

**Give a man a fish and he will eat for a day.
Teach a man to fish and you'll be looking for
a new fishing spot.**

- Irish Proverb

Overfishing

Document Overview

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Overfishing is one of the single greatest threats to the future of humanity. If present rates of fishing continue it is projected that most fished species will be extinct by 2048. Since the Ocean is a common resource it is critical that people understand the importance of managing it for the present and the future.

Minnesota Academic Standards

1.4.2.1.1 Recognize that animals need space, water, food, shelter and air.

1.4.2.1.2 Describe ways in which an animal's habitat provides for its basic needs.

For example: Compare students' houses with animal habitats.

4.1.2.1.1 Describe the positive and negative impacts that the designed world has on the natural world as more and more engineered products and services are created and used.

5.3.4.1.3 Compare the impact of individual decisions on natural systems.

For example: Choosing paper or plastic bags impacts landfills as well as ocean life cycles.

5.4.4.1.1 Give examples of beneficial and harmful human interaction with natural systems.

For example: Recreation, pollution, or wildlife management.

3.1.1.2.1 Generates questions that can be answered when scientific knowledge is combined with knowledge gained from one's own observations or investigations.

9.1.1.1.2 Understand that scientists conduct investigations for a variety of reasons including: to discover new aspects of the natural world, to explain observed phenomena, to test the conclusions of prior investigations, or to test the predictions of current theories.

9.4.2.1.1. Describe factors that affect the carrying capacity of an ecosystem and relate these to population growth.

9.4.4.1.2 Describe the social, economic and ecological risks and benefits of changing a natural ecosystem as a result of human activity

National Science Standards:

This activity supports the following National Academy of Sciences science education standards. Grades 5-8: Unifying Concepts and Processes—Evidence, models, and explanation Standard A: Science as Inquiry—Abilities necessary to do scientific inquiry Standard A: Science as Inquiry—Understandings about scientific inquiry Standard F: Science in Personal and Social Perspectives—Populations, resources and environments Standard F: Science in Personal and Social Perspectives—Natural hazards Standard F: Science in Personal and Social Perspectives—Risks and benefits Grades 9-12: Unifying Concepts and Processes—Evidence, models, and explanation Standard A: Science as Inquiry—Abilities necessary to do scientific inquiry Standard A: Science as Inquiry—Understandings about scientific inquiry Standard F: Science in Personal and Social Perspectives—Natural resources Standard F: Science in Personal and Social Perspectives—Environmental quality Standard F: Science in Personal and Social Perspectives—Science and technology in local, national, and global challenges

Objective: Experience the “tragedy of the commons” as it relates to fishing resources. Consider social, environmental, and economic impacts of overfishing. Identify sustainable fishing practices.

Type of Activity: This is a simulation to demonstrate “tragedy of the commons” pertaining to overfishing of the oceans.

Duration: Two 45 minute class periods.

Connection to Nobel Speaker: Carl Safina is a prominent ecologist and marine conservationist who in 2003 co-founded Blue Ocean Institute, an environmental organization designed to inspire conservation by using science, art, and literature to build a “sea ethic.” In 1995 he had been a force behind the passage of a new fisheries treaty through the United Nations, and in 1996 the U.S. Congress incorporated some of his ideas in the Sustainable Fisheries Act, which required the rebuilding of marine-life populations depleted by fishing.

Teacher Tips: The project is from the PBS Marine Fisheries & Aquaculture Series. <http://www.pbs.org/emptyoceans/educators/activities.html> There are a number of resources and lessons at the PBS Empty Oceans site. Navigate through the site for a background into overfishing. In addition familiarize yourself with the work of Carl Safina at www.carlsafina.org. and the Blue Ocean Institute site on fishing. <http://blueocean.org/issues/fish-as-food/>. Teachers can choose to purchase the accompanying video to this lesson: Empty Oceans, Empty Nets: The Race to Save Marine Fisheries or do the project without the video.

“Fishing for the Future” is a fishing simulation that allows students to model several consecutive seasons of a commercial fishery and explore how technology, population growth, and sustainable practices impact fish catch and fisheries management. It also touches upon the idea of “Tragedy of the Commons” specifically regarding the oceans as a common resource.

As with any new activity, read the lab thoroughly in advance, decide what modifications need to be made, then obtain and prepare materials.

Concepts: sustainability, tragedy of the commons, overfishing, “sea ethic”.

Materials:

1. Check for peanut allergies in your class. You can do the activity using only plain M&Ms, if necessary.
2. For a class of 20, you will have five or six groups of three to four students each. Each group will start with 20 plain and 10 peanut M&Ms. Count out the first round of M&Ms and place them in cups or bags.
3. Copy the Fishery Facts and Fishing Log handouts.
4. As a pre- or post-activity reference, have students read the handout Fishery Facts. For additional references, read Chapter 5 “Global Trends – Food, Water, and Income” and Chapter 6 “Environmental Sustainability” from Facing the Future’s publication Global Issues & Sustainable Solutions (www.facingthefuture.org).

Activity:

The set for this activity is to read Carl Safina’s blog a brief history of fishing. Assign this the day before the lab, or have students read it in class.

<http://carlsafina.org/2011/12/20/tutorial-a-brief-history-of-fishing%E2%80%94with-a-splash-of-hope/>

<http://carlsafina.org/2011/12/27/tutorial-a-brief-history-of-fishing-part-2/>

Day 1

1. Introduce and discuss the concept of sustainability using the following definition: “Sustainability is meeting the needs of the present without limiting the ability of people, other species, and future generations to survive.”

Show the youtube video: <http://www.youtube.com/watch?v=VxacxShp3LY>. Discuss why overfishing is connected to sustainability.

Ask why sustainability might be an important goal for a society and what might be difficult about realizing this goal.

2. Tell students that today they’re going to go fishing and explore some of these sustainability issues.
3. Explain the game rules:
 - a. Each student will be a “fisher” whose livelihood depends on catching fish.
 - b. Peanut M&Ms represent the largest and most valuable fish (tuna, swordfish, et cetera).
4. Plain M&Ms represent the next most-valuable fish (cod, salmon, et cetera).
 - a. Each fisher must catch at least two fish (large or small) in each round to survive (i.e., get enough fish to either eat or sell).

- b. When the fishing begins, students must hold their hands behind their backs and use the “fishing rod” (straw) to suck “fish” (M&Ms) from the “ocean” (bowl) and deposit them into their “boat” (cup).
 - c. The fish remaining in the ocean after each fishing season represent the breeding population, and thus one new fish will be added for every fish left in the ocean (bowl).
5. Divide the class into groups of three or four students and have each group choose an ocean name such as North Atlantic, North Pacific, Arctic, Mediterranean, et cetera.
 6. Give each group one serving bowl and each student one cup, one straw, and one copy of the handout Fishing Log.
 7. Put 20 plain and 10 peanut M&Ms in each group’s bowl.
 8. Say “start fishing” and give the students 20 seconds for the first “season” of fishing.
 9. Have each fisher count his or her catch (M&Ms in their cup) and record the data in their Fishing Log.
 10. Fishers who did not catch the two-fish minimum must sit out for the following round.
 11. Add one new fish for every fish left in the ocean (bowl).
 12. Allow fishers to use their hands on the straws during the second session to represent “new technology.”
 13. After the second fishing season, give one fisher from each group a spoon representing more new fishing technology such as trawl nets, sonar equipment, et cetera. Continue the game for round three.
 14. Ask, “What happened when ocean group [name] ran out of fish? How are the fishers going to survive now?” (One option is to move to another ocean.) Allow students to “invade” other ocean groups when their ocean is depleted, but don’t tell them that they can do this beforehand. Fishers may either go as a group to another ocean or they may disperse to other oceans.
 15. Repeat fishing, recording, and replenishing fish stocks until either sustainable fishing is achieved or until all (or most) groups fish out their ocean.

Reflection

1. Have students do a free-write on the following quote by John C. Sawhill, relating it to the fishing activity: “In the end, our society will be defined not only by what we create, but by what we refuse to destroy.” (John Sawhill is the former President and Chief Executive Officer of The Nature Conservancy.)
2. Use the following sample questions to lead a discussion about the activity:

- How did you feel when you realized that you had depleted your fish stock?
 - How did you feel when other fishers joined your ocean group?
 - How does this activity relate to real ocean and fishery issues?
 - What's missing in this game? (Impacts to nonhuman animals that rely on fish for their survival, population growth, et cetera.)
 - What happens to a resource when you have infinite population growth, growing technology, and a finite resource?
 - Are there any commonly owned resources in our region or community? If so, what are some similar issues around them, and how can they best be managed? (Air is a commonly used resource—how do we deal with air pollution? Forestry or animal grazing rights also sometimes create similar discussions. You might also talk about city, national parks, and other public lands, and the competing uses and needs.)
3. Have students brainstorm ways to have a sustainable fishery. What rules could be developed? (For example, limits on type of equipment allowed, amount and type of fish, shorter seasons.)

Homework: Have students read “Tragedy of the Commons” and write an explanation of how overfishing exemplifies the concept.

http://www.garretthardinsociety.org/articles/art_tragedy_of_the_commons.html

Day 2

Watch the video on overfishing <http://www.youtube.com/watch?v=F6nwZUkBeas>. and Carl Safina's video:

<http://www.youtube.com/watch?v=tCW7gmbZf5I&list=UUisJWfWNf9dX7HMjw7mf-OQ&index=5&feature=plcp>

- Repeat the activity after the class has experienced the “tragedy of the commons” and discussed sustainable practices to see if they can harvest in a sustainable manner.

Discuss how sustainability was achieved.

Have students complete the response questions.

ASSESSMENT

Ask students to write, draw, or chart an explanation of factors that affect management of fish populations and identifies the goal of sustainable fisheries. (Responses should reflect such factors as technology, environmental conditions, market prices, and consumer choices.)

CREDIT

Fishing for the Future,” © by Facing the Future: People and the Planet, www.facingthefuture.org 2004 (used with permission). Adapted from “Fishing with Jim” by teachers Jim Hartmann and Ben Smith.

Student Response Questions to Carl Safina and Overfishing **Name:** _____

1. What technological advances made overfishing possible?
2. What legislation was passed in 1996 to stop overfishing?
3. Why is fish farming not a viable solution to overfishing?
4. How was the activity a good demonstration of overfishing? What were its limitations?
5. If we know overfishing is a problem, why has it not been solved?
6. Explain some of the unintended consequences of fishing nets.
7. How are we near a point of no return with overfishing?
8. Why do we need international cooperation to rebuild fisheries?
9. How is overfishing a moral issue?
10. What can you do to help solve this problem?