low Concern | Green (3.464) |
| Ohio / Lake Erie / Barriers, fences, weirs, corrals, etc. / United States of America         | 3.00: Low Concern              | 0.00: No Effective Mitigation     | 4.00: Low Concern | Green (3.464) |
| Pennsylvania / Lake Erie / Barriers, fences, weirs, corrals, etc. / United States of America | 3.00: Low Concern              | 0.00: No Effective Mitigation     | 4.00: Low Concern | Green (3.464) |

### **Criterion 4 Assessment**

#### **SCORING GUIDELINES**

#### **Factor 4.1 - Impact of Fishing Gear on the Habitat/Substrate**

- 5 (None) - Fishing gear does not contact the bottom
- 4 (Very Low) - Vertical line gear
- 3 (Low)—Gears that contacts the bottom, but is not dragged along the bottom (e.g. gillnet, bottom longline, trap) and is not fished on sensitive habitats. Bottom seine on resilient mud/sand habitats. Midwater trawl that is known to contact bottom occasionally (
- 2 (Moderate)—Bottom dragging gears (dredge, trawl) fished on resilient mud/sand habitats. Gillnet, trap, or bottom longline fished on sensitive boulder or coral reef habitat. Bottom seine except on mud/sand
- 1 (High)—Hydraulic clam dredge. Dredge or trawl gear fished on moderately sensitive habitats (e.g., cobble or boulder)
- 0 (Very High)—Dredge or trawl fished on biogenic habitat, (e.g., deep-sea corals, eelgrass and maerl)  
*Note: When multiple habitat types are commonly encountered, and/or the habitat classification is uncertain, the score will be based on the most sensitive, plausible habitat type.*

#### **Factor 4.2 - Mitigation of Gear Impacts**

- +1 (Strong Mitigation)—Examples include large proportion of habitat protected from fishing (>50%) with gear, fishing intensity low/limited, gear specifically modified to reduce damage to seafloor and modifications shown to be effective at reducing damage, or an effective combination of 'moderate' mitigation measures.
- +0.5 (Moderate Mitigation)—20% of habitat protected from fishing with gear or other measures in place to limit fishing effort, fishing intensity, and spatial footprint of damage caused from fishing.
- +0.25 (Low Mitigation)—A few measures are in place (e.g., vulnerable habitats protected but other habitats not protected); there are some limits on fishing effort/intensity, but not actively being reduced
- 0 (No Mitigation)—No effective measures are in place to limit gear impacts on habitats

#### **Factor 4.3 - Ecosystem-Based Fisheries Management**

- 5 (Very Low Concern)—Substantial efforts have been made to protect species' ecological roles and ensure fishing practices do not have negative ecological effects (e.g., large proportion of fishery area is protected with marine reserves, and abundance is maintained at sufficient levels to provide food to predators)
- 4 (Low Concern)—Studies are underway to assess the ecological role of species and measures are in place to protect the ecological role of any species that plays an exceptionally large role in the ecosystem. Measures are in place to minimize potentially negative ecological effect if hatchery supplementation or fish aggregating devices (FADs) are used.
- 3 (Moderate Concern)—Fishery does not catch species that play an exceptionally large role in the ecosystem, or if it does, studies are underway to determine how to protect the ecological role of these species, OR negative ecological effects from hatchery supplementation or FADs are possible and management is not place to mitigate these impacts
- 2 (High Concern)—Fishery catches species that play an exceptionally large role in the ecosystem and no efforts are being made to incorporate their ecological role into management.
- 1 (Very High Concern)—Use of hatchery supplementation or fish aggregating devices (FADs) in the fishery is having serious negative ecological or genetic consequences, OR fishery has resulted in trophic cascades or other detrimental impacts to the food web.

#### **Factor 4.1 - Impact of Fishing Gear on the Habitat/Substrate**

CANADA / LAKE ERIE, MIDWATER TRAWLS, CANADA

**None**

Midwater trawls do not come into contact with substrate. Therefore, there is minimal habitat damage due to

mid-water trawls.

CANADA / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA  
MICHIGAN / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
NEW YORK / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
OHIO / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
PENNSYLVANIA / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

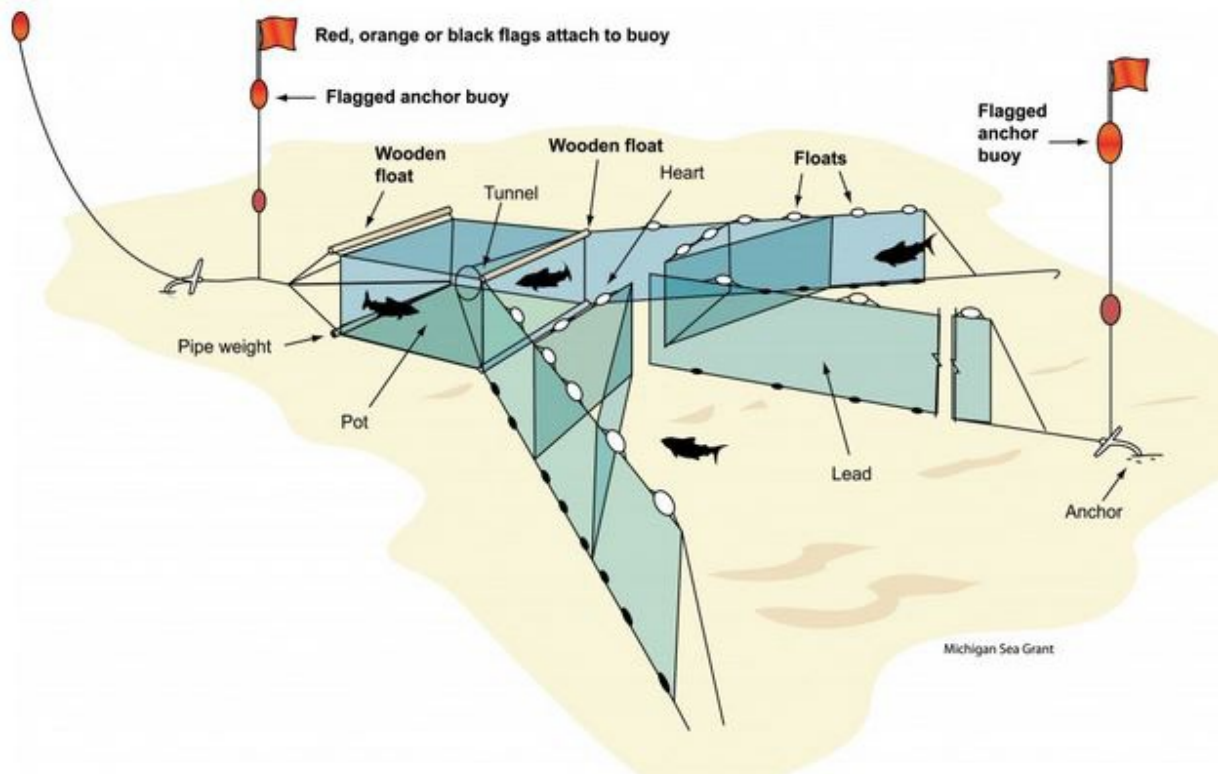
### Low Concern

Trapnets are used throughout Lake Erie both in U.S. and Canadian waters. Trapnet impacts on benthic substrate has not been assessed. However, their impacts are considered low where they are utilized. Substrate in Lake Erie is primarily soft and has quick recovery time if damaged.

### Justification:

Trapnets are long lead nets that lead fish into an enclosure through a small tunnel into a pot (trap). Sometimes called impoundment nets.

## Trap Nets



Images from Michigan Sea Grant website showing how a trapnet is used and laid out.

CANADA / LAKE ERIE, SET GILLNETS, CANADA

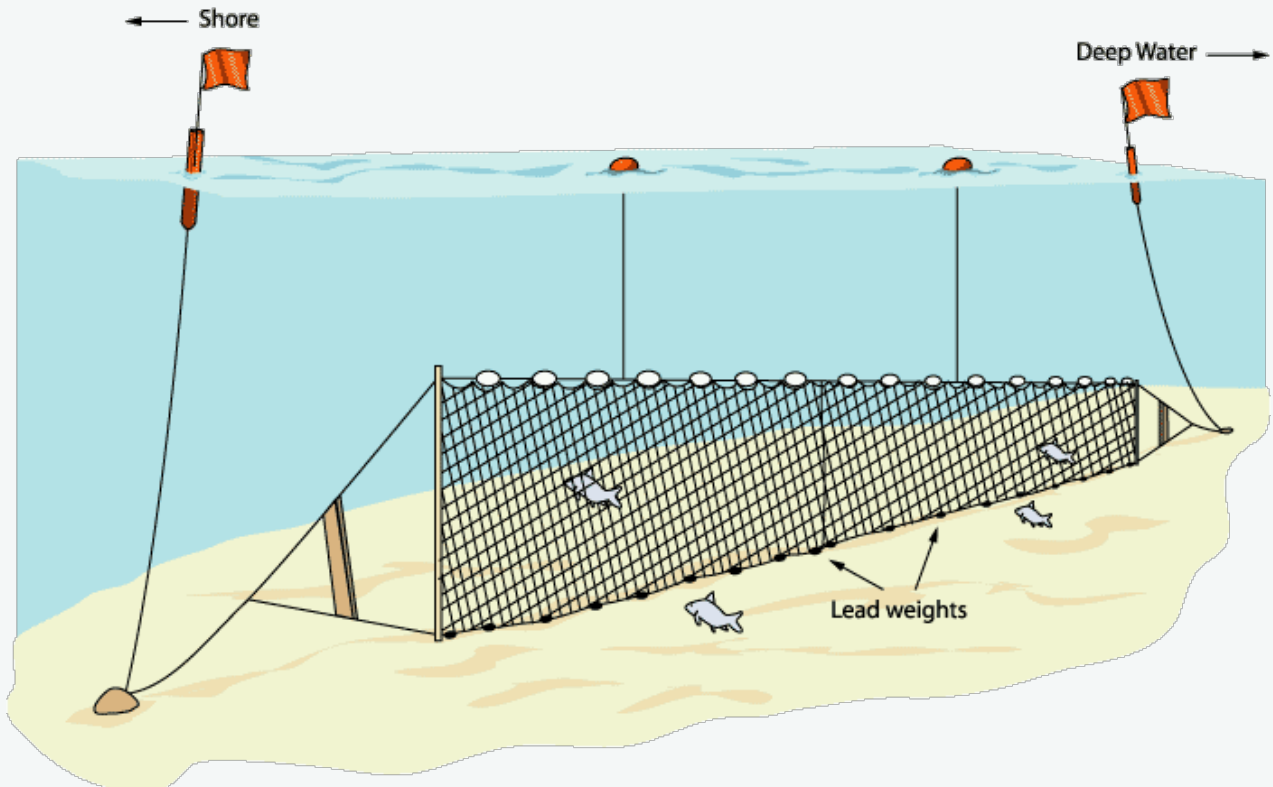
### Low Concern

Gillnet fisheries are prohibited in U.S. waters and are restricted to Canadian waters of Lake Erie. Gillnets are primarily used for Lake Whitefish, Yellow Perch, and Walleye fisheries. Gillnets used are not reported as either midwater or bottom gillnets. However, it can be assumed that both are used and would have similar impacts.

Midwater gillnets use lines fished several feet above the bottom while bottom gillnets are fished along the bottom and come into direct contact with the substrate. For both types, anchors stabilize the gillnets in place and come into direct contact with the bottom substrate. The impact of gillnets on the lakebed are expected to be limited to the impact of the anchors on the substrate and minimal amounts of scouring during setting and hauling nets. The substrate found in Lake Erie is mainly soft rather than hard substrate so anchor impact damage is thought to have quick recovery. (Figure 9 and personal communication DNR & OMNR).

The impact of this gillnet fishery in Lake Erie on the substrate is ranked as "Low Concern" since there is the potential that both anchors and the gillnets come into contact with the substrate but soft substrate in Lake Erie allows for quick recovery and minimal impacts.

**Justification:**



Depiction of typical gillnet deployment in Great Lakes. Image provided by Michigan Seagrant.

**Factor 4.2 - Mitigation of Gear Impacts**

CANADA / LAKE ERIE, MIDWATER TRAWLS, CANADA

**Not Applicable**

CANADA / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA

CANADA / LAKE ERIE, SET GILLNETS, CANADA

MICHIGAN / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

NEW YORK / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

OHIO / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

PENNSYLVANIA / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

**No Effective Mitigation**

Impacts of commercial fishing gear on benthic substrate has not been fully assessed in Lake Erie. However, it

is believed that no gears used in Lake Erie cause significant impact to benthic substrate. So, mitigation strategies for negative impacts are non-existent. The substrate of Lake Erie is generally soft substrate which does not suffer significant long-term damage from gear placement.

### **Factor 4.3 - Ecosystem-Based Fisheries Management**

CANADA / LAKE ERIE, MIDWATER TRAWLS, CANADA

CANADA / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA

CANADA / LAKE ERIE, SET GILLNETS, CANADA

MICHIGAN / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

NEW YORK / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

OHIO / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

PENNSYLVANIA / LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

#### **Low Concern**

The EBFM score for the entire Lake Erie fisheries is given a score of 'Low Concern' for the following reasons:

Scientific assessment and management efforts to account for ecological role are underway.

The fishery catches no "exceptional species".

For fisheries with hatchery supplementation, practices are designed to minimize or mitigate any potential negative ecological and/or genetic impacts, where applicable.

Only one non-native fishery exists (rainbow smelt), there are policies in place to manage the fishery so that it does not have adverse effects on native species.

#### **Justification:**

The GLFC (Great Lakes Fishery Commission) currently implements an Ecosystem Based Fisheries Management (EBFM) strategy (GLFC 2007). The Joint Strategic Plan for the Great Lakes explicitly calls for an Ecosystem-Management Strategy as one of 4 agreed upon strategies recognized by the GLFC. The policy was adopted for 2 main reasons (1) Fisheries managers realize that the Great Lakes are all intimately connected and if something negatively impacts one there is a high likelihood that it will affect the others, (2) the Great Lakes commercial fishing industry is comprised of multi-species of interests with each currently existing in a different state of conservation concern and requiring different management efforts to recovery. As such, targeted fish stocks and status are continually monitored and recommendations on harvest restrictions are made to reflect current stock conditions. The Joint Strategic Plan for Management of Great Lakes Fisheries calls for each lake committee to prepare a set of objectives for fish-communities (GLFC 2007).

The 2003 Lake Erie Committee decided on nine guiding principles which are: self-sustaining stocks, the stock concept, indigenous species, aversion to introductions, preservation and restoration of habitat, preservation of rare and endangered species, recognition of naturalized species, requirement to harvest on a sustainable basis, and recognition of the limit on productivity (Ryan et al. 2003). The Lake Erie committee also would like to focus on restoration of fish-community stability through management that promotes healthy stocks of top predators, reduction in (or prevention of) the establishment of aquatic nuisance species, and protection (or restoration) of important coastal near shore and tributary habitats (Ryan et al. 2003). Two goals were decided on to be their first goals for Lake Erie's future. (1) Secure a mostly cool-water fish community which would be self-sustaining and include valuable fish species. Walleye would be the key predator in the western basin, central basin, and nearshore waters of the eastern basin. (2) Secure a mostly cold-water fish community in deep, offshore waters of the eastern basin. Lake trout and burbot would be the key predators in this community (Ryan et al. 2003).

## **Acknowledgements**

*Scientific review does not constitute an endorsement of the Seafood Watch® program, or its seafood recommendations, on the part of the reviewing scientists. Seafood Watch® is solely responsible for the conclusions reached in this report.*

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## **Appendix A: Extra By Catch Species**

### **COMMON CARP**

#### **Factor 2.1 - Inherent Vulnerability**

CANADA/LAKE ERIE, MIDWATER TRAWLS, CANADA  
CANADA/LAKE ERIE, SET GILLNETS, CANADA  
MICHIGAN/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
OHIO/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
CANADA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA  
PENNSYLVANIA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

##### **Medium**

The common carp, a member of the family Cyprinidae, is extremely hardy and tolerant of poor water quality. It prefers large bodies of waters but can also be found in large rivers. They are non-native to the Great Lakes but were accidentally introduced in the 1890s when flooding allowed some individuals to enter the Great Lakes watershed. They spawn in shallow, weedy areas, similar to wetland habitats.

The fishbase vulnerability score for common carp is 45 (Froese & Pauley 2012). Therefore, common carp inherent vulnerability is listed as "medium".

#### **Factor 2.2 - Abundance**

CANADA/LAKE ERIE, MIDWATER TRAWLS, CANADA  
CANADA/LAKE ERIE, SET GILLNETS, CANADA  
MICHIGAN/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
OHIO/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
CANADA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA  
PENNSYLVANIA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

##### **Very Low Concern**

Common carp are invasive to the Great Lakes. For this reason, it is listed as "very low concern" for stock status.

#### **Factor 2.3 - Fishing Mortality**

CANADA/LAKE ERIE, MIDWATER TRAWLS, CANADA  
CANADA/LAKE ERIE, SET GILLNETS, CANADA  
MICHIGAN/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
OHIO/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
CANADA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA  
PENNSYLVANIA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

##### **Very Low Concern**

Common carp are given a score of "Very Low Concern" for fishing mortality because they are non-native to the Great Lakes basin.

#### **Factor 2.4 - Discard Rate**

CANADA/LAKE ERIE, MIDWATER TRAWLS, CANADA

< 20%

Discard rates for all fisheries in Lake Erie are estimated to be less than 20%.

**Justification:**

Discard data is not well documented for the fisheries in Lake Erie. However, discards from trawls in Canadian water appear to be low since most fish caught can be subsequently sold. Trawls not appear to afflict any one species in a particular adverse way.

Species of concern in Lake Erie that could be impacted by trawls are Lake Sturgeons and Lake Trout. There is a general consensus throughout the fishery community (scientists and fishermen) that trawls most often do not harm lake sturgeon since they are able to out swim trawls. Lake sturgeon are released alive and unharmed following capture in a trawl.

Lake trout are considered a cool-water species and inhabit deep waters of Lake Erie. Commercial fisheries targeting rainbow smelt using trawls in Ontario waters are not collecting fish in areas where lake trout are likely to be found. There are no reported lake trout taken in this rainbow smelt trawl fishery. Therefore, it is thought that the bycatch of lake trout is extremely low for this particular fishery.

In 2012, there were no reported lake trout or lake sturgeon caught by commercial fisheries in Canadian waters of Lake Erie (OMNR 2013).

CANADA/LAKE ERIE, SET GILLNETS, CANADA

< 20%

Discard rates for fisheries in Lake Erie are all estimated to be less than 20%.

**Justification:**

Discard data is not well documented for the fisheries in Lake Erie. However, discards from gillnets in Canadian water appear to be low since most fish caught can be subsequently sold. Gillnets not appear to afflict any one species in a particularly adverse way.

Species of concern in Lake Erie that could be impacted by gillnets are Lake Sturgeons and Lake Trout. There is a general consensus throughout the fishery community (scientists and fishermen) that gillnets most often do not harm lake sturgeon. Lake sturgeon are released alive and unharmed following capture in a gillnet. In 2012, there were no reported lake trout or lake sturgeon caught by commercial fisheries (OMNR 2013).

MICHIGAN/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
OHIO/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
PENNSYLVANIA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

< 20%

The discard rate for all fisheries in Lake Erie is estimated to be less than 20%.

**Justification:**

In US waters of Lake Erie (Michigan, Ohio, Pennsylvania, and New York), trap nets are the only gear type used by commercial fisheries since gillnets have been prohibited in US waters since the late 1980s. In 2012, Michigan and New York both had only three active commercial fishing licenses for the waters of Lake Erie. (The data on active commercial fishing licenses for Ohio and Pennsylvania could not be easily found.)

Unfortunately, discard data is not well documented for the fisheries in Lake Erie. However, discards from trap nets appear to be low since most fish caught can be subsequently sold and those not targeted are released unharmed. The 2012 harvest list includes: common carp, buffalo, freshwater drum, channel catfish, white bass, quillback, yellow perch, and gizzard shad (MI DNR 2013). Most of the species in that list are not ideal commercial species but this list illustrates that bycatch is very low due to the fact that non-target species are able to be sold at market.

Species of concern in Lake Erie that could be impacted by trap nets are Lake Sturgeon and Lake Trout. There is a general consensus throughout the fishery community (scientists and fishermen) that trap nets most often do not harm Lake Sturgeon. Lake Sturgeon are released alive and unharmed following capture in a trap net. In 2012, there were no reported Lake Sturgeon or Lake Trout caught by commercial fisheries (OMNR 2013).

Trap nets do not appear to afflict any one species in a particular adverse way.

In 2012, there were no reported lake trout or lake sturgeon caught by commercial fisheries (OMNR 2013).

#### CANADA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA

**< 20%**

Discard rates for fisheries in Lake Erie are all estimated to be less than 20%.

#### **Justification:**

Discard data is not well documented for the fisheries in Lake Erie. However, discards from trapnets appear to be low since most fish caught can be subsequently sold and those unable to be sold are returned alive to the lake. Trapnets not appear to afflict any one species in a particular adverse way.

Species of concern in Lake Erie that could be impacted by trapnets are Lake Sturgeons and Lake Trout. There is a general concensus throughout the fishery community (scientists and fishermen) that trap nets most often do not harm lake sturgeon. Lake sturgeon are released alive and unharmed following capture in a trap net.

In 2012, there were no reported lake trout or lake sturgeon caught by commercial fisheries (OMNR 2013).

### WHITE PERCH

#### **Factor 2.1 - Inherent Vulnerability**

CANADA/LAKE ERIE, MIDWATER TRAWLS, CANADA

CANADA/LAKE ERIE, SET GILLNETS, CANADA

MICHIGAN/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

OHIO/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

CANADA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA

PENNSYLVANIA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

#### **High**

The white perch, a member of the family Moronidae, is non-native to the Great Lakes but was introduced through the Erie and Welland canals from the Atlantic coast. They are predacious, opportunistic feeders and will feed on the eggs of other native fish. Since arriving in the Great Lakes, white perch have hybridized with native white bass in western Lake Erie.

The fishbase vulnerability score for white perch is 68 (Froese & Pauley 2012). Therefore, white perch inherent vulnerability is listed as "High".

## Factor 2.2 - Abundance

CANADA/LAKE ERIE, MIDWATER TRAWLS, CANADA  
CANADA/LAKE ERIE, SET GILLNETS, CANADA  
MICHIGAN/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
OHIO/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
CANADA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA  
PENNSYLVANIA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

### Very Low Concern

White perch are invasive to the Great Lakes. For this reason, it is listed as "very low concern" for stock status.

## Factor 2.3 - Fishing Mortality

CANADA/LAKE ERIE, MIDWATER TRAWLS, CANADA  
CANADA/LAKE ERIE, SET GILLNETS, CANADA  
MICHIGAN/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
OHIO/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
CANADA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA  
PENNSYLVANIA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

### Very Low Concern

White perch are given a score of "Very Low Concern" for fishing mortality because they are non-native to the Great Lakes basin.

## Factor 2.4 - Discard Rate

CANADA/LAKE ERIE, MIDWATER TRAWLS, CANADA

### < 20%

Discard rates for all fisheries in Lake Erie are estimated to be less than 20%.

### Justification:

Discard data is not well documented for the fisheries in Lake Erie. However, discards from trawls in Canadian water appear to be low since most fish caught can be subsequently sold. Trawls not appear to afflict any one species in a particular adverse way.

Species of concern in Lake Erie that could be impacted by trawls are Lake Sturgeons and Lake Trout. There is a general consensus throughout the fishery community (scientists and fishermen) that trawls most often do not harm lake sturgeon since they are able to out swim trawls. Lake sturgeon are released alive and unharmed following capture in a trawl.

Lake trout are considered a cool-water species and inhabit deep waters of Lake Erie. Commercial fisheries targeting rainbow smelt using trawls in Ontario waters are not collecting fish in areas where lake trout are likely to be found. There are no reported lake trout taken in this rainbow smelt trawl fishery. Therefore, it is thought that the bycatch of lake trout is extremely low for this particular fishery.

In 2012, there were no reported lake trout or lake sturgeon caught by commercial fisheries in Canadian waters of Lake Erie (OMNR 2013).

CANADA/LAKE ERIE, SET GILLNETS, CANADA

< 20%

Discard rates for fisheries in Lake Erie are all estimated to be less than 20%.

**Justification:**

Discard data is not well documented for the fisheries in Lake Erie. However, discards from gillnets in Canadian water appear to be low since most fish caught can be subsequently sold. Gillnets not appear to afflict any one species in a particularly adverse way.

Species of concern in Lake Erie that could be impacted by gillnets are Lake Sturgeons and Lake Trout. There is a general consensus throughout the fishery community (scientists and fishermen) that gillnets most often do not harm lake sturgeon. Lake sturgeon are released alive and unharmed following capture in a gillnet. In 2012, there were no reported lake trout or lake sturgeon caught by commercial fisheries (OMNR 2013).

MICHIGAN/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
OHIO/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA  
PENNSYLVANIA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., UNITED STATES OF AMERICA

< 20%

The discard rate for all fisheries in Lake Erie is estimated to be less than 20%.

**Justification:**

In US waters of Lake Erie (Michigan, Ohio, Pennsylvania, and New York), trap nets are the only gear type used by commercial fisheries since gillnets have been prohibited in US waters since the late 1980s. In 2012, Michigan and New York both had only three active commercial fishing licenses for the waters of Lake Erie. (The data on active commercial fishing licenses for Ohio and Pennsylvania could not be easily found.)

Unfortunately, discard data is not well documented for the fisheries in Lake Erie. However, discards from trap nets appear to be low since most fish caught can be subsequently sold and those not targeted are released unharmed. The 2012 harvest list includes: common carp, buffalo, freshwater drum, channel catfish, white bass, quillback, yellow perch, and gizzard shad (MI DNR 2013). Most of the species in that list are not ideal commercial species but this list illustrates that bycatch is very low due to the fact that non-target species are able to be sold at market.

Species of concern in Lake Erie that could be impacted by trap nets are Lake Sturgeon and Lake Trout. There is a general consensus throughout the fishery community (scientists and fishermen) that trap nets most often do not harm Lake Sturgeon. Lake Sturgeon are released alive and unharmed following capture in a trap net. In 2012, there were no reported Lake Sturgeon or Lake Trout caught by commercial fisheries (OMNR 2013).

Trap nets do not appear to afflict any one species in a particular adverse way.

In 2012, there were no reported lake trout or lake sturgeon caught by commercial fisheries (OMNR 2013).

CANADA/LAKE ERIE, BARRIERS, FENCES, WEIRS, CORRALS, ETC., CANADA

< 20%

Discard rates for fisheries in Lake Erie are all estimated to be less than 20%.

**Justification:**



Discard data is not well documented for the fisheries in Lake Erie. However, discards from trapnets appear to be low since most fish caught can be subsequently sold and those unable to be sold are returned alive to the lake. Trapnets not appear to afflict any one species in a particular adverse way.

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In 2012, there were no reported lake trout or lake sturgeon caught by commercial fisheries (OMNR 2013).