4. Does Fishing Threaten the Great Lakes?

Overview and Purpose

To relate knowledge of fish population dynamics and food chains to the commercial and recreational fishing industry in the Great Lakes.

Lesson Summary

Students will understand the link between fish population dynamics and the fishing industry. There is a mutual relationship between the two, which students should realize by the end of the lesson, because humans and fish are part of a common food chain in the Great Lakes.

Commercial fishing is a big industry in the Great Lakes, as is the pastime of recreational fishing, but fishing depends largely on fish populations. At the same time, fish populations are affected by fishing—both commercial and recreational—and so the link between the ecosystem and the environmental interactions happens in multiple ways.

The background information needed for this lesson includes a knowledge of population dynamics, the ability to graph a predator-prey population over time, as well as knowledge of food chains and food webs. Optionally, teachers can first teach the lesson titled "Fish Population Dynamics" to students prior to completing this lesson as a way to develop background knowledge.

As more fishing takes place, fish populations can decline, but as fish populations decline, fishing becomes less productive. The threat to fish populations from fishing can have an impact on the number of fish of a certain species, while the fish population will impact the fishing that is done in a certain area. The dynamics between fishing and fish populations can be further impacted when certain fish populations are affected by invasive competing species or other disruptions to the ecosystem.

This lesson focuses on the way that the fishing industry can become a threat to the native species of the Great Lakes, while at the same time the natural dynamics of fish populations can affect the freshwater fishing industry that depends on the Great Lakes. As students explore the history of commercial fishing in the Great Lakes, through articles from Great Lakes Now and the Illinois-Indiana Sea Grant, they will familiarize themselves with this interconnectedness between the ecosystem of the Great Lakes and the fishing industry.

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ESSENTIAL THEMES	● Interconnectedness of the Great Lakes ecosystem to the commercial fishing industry ● The relationship between human activity and population dynamics in the Great Lakes
NEXT GENERATION SCIENCE STANDARDS	➔ MS-ESS3.A.1 Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. ➔ MS-LS2-1 Ecosystems: Interactions, Energy and Dynamics. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. ➔ MS-LS2-2 Ecosystems: Interactions, Energy and Dynamics. Construct an explanation about how the different parts of the food chain are dependent on each other. ➔ SEP2: use a model to generate data to test ideas about phenomena in natural or designed systems, including those representing inputs and outputs, and those at unobservable scales.
OBJECTIVES	❏ Understand the impact of commercial/recreational fishing on the fish populations of the Great Lakes ❏ Understand the impact of declining fish populations on the commercial/recreational fishing industry in the Great Lakes ❏ Apply population dynamics principles to human activity within a food chain
ESTIMATED TIME	❖ **2 class periods**

Materials Needed

- Video projection monitor or screen/speakers
- Internet access via computers or mobile devices (e.g., tablets, cellphones)
- Notebooks and pencils
- Chart paper or a dry erase board and markers

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Facilitation Steps

WARM UP: Begin by asking students what they already know about the essential themes of the lesson and what they wonder about it. Have them turn and talk with a shoulder partner. Then, after a minute of conversation, elicit responses from a couple of volunteers and jot down 2-3 ideas on the board under the categories KNOW and WONDER. The teacher should help students clarify their ideas as they are shared by checking for understanding using a talk move such as "so you are saying…" or help students think together by asking for a show of hands of agreement from the class in response to what individual students share.

LAUNCH: Once the warm up has concluded, give a brief overview of the background context to students, making connections to their KNOW and WONDER responses as well as any other relevant prior knowledge they would have from other lessons they have learned. Describe the activities planned for this lesson to students.

ACTIVITY 1: Fishing Affects Fish

First, explain to students that, as a class, they are going to read a short article on one way that fishing affects fish populations. Each student should listen while reading along and be prepared to share one thing that surprised them from the article after they finish reading it.

Next, distribute copies of the article [Fishing may lead to rapid changes in Great Lakes fish](#) from the Illinois-Indiana Sea Grant (or, alternatively, direct students to the URL to read the article online) and ask for a couple of volunteers to read the first half and second half of the article aloud to the class.

Then, proceed to have the class read the article aloud and give them time to jot down what surprised them about the article at the end.

Last, ask for a few students to share what surprised them from the article. After each share, ask for a show of hands as to whether or not students were also surprised by that same point. Conclude the reading of this article by reminding students that they are going to explore the relationship between fishing and fish populations more in depth in the upcoming activities and encourage them to look out for connections between articles.

ACTIVITY 2: Fishing Affects Fish Populations

First, explain to students that they are going to be reading an article from Great Lakes Now about the history of commercial fishing in the Great Lakes. This article will provide some important information to them and address some of their WONDERS from the warm up. Introduce students

to the 4 Notes Summary protocol that they will use after they finish reading the article, where they write one of each of the following notes:

- Oooh! (something that was interesting)
- Aaah! (something that was an ah-ha moment)
- Hmmm… (something that left them thinking afterward)
- Huh? (a question they have afterward)

Ask students to give an example of each type of note that they will be making to check for understanding before proceeding.

Next, distribute copies of the article [Great Lakes Fishery: The start of the industry and the fall of fish populations](#) from Great Lakes Now (or, alternatively, direct students to the URL to read the article online) and give students time to read the article individually.

Then, after the video, have students record in their notebooks a 4 Notes Summary.

Last, have students work in partners to share their 4 Notes Summary from the article with each other.

ACTIVITY 3: Fish Populations Affect Fishing Industry

First, explain to students that they are going to be reading an article from [GreatLakesNow.org](#) about the ecosystem interacts with both the recreational and commercial fishing industries in the Great Lakes. This article will provide some important information to them and address some of their WONDERS from the warm up. Remind students that they will again complete a 4 Notes Summary for this article, but this time they will do so with their partner from the end of the last activity.

Next, have students partner up (if they are not already) and distribute copies of the article [Great Lakes Fishery: Commercial vs. recreational conflict](#) from Great Lakes Now (or, alternatively, direct students to the URL to read the article online) and give students time to read the article with their partner.

Then, after the video, have students discuss with their partner and record in their notebooks a 4 Notes Summary.

Last, have partners join another set of partners to form a group of four, and have the groups share their 4 Notes Summary from the article with each other.

ACTIVITY 4: What Can Be Done?

First, explain to students that they are going to be working with their group to brainstorm possible solutions to the problems with fishing and fish populations in the Great Lakes. This solution should address one specific aspect of the problem and be backed with evidence and reasoning to support the claim students make for their solution. Inform students that they will be creating a poster to do a poster presentation to the class about the solution that they devise. Their posters should include a population dynamics graph that would show how the fish population would be affected by fishing before and after their solution.

Next, give students time to work in their groups to identify the problem and develop a solution to it, as well as create their posters. Close monitor groups as they work to ask questions to help them focus on what is important about the issue and to reference back to evidence mentioned in the articles they read. Assist groups, as needed, with constructing their graphs or developing their posters.

Then, have students present their posters with the problem and solution they addressed to the class. As students present their posters, invite students from the audience to give feedback to the group using the NOTICE and WONDER protocol (e.g., they should frame their feedback to the presenting group in the format of "I noticed…" or "I wonder…").

Last, have the class vote on which solution they think would be most workable of all the options presented to actually carry out. Ask for a couple of volunteers to share their reasons why they voted the way that they did.

SYNTHESIS: Give students individual thinking and writing time in their notebooks to synthesize their learning by jotting down their own reflections using a Word, Phrase, Sentence protocol, with:

- A **word** that they thought was most important from the lesson
- A **phrase** that they would like to remember
- A **sentence** that sums up what they learned in the lesson

After the individual synthesis is complete, students should share their synthesis with a shoulder partner.

COOL DOWN: Have students complete a 3, 2, 1 Review protocol for the lesson with a partner, recording in their notebooks or, optionally, on exit ticket slips to submit, the following:

- **3** things that they liked or learned
- **2** things that make more sense now

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- **1** question that they were left with

CLOSURE: Have one student share a response from each of the categories of the 3, 2, 1 Review. Depending on the available time, the teacher can make connections between the ideas students share and the learning objectives of the lesson, and respond to the question that is shared.

EXIT TICKET: Students write one difficulty they see with the solution that was voted most workable by the class and explain why they think that it would be a difficulty.

About the Author

Gary is an educational consultant, award-winning science educator and the author of *Science With Scarlett*. He is also a double cornea transplant recipient who, since having his sight restored, was moved to use his teaching gifts to make science fun for kids. He lives with his family near Detroit and designs learning experiences to inspire children, like his own daughter, to love science. Gary is the 2014 recipient of the Michigan Teacher of the Year honor. Contact him via his consulting firm, Saga Educators, or connect with him on Twitter.

About Great Lakes Now

With a monthly magazine-style television program and daily online reports at GreatLakesNow.org, the **Great Lakes Now** initiative offers in-depth coverage of news, issues, events and developments affecting the lakes and the communities that depend on them, while capturing the character and culture of the region.