What's the Stake?

A Hands-On Lesson on Fisheries Management

Presented in Partnership with Northrop Grumman Foundation

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Teacher Introduction

A fishery is a geographic region that contains a population of aquatic species which are a natural resource that needs to be managed. This management requires people from different backgrounds and in different fields, such as stakeholders, scientists, fisherpeople, government groups, and citizens. The goal of managing fisheries is to ensure that the different fish populations will be sustainable and a resource for now and future use. It can be a difficult thing to manage since people in different roles will have different priorities. For example, a fisherman may not favor a limit on the amount of a certain fish caught because it can negatively impact their income. Before you use this activity with your students, please review the concept of sustainability with them. Fisheries need to be a process where fish species are maintained at a certain population in order to ensure their survival, the health of the food web, and the needs of the fisher people and citizens who depend on fish as a source of protein.

Learning Objectives

- Students will re-enact a fisheries management meeting by adopting the roles of various stakeholders in Plymouth (commercial fishers, recreational fishers, environmental groups, citizens, scientists, etc.) and advocate for a certain policy based on their role as a stakeholder.
- Students will compare and contrast the values of various stakeholders and how they can influence management decisions.
- Students will draw conclusions on the interdisciplinary role of science in policy.
- Students will determine the role of economics for various stakeholder groups and how economics assumes a role in policy.
- Students will assess, compare, and contrast the impacts of various stakeholders on the environment.
Resources for Teachers

Vocabulary: The following were adapted from www.dictionary.com

- Commercial fishing: fishing for profit
- Recreational fishing: fishing for leisure
- Stakeholder: an individual with an interest or concern in something
- Sustainability: maintaining the availability of resources for present and future use

Pollock: The Most Fished Fish in the World (video): https://www.youtube.com/watch?v=3UJJlvxEVzc


Materials

- Student Worksheets

Lesson

Engage

Divide students into groups (4-6 students per group). Begin the lesson by asking your students if they have ever been fishing (i.e. recreational, commercial, charter, etc.). Then discuss the concept of sustainability and how it applies to fishery resources and fisheries management with your students. Teachers may use the following video as a resource - Pollock: The Most Fished Fish in the World (video): https://www.youtube.com/watch?v=3UJJlvxEVzc

Explore

Have a class discussion with your students. Guiding questions that can be used are:

- What is the importance of sustainability?
- What are the impacts of removing a species from the environment?
- What is the impact of unregulated fisheries and resources?

Explain

Students should be able to identify various stakeholders in a given situation and evaluate how the viewpoints of different stakeholders vary. This can be demonstrated with a scientific or non-scientific example. The discussion should then focus on the pollock fishery in Plymouth, England by providing a summary of the species (https://www.plymouthfisheries.co.uk/news/2018/3/6/spring-fish).

As an introduction to the activity, teachers should ask students who the relevant stakeholders are in this fishery and demonstrate why they are relevant. Teachers should lead the discussion using the vocabulary words listed under teacher references. It is important to make sure students understand that management agencies play a large role in fisheries resources, even though they are not using them in the same way that a commercial or recreational fisher would. Teachers should review answers from students and guide them to connect social, economic, and ecological factors for each group.
**Elaborate**

Teachers distribute a unique Stakeholder Information handout to each group. Ideally, the management agency group will sit at the front of the classroom, as they will be listening to recommendations from the various stakeholders and making the final policy decision. The management agency will initially present the proposed policy to the class. Once the proposed policy is presented, students will review the Stakeholder Information handout and discuss within their groups how the proposed policy will affect them.

Fisheries management meetings often operate under time restrictions. After discussion within groups, each group will be given 3 minutes to present their argument to the management agency. Students are encouraged to consider economic, social, and ecological aspects in their argument.

If another stakeholder group wishes to respond to the stakeholder group presenting, they will have 1.5 minutes to do so. This time does not affect their 3-minute group presentation. The teacher should encourage questions and further discussion after each group has presented.

After all of the groups have presented and there is no further discussion, the management agency should discuss within their group how to proceed. Teachers should explain that the management agency group may propose to move forward with the current policy, alter the policy, or develop a new policy. The management agency group should explain their reasoning for their actions.

Finally, the teacher should invite students to think about how social, economic, and ecological aspects played a role in the decision and how the decision may impact various stakeholders in the future.

**Evaluate**

Use the assessment rubric to provide feedback to students on their class discussion.
## Assessment

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<tr>
<th>Criteria</th>
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<th>4 Points</th>
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<td><strong>Rebuttal</strong></td>
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<td>The team clearly understood the topic in-depth and presented their information forcefully and convincingly.</td>
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**Total Points**

*Comments:*
Student Worksheet: Stakeholder Information

Stakeholder Information – Commercial Fisher
You are a commercial fisher in the Plymouth sound and enjoy making a livelihood on the water. Many generations of your family have also been commercial fishers and have taught you the proper techniques needed to catch fish. You often target summer flounder using gill nets and bottom trawls. Each year, most of your profit is from harvesting this species. You like to sell this species to local processors, which in return sell to local restaurants. Throughout the years, you have noticed a decline in the number of summer flounder caught. You are unsure if this is due to increasing regulations or because there are less summer flounder in the area.

Stakeholder Information – Recreational Fisher
You are a recreational fisher in the Plymouth sound and have been fishing in the area for years. Your favorite species to fish for is pollock. On occasion, your friends and family from out of town will travel to the area to fish for pollock with you in hopes of catching a large fish. Each weekend, you like to stop at a local gas station to get snacks and drinks before you go fishing. You are concerned that a decline in the number of pollock will force you to start targeting another species that is less enjoyable for you.

Stakeholder Information – Scientist/Researcher
You are a scientist at The University of Plymouth. You have been researching the predator-prey dynamics of pollock. The species typically eat zooplankton, crabs, and other crustaceans. As pollock grow in size they switch diets and feed on bony fish, including juvenile pollock. Predators of pollock include marine mammals, such as seals, whales, and larger bony fish. Due to recent declines in the numbers of pollock, you are concerned that predators of the pollock will not be able to find food, which will result in changes to the food web. You believe that without pollock as a prey item, it is possible for the predators of pollock to decline.

Stakeholder Information – Management Agency
You work for a state management agency that regulates pollock. Based on a recent stock assessment, the agency has determined that overfishing of the fishery is occurring. This means that pollock are being harvested at a rate that is unsustainable. The agency understands that there are many stakeholders involved in the pollock fishery and wants to hold a public comment meeting to hear the viewpoints of various stakeholders on a newly proposed policy. After hearing the comments on the proposed policy, you must decide whether to go forward with the new policy, alter the policy, or develop a new policy. The proposed policy will reduce the annual catch limit of pollock to 1,000,000 pounds. The recreational fishery will be able to harvest 65% of the annual catch limit and the commercial fishery will be able to harvest 35%. The minimum size limit for both industries will be 17 inches. The commercial fishery will only be able to use bottom trawls in specific areas of the Plymouth sound.
Stakeholder Information – Local Citizen
You are a local citizen of Plymouth. You are not involved in the commercial or recreational fishing industry. You enjoy visiting restaurants that offer local seafood on the menu. You feel that it is important to support the commercial fishing industry because they supply local seafood to restaurants. You believe that your community values having local seafood on the menu and that the availability of local seafood encourages people to visit the town.

Discussion Questions:
1. How do economics, ecology, and social values affect decision-making in fisheries management? Provide at least two examples.

2. Based on your role in the re-enactment, do you feel that economics, ecology, or social values most influenced your position towards the proposed policy?

3. What effects do you think the commercial and recreational fishing industry have on the ecology of the summer flounder?

4. If you were the management agency, how would you decide what to do after hearing the views of other stakeholders? Would you go forward with the proposed policy, alter the policy, or develop a new policy? Why?

5. What is the overall common goal for all stakeholders?
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Comments:
Next Generation Science Standards:

5-ESS3-1: 
Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

MS-ESS3-3: 
Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

ESS3.C: Human Impacts on Earth Systems

Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. 3-5: Use evidence to construct or support an explanation or design a solution to a problem.

Australian Standards: Technologies and Society –Investigate how people in design and technologies occupations address competing considerations, including sustainability, in the design of solutions for current and future use. (VCDSTS033)

Examine and prioritize competing factors including social, ethical, economic, and sustainability considerations in the development of technologies and designed solutions to meet community needs for preferred futures. (VCDSTS043)

Investigate the ways in which designed solutions evolve locally, nationally, regionally, and globally through the creativity, innovation, and enterprise of individuals and groups. (VCDSTS044)

UK Science Standards: Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary:

- reporting and presenting findings from enquiries, including conclusions, causal relationships, and explanations of and a degree of trust in results, in oral and written forms such as displays and other presentations
- identifying scientific evidence that has been used to support or refute ideas or arguments
- ask questions and develop a line of enquiry based on observations of the real world, alongside prior knowledge and experience
- the assumption that every effect has one or more cause

References