



BIOLOGICAL CARRYING CAPACITY OF YOUR NEARBY LAKE



educational partners

Great Lakes
RESTORATION



RECREATIONAL
BOATING & FISHING
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GRADE LEVELS

Middle School - Grades 6-8

CONTENT AREA

Life Science

UNIT THEME

Aquatic Ecology

TOPIC

Carrying Capacity

TIME REQUIRED

Two 45-minute classes, 2 hours lakeside



OVERVIEW

Fish biologists manage fish species populations for the overall health of biodiverse species and the ecosystem where they live. But sometimes a healthy ecosystem can become damaged when too many of a certain species over-consume or somehow damage food sources. Once an aquatic ecosystem gets damaged, it can impact the health of all the species living there. So fish biologists are faced with the question, "What's the right balance of certain species within an ecosystem?" Biologists call the right balance the "biological carrying capacity" of the species. It's the capacity of an ecosystem to "carry" or support a healthy number of a certain species without long-term damage to the ecosystem.

In this lesson, students will develop an understanding of the concept biological carrying capacity by watching the companion video, having a class discussion about carry capacity in a "closed" lake system, then graphing key fish populations under different scenarios. Finally, students will work in groups of four (3-5) "fish sampling teams" to go fishing at the sample lake, attempt to catch different species, take photos and/or videos on smart phones, then present their conclusions back in the classroom for discussion.

CONCEPT Biological Carrying Capacity

ENDURING UNDERSTANDING:

Students will understand that the different parts of ecosystems are complicated and interconnected. The smallest change in one part can impact different species populations. [Fishing can be fun.](#)

CONTENT OBJECTIVES:

Students will be able to define Biological Carrying Capacity in their own words as well as describe factors that can affect the carrying capacity of a species.

LEARNER OBJECTIVES:

Students will use pictures and graphs to help develop and support their understanding of the concept of Biological Carrying Capacity. [Students will learn how to team fish.](#)

PROCESS OBJECTIVES:

Students will work in small and large groups to process new information and use evidence to come to a conclusion after team fishing research and angling.

MATERIALS NEEDED (each group, each student):

1. TakeMeFishing Plan Worksheets
2. Fishing Gear - Rods, Reels, Lures
3. Measuring Tape - Scale
4. Fish Data Recording Sheets
5. Smart Phone



PROCEDURES

Class Session #1 - Discuss a lake ecosystem as a class. Draw one on the board with the class. If students don't offer, make sure the human, pike, bass, panfish and zooplankton food chain are part of your drawing. Prior knowledge of a lake ecosystem and typical fish species is helpful to this activity.

Next, watch the companion video on "Biological Carrying Capacity". Have students take notes on variables that affect species and their carrying capacity.

Pose the question, "What types of things affect both the population size and typical size of individual fish of these different species?" Do a Think-Pair-Share with the class. Students take a few minutes to think or write their answers individually, then share it with a partner, and finally share out to the whole class.

Field Research Session - Put students in groups of 3-5 and handout the "Fishing Survey Team Instructions". Have them work in groups to developing a "takemefishing" plan to "sample catch-n-release" key species on their list. Have them develop a plan by exploring takemefishing.org. Part of their plan includes enlisting a "fishing mentor" to oversee the lakeside portion of the activity. See the reference list to enlist potential mentors. Teachers with fishing experience can serve as mentor.

Student "fishing sampling teams" go fishing at their selected lakeside site for two hours. Each team member takes part in fishing, recording data, taking photos or video, and assisting other team members in conducting the study. Part of their study is to interview other fishermen to help gather population and size data (and to learn more about successful fishing their site).

Homework - When all the fishing teams have completed the angling portion of their assignment, have them prepare the results of their research for class presentation and discussion.

PROCEDURES *(continued)*

Class Session #2 - Each Fishing Survey Team presents their research and results to the class. Presentations may include posters, videos, photos, and interactive discussion. Make sure that a few groups are presenting different approaches to fish sampling (angling techniques) success and what they learned about the process of fishing to deepen class discussion. While groups present, make sure they explain why and what evidence they are using to support their research. Use the presentations to spark class discussions about carrying capacity and the different fishing techniques for various species sampled. Encourage students to also discuss how to improve their sampling and fishing techniques for either independent studies or activity extensions.

ASSESSMENT

Students should complete an exit slip before they leave class in which they answer the following questions:

- Describe why population sizes cannot increase forever.
- How can human activity affect carrying capacity of their lake site? Give one example in which it can increase it and one example where it can decrease it.
- If the carrying capacity of adult pike is 50 for a lake, could 55 pike survive? Could 40 pike survive? Explain the impacts on the population, ecosystem and individual pike size.
- Describe the challenges and solutions to developing their "Takemefishing plan" and what can be done to reduce challenges to fishing and improving success.

EXTENSION ACTIVITIES

- Have students research current management techniques on the state DNR website or National Park Service website www.nps.gov to help struggling populations. Students can evaluate current management plans and propose new ones.
- Fishing Survey Teams use their acquired fishing knowledge to sample another lake. This time they use smart phones and computers to create "Aquatic Science Survey" video production. Encourage them to use a theme, the principles of scientific research, principles of fish habitat or conservation. Encourage them to show the discovery and fun of fishing.



SPECIAL CONSIDERATIONS:

This activity is richest when completed in fishing team groups with answers shared to a whole class. This worksheet is not a typical worksheet as it encourages students to construct knowledge as they answer questions. The questions build off of each other.



RESOURCES

- <https://www.takemefishing.org/>
- <http://vamosapescar.org/>
- <http://asafishing.org/conservation/the-north-american-conservation-model/>
- <http://www.futureangler.org/>
- <http://boysliffe.org/outdoors/outdoorarticles/1802/10-steps-to-start-fishing/>

ADDITIONAL RESOURCES

- <https://www.fs.fed.us/fishing/>
- <http://www.areanet.org/> (teachers)
- <http://www.projectwild.org/projectwildwebsite/aquatic/> (teachers)