

RESOURCE LIBRARY
ACTIVITY : 55 MINS

Selecting a Restoration Site in the Chesapeake Bay

Students make a decision about where to implement an action plan for improving water quality in the Chesapeake Bay watershed.

GRADES

6 - 8

SUBJECTS

Biology, Ecology, Chemistry, Geography, Geographic Information Systems (GIS)

CONTENTS

8 PDFs

OVERVIEW

Students make a decision about where to implement an action plan for improving water quality in the Chesapeake Bay watershed.

For the complete activity with media resources, visit:

<http://www.nationalgeographic.org/activity/selecting-restoration-site-chesapeake-bay/>

DIRECTIONS

1. Have students discuss the influence of the stakeholders in an environmental decision.

Set the stage by connecting back to the Stakeholder Table. Remind students that in the previous activities they considered the various levels of influence of the stakeholders before making their decision to select a site and implement the action plan to improve water quality in the Chesapeake Bay. Ask:

- *Which stakeholders do you think have the most influence and why?*

- *Which stakeholders will be most affected by this decision and why? (Answers will vary.)*

Explain to students that throughout this lesson, they have been uncovering the complexity of environmental decisions. So far, students have learned that a first step in making an environmental decision is identifying many of the stakeholders and their level of influence. In this activity, students will explore the potential consequences of the decision to select a site and implement a water improvement action plan.

2. Have students identify the consequences of a decision.

Encourage students to review the student worksheets they have completed for dissolved oxygen, nitrates, and land cover in the Chesapeake Bay watershed. It is important at this stage that students consider all of these variables at once. As they are reviewing, have them highlight any consequences linked to the decision of putting an action plan in place at a certain site.

Then, have students complete a Decision Template for their top three sites. The Decision Statement Template will ask them to calculate the costs associated with different management steps, as this is an important part of the decision.

Once students have identified and budgeted their three options, have them visually illustrate the consequences in a Consequence Web. Ask them to draw a square in the middle of a sheet of paper and write in the square one potential site for the action plan. Then have them write consequences around it in circles in a web-like configuration. Have students think about what additional effects the consequences will have on various stakeholders that they have identified in their stakeholder worksheet. If there are additional consequences, have students add them to the web next to the original ones.

While working through the Consequence Webs, students should have access to FieldScope so they can refer to any maps they have used and analyze them in new ways to help make their decision; for example, they may choose to add different layers, try some of the extension activities that they did not have time to do, or perform different queries.

3. Have students weigh the options and the consequences of implementing the restoration project at each of the sites.

Once students have finished their Consequence Webs and their Decision Statement Templates for three sites, they need to weigh their options and select the best site for the action plan to improve water quality in the Chesapeake Bay watershed based on the evidence they have generated from FieldScope.

4. Have students create a decision statement.

Explain to students that the product of the decision-making process is a decision statement. A decision statement for this project contains three criteria: (1) a statement of the decision that includes one of the six pre-selected sites to implement the action plan, along with the action plan steps needed for that site; (2) evidence from multiple FieldScope maps, stakeholder and consequence analyses, budget, and other sources that support the decision; and (3) a statement of who will positively and negatively benefit from the decision. Ask students to complete a Decision Statement that includes these criteria. They may use the Decision-Making Template to help them organize information and the Decision Statement rubric to make sure they have fulfilled the criteria needed for a complete decision statement. Evaluate the Decision Statements using the Decision Statement rubric as a formal assessment of all activities.

Modification

Step 2: Ask struggling readers to annotate the readings by circling new vocabulary and underlining important phrases or sentences. They can also be paired with more confident readers to help process the text.

Modification

Step 3: Some students may need fewer sites to compare. Consider reducing the number of focus sites to three or four. When working with FieldScope, some students may work better in partners or small groups.

Modification

Step 4: Final Decision Statements can be presented in a variety of ways. For example, students could design a pamphlet or the front page of a newspaper, make a TED talk, or create a PSA.

Modification

Steps 2-4: The Decision-Making Template will help students organize information from the Action Plan. It may be helpful to have student groups complete this template for their top two or three sites to help them make a better decision.

Formal Assessment

Students' Decision Statements are to be evaluated as a formal assessment using the Decision Statement Rubric. Students' decision statements show both knowledge of the decision-making process and application of reasoning to the decision. The decision statement created by students should include: (1) a statement of the decision (what site they select), (2) evidence that supports the decision (using data they collected from FieldScope), and (3) a statement describing who will positively and negatively benefit from the decision.

OBJECTIVES

Subjects & Disciplines

Biology

- Ecology
- Chemistry

Geography

- Geographic Information Systems (GIS)

Learning Objectives

Students will:

- analyze and synthesize information gathered about water quality at six different sites in the Chesapeake Bay
- identify the stakeholders and the various degrees of influence they have in the decision-making process
- identify various consequences from a decision and determine their impact on stakeholders
- weigh the options and the consequences of implementing the restoration project at each of the sites

- make a decision about where to implement a water quality improvement action plan that is based on a water quality analysis done through FieldScope activities and is justified by evidence from this analysis

Teaching Approach

- Learning-for-use

Teaching Methods

- Cooperative learning
- Discussions
- Multimedia instruction
- Reading
- Reflection
- Research
- Writing

Skills Summary

This activity targets the following skills:

- 21st Century Student Outcomes
 - Information, Media, and Technology Skills
 - Information Literacy
 - Information, Communications, and Technology Literacy
 - Media Literacy
 - Learning and Innovation Skills
 - Critical Thinking and Problem Solving
- 21st Century Themes
 - Environmental Literacy
- Critical Thinking Skills
 - Analyzing
 - Understanding
- Geographic Skills

- Acquiring Geographic Information
- Analyzing Geographic Information
- Science and Engineering Practices
 - Analyzing and interpreting data
 - Constructing explanations (for science) and designing solutions (for engineering)
 - Obtaining, evaluating, and communicating information

National Standards, Principles, and Practices

NATIONAL COUNCIL FOR SOCIAL STUDIES CURRICULUM STANDARDS

- Theme 3:

People, Places, and Environments

COMMON CORE STATE STANDARDS FOR ENGLISH LANGUAGE ARTS & LITERACY

- Reading Standards for Informational Text 6-12:

Key Ideas and Details, RI.6.2

- Reading Standards for Informational Text 6-12:

Key Ideas and Details, RI.7.2

- Reading Standards for Informational Text 6-12:

Key Ideas and Details, RI.8.2

- Speaking and Listening Standards 6-12:

Presentation of Knowledge and Ideas, SL.8.5

- Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects 6-12:

Research to Build and Present Knowledge, WHST.6-8.9

NEXT GENERATION SCIENCE STANDARDS

- MS-ESS3: Earth and Human Activity:

Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment

- MS-LS1: From Molecules to Organisms: Structures and Processes:

MS-LS1-5: Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

- **MS-LS2: Ecosystems: Interactions, Energy, and Dynamics:**

MS-LS2-1: Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem

THE COLLEGE, CAREER & CIVIC LIFE (C3) FRAMEWORK FOR SOCIAL STUDIES STATE STANDARDS

- **Geographic Representations: Spatial Views of the World: D2.Geo.2.6-8:**

Use maps, satellite images, photographs, and other representations to explain relationships between the locations of places and regions, and changes in their environmental characteristics.

Preparation

What You'll Need

MATERIALS YOU PROVIDE

- Copies of Action Plan
- Copies of Data Table
- Copies of Decision Template (2-3 copies per group)
- Copies of Letter
- Copies of Stakeholder Table
- Pencils
- Paper for Consequences Webs (2-3 pieces per group)

REQUIRED TECHNOLOGY

- Internet Access: Required
- Tech Setup: 1 computer per learner, 1 computer per small group, Interactive whiteboard, Presentation software

PHYSICAL SPACE

- Computer lab
- Laboratory space
- Media Center/Library

SETUP

Students either need to be at one computer independently or working in a small group. The space should have enough flexibility so groups can move between the computers and workstations easily.

GROUPING

- Heterogeneous grouping
- Homogeneous grouping
- Small-group instruction

BACKGROUND & VOCABULARY

Background Information

This work is modified from the decision-making process called Stakeholder Consequences Decision-Making (SCDM) process. This process is generally used when individuals are at the stage of making a decision. The SCDM process consists of four stages: establishing constraints and considerations, identifying consequences, assessing impact on stakeholders, and weighing impacts on stakeholders. In this activity, we are using a simplified way of introducing the decision-making process to students. For this activity, the decision-making process is based, in part, on stakeholders, but also on environmental conditions and on the project cost. In reality, a variety of stakeholders should be part of the discussion from the beginning, before the decisions are made, and are an integral part of the solution.

Prior Knowledge

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Recommended Prior Activities

- None

Vocabulary

Term	Part of Speech	Definition
consequence	<i>noun</i>	result or outcome of an action or situation.
dead zone	<i>noun</i>	area of low oxygen in a body of water.

Term	Part of Speech	Definition
dissolved oxygen	<i>noun</i>	measure of the amount of oxygen in a substance, usually water.
ecosystem	<i>noun</i>	community and interactions of living and nonliving things in an area.
environment	<i>noun</i>	conditions that surround and influence an organism or community.
intended consequences	<i>noun</i>	results of an action or situation that are deliberately brought about and/or anticipated.
photosynthesis	<i>noun</i>	process by which plants turn water, sunlight, and carbon dioxide into water, oxygen, and simple sugars.
stakeholder	<i>noun</i>	person or organization that has an interest or investment in a place, situation, or company.
unintended consequences	<i>noun</i>	results of an action or situation that are not deliberately brought about and/or anticipated.
water quality	<i>noun</i>	chemical, physical, and biological characteristics of water for a specific purpose such as drinking.
watershed	<i>noun</i>	entire river system or an area drained by a river and its tributaries.

For Further Exploration

Websites

- [National Science Teachers Association: Learning to Make Systematic Decisions](#)

FUNDER



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