



## Fishing for the Future

### OBJECTIVES

Through a fishing simulation, students model several consecutive seasons of a commercial fishery and explore how technology, population growth, and sustainable practices impact fish catch and fisheries management.

### ESSENTIAL QUESTIONS

- How do we manage spaces that are not owned by anyone?
- How does overfishing impact future generations?
- What is the concept "tragedy of the commons"?
- What alternative strategies can be utilized to help limit overfishing?

### MATERIALS NEEDED

- Copies of the Fishery Facts and Fishing Log handouts (attached)
- "Fish": M&M's or Goldfish are a great option if you want to give students snacks at the end of the activity, or I commonly use varieties of colored beads.
- "Oceans": Use five bowls to represent the five different oceans and give a variety of fish based on the size of the ocean.
- "Nets": ie. spoons, pipe cleaners, chop sticks
- Slide Deck (PDF: <https://bit.ly/44B7Aqi>; Google Slides: <https://bit.ly/42cwefn>)

### LESSON

#### Introduction

Students will simulate fishery activity in different oceans. As students progress through the fishing seasons, they will likely over fish their oceans and have to migrate to other oceans to meet their needs. Most groups will create a total crash of fish stocks. This will demonstrate the benefits of sustainable fishing practices. This activity is a great way to incorporate tragedy of the commons into the classroom. You can introduce this concept after the activity, and continue to have conversations about managing land in a sustainable manner. Review the linked slides ([PDF](#) / [Google Slides](#)) with your class to give them a baseline understanding about fish and how fishing has evolved over the years.

## Procedure

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." 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 (use colored goldfish or colored beads if allergies exist in classroom):
  - 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).
  - c. Plain M&Ms represent the next most-valuable fish (cod, salmon, et cetera).
  - d. 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).
  - e. 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).
  - f. 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 Fishing Log handout.
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.)

4. 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.)

# Fishing for the Future

## Fishery Facts Handout

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The world's fisheries are under more pressure than ever before. From 1950 to 1990, there was a fivefold increase in the world annual fish catch. The average yearly per person fish consumption in the industrialized world (59 pounds) is three times that of people in the developing world (20 pounds). Fish demand remains high: An additional 15.5 million tons of fish will be required by 2010 just to maintain current rates of fish consumption. Today, 70 percent of the planet's marine stocks are fully exploited or overexploited.

The number of people fishing and practicing aquaculture worldwide has doubled since 1970. More than 21 million people are full-time fishers, and 200 million depend on fishing for their livelihood. Asia contains the vast majority of the world's fishers. In the early 1950s, developed countries took 80 percent of the world's fish catch. Today, they take only 36 percent of the catch, while developing countries take 64 percent.

The technology used to catch fish and the number of fish caught per fisher varies enormously. Modern fleets are the most environmentally destructive, as they use enhancements such as airplanes, radios, seafloor maps, and video sonar to track down fish schools. Once they have found the fish, these fleets use large nets to drag up not only the targeted fish but also coral, the seafloor, and around 27 million tons annually of "by-catch"—non-marketable fish that are killed and thrown overboard.

To compensate for reduced wild fish stocks, more and more fish are being farmed. Nearly a third of all fish for food is harvested from aquaculture. For every 11 pounds of beef grown globally, there are now 4.5 pounds of farm-raised fish produced. Fish farming causes environmental destruction comparable to the replacement of rain forest with cattle ranches. About 11 pounds of wild ocean fish need to be caught to feed each pound of farmed species. Thailand, which has one of the biggest aquaculture industries, has lost half its mangrove forests due to shrimp farming. Densely stocked salmon farms in British Columbia, Canada, produce waste (including fertilizer, effluent, and fishmeal) equivalent to that generated by half a million people.

Despite these numbers, there is still hope for the world's fisheries. Fisheries can be restored through the adoption of sustainable fishing practices. With the proper incentives, fishers can be encouraged and rewarded in their effort to sustainably manage marine resources. For example, partnerships between local communities and scientists in the central islands of the Philippines resulted in the establishment of marine reserves to help manage overexploited fisheries. The establishment of no-fishing zones in the reserves has increased catches in adjacent fishing grounds. Another solution is to use the power of the market to encourage sustainable fishing practices. The Marine Stewardship Council together with the World Wildlife Federation and Unilever, one of the largest makers of fish products, has developed a certification process that includes a label telling consumers that fish products came from fisheries certified as sustainable.

References: The New Internationalist magazine issue 325, [www.newint.org](http://www.newint.org);  
The United Nations Food and Agriculture Organization, [www.fao.org](http://www.fao.org); Environmental News Service, February 2002, [www.enn.com](http://www.enn.com)

## FISHING LOG

Ocean Group: Fishers:

Record Your Group's Catch & Fish Left in Ocean After Each Season:

Catch				Fish Left in Ocean
Season	High Value Fish	Medium Value Fish	Total Catch	
1				
2				

Describe the status/health of your fishery:

Catch				Fish Left in Ocean
Season	High Value Fish	Medium Value Fish	Total Catch	
3				
4				

Discuss changes in fishing practices or regulations. Are any fisheries in trouble? What did they do and how did that impact your fishery?

# FISHING LOG

Ocean Group: Fishers:

Record Your Group's Catch & Fish Left in Ocean After Each Season:

Catch				Fish Left in Ocean
Season	High Value Fish	Medium Value Fish	Total Catch	
5				
6				

Describe the status/health of your fishery after Season 6:

How could you have made your fishing sustainable?