NATIONAL GEOGRAPHIC

RESOURCE LIBRARY
ACTIVITY : 55 MINS

Exploring the Chesapeake Bay

Students use FieldScope to explore the geography and patterns of salinity levels of the Chesapeake Bay watershed. Students are introduced to issues around water quality, and identify stakeholders who are affected by water quality issues.

GRADES

6 - 8

SUBJECTS

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

CONTENTS

6 PDFs, 3 Links

OVERVIEW

Students use FieldScope to explore the geography and patterns of salinity levels of the Chesapeake Bay watershed. Students are introduced to issues around water quality, and identify stakeholders who are affected by water quality issues.

For the complete activity with media resources, visit:
http://www.nationalgeographic.org/activity/exploring-chesapeake-bay/

DIRECTIONS

1. Connect to students' prior knowledge about water quality.

Explore students' prior understanding of water quality, and the factors that influence water quality, by asking the following questions:

- *How do we know if water is healthy?* (Student responses may include that it can be tested for pH, chemicals, or the presence of organisms.)
- *What are the reasons for poor water quality?* (Student responses may include pollution, people, waste, and chemicals.)
- *Who needs the water quality to be high?* (Student responses may include all organisms that use the water–for living, drinking, or hygiene.)
- *What would happen to people, and other living things in the area, if the water quality were poor?* (Student responses may include that living things will get sick, be forced to relocate, and some may even die. Students may also mention that the food chain could get disrupted if one organism is reduced or removed from the ecosystem.)

Ask students to share their ideas with the class. The focus of this discussion is to engage students in thinking about issues around water quality and the importance of a healthy watershed for organisms within the ecosystem.

2. Introduce water quality concerns in the Chesapeake Bay Watershed.

Distribute the Letter to Students and the Action Plan to students. Have students read the handouts in small groups. While they are reading, ask students to highlight important pieces of information and to write down questions they have about the letter, or the decision they are supposed to make. Discuss student questions and review important pieces of information (constraints and considerations) as a class.

3. Have students complete the Stakeholders Table.

Brainstorm individuals or groups who may be involved in the decision to select a site to implement the action plan for the Chesapeake Bay watershed. A stakeholder is a person or organization affected by a decision that is made. Stakeholders can represent the interests of the environment, and the plants and animals that inhabit it. Some stakeholders have a strong voice in a decision and are generally part of the decision-making process.

Write the list of stakeholders identified on the board. (For example, residents of the sites, fishermen, people who enjoy recreational activities on the Chesapeake Bay, farmers, organizations that represent the welfare of flora and fauna such as blue crabs, oysters, fish,

bay grasses, Chesapeake Bay ecosystem, waste water treatment plants, recreational businesses, non-profit groups that support bay health, researchers who study the bay, politicians in the bay and surrounding states, menhaden fish and menhaden fisherman.) Remind students that the health of the Chesapeake Bay watershed has a real-world environmental impact and many stakeholders will be influenced by decisions that are made.

Distribute the Stakeholder Table worksheet, and model how to complete the first row. Ask students to work in small groups of three to finish the table; grouping in odd numbers supports a more productive discussion. There are no right or wrong answers to the table. Explain to students that they will consider these stakeholders as they write a decision statement for where to locate the action plan for improving water quality of the Chesapeake Bay.

4. Explore the geography of the Chesapeake Bay Watershed.

Tell students they will use FieldScope to explore the geography of the Chesapeake Bay watershed. Distribute the handout, Exploring the Chesapeake Bay Watershed. Introduce students to FieldScope. National Geographic FieldScope is an easy-to-use online geographic information system (GIS) interface for citizen scientists to map, graph, enter, and understand data. FieldScope supplies base maps and map layers, stream observation data from participants, the ability to graph variables, and tools to query the map. Note: FieldScope works better if you use the Internet browsers Google Chrome or Firefox.

Distribute the student worksheet, Exploring the Chesapeake Bay Watershed. Demonstrate Part I: General Information about the Chesapeake Bay Watershed, and Part II: Switching Base Maps. As you model Part I and II, highlight key FieldScope vocabulary terms that you use. Have students follow along on their worksheets.

5. Have students explore salinity in the Chesapeake Bay Watershed.

Each student, or small group of students, needs to move to a computer with Internet access to open FieldScope. Have students follow the directions for Part III: Salinity Observations in the Chesapeake Bay Watershed on their Exploring the Chesapeake Bay Watershed worksheets. Tell students that the mix of salt and fresh water is one characteristic that makes the Chesapeake Bay an interesting ecosystem with several unique organisms. Students will explore salinity patterns in the Chesapeake Bay using FieldScope.

6. Have students make a connection to the Chesapeake Bay Action Plan decision.

Regroup students and tell them to think about some of the questions from the beginning of the lesson:

- *What are the reasons for poor water quality?*
- *Who needs the water quality to be high?*
- *What would happen to people and other living things in the area if the water quality were poor?*

Ask students to restate why the Chesapeake Bay Watershed Task Force needs their help (to select a site to implement the action plan). Ask students to work in groups of three or four to generate questions they would like to have answered about the sites before they make a decision about what site to select for the action plan. Post these questions around the room. In a discussion, identify common topics raised in questions. Emphasize questions that relate to identifying levels of dissolved oxygen, nutrient levels, and land use to motivate the next activities.

TipTeacher Tip

Step 1: If students do not have the necessary background knowledge, have them explore the resources (for further exploration).

TipTeacher Tip

Step 2: Groups of three or four students work well.

TipTeacher Tip

Step 2: Students need to keep the documents for all of the activities. It might be helpful to have a folder for each group of students to collect and organize their papers for the project.

TipTeacher Tip

Step 4: If students need a FieldScope orientation, have them watch the Chesapeake Watershed Project Help Overview Video and the Chesapeake Watershed Project Help Working with Maps Video.

TipTeacher Tip

Step 5: Students who have not used FieldScope before should refer to the tutorial if they have questions.

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 them understand the text.

When working with FieldScope, some students may work better in partners or small groups.

Modification

Step 4: Students may want to explore their own town or city (instead of Richmond, Virginia) for Part II: Switching Base Maps on the worksheet, Exploring the Chesapeake Bay Watershed.

Informal Assessment

The student worksheet, Exploring the Chesapeake Bay Watershed, can be used to assess learning objective one (Part I of worksheet), objective two (Part II of worksheet), and objective three (Part III of worksheet). Objective four can be assessed informally through discussion at the beginning of class when the teacher is drawing out prior knowledge about water quality and again at the end of class when students are generating questions they need to know to make an informed decision. The Stakeholder Table can be assessed for objective five.

Extending the Learning

Have students explore their local area using different base maps in FieldScope.

OBJECTIVES

Subjects & Disciplines

Biology

- Ecology

Geography

- Geographic Information Systems (GIS)
- Physical Geography

Learning Objectives

Students will:

- explore the geography of the Chesapeake Bay watershed
- explore maps of the Chesapeake Bay watershed
- identify patterns in salinity levels of the Chesapeake Bay watershed
- identify concerns about water quality
- identify stakeholders and the various degrees of influence they have in the decision-making process

Teaching Approach

- Learning-for-use

Teaching Methods

- Brainstorming
- Cooperative learning
- Discussions
- Multimedia instruction

Skills Summary

This activity targets the following skills:

- Geographic Skills
  - Acquiring Geographic Information
  - Asking Geographic Questions
- Science and Engineering Practices
  - Analyzing and interpreting data
  - Asking questions (for science) and defining problems (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:**
MS-ESS3-3: 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

- Paper
- Pencils

REQUIRED TECHNOLOGY

- Internet Access: Required
- Tech Setup: 1 computer per learner, 1 computer per small group, Interactive whiteboard, Presentation software
- Plug-Ins: Active X, Flash, Microsoft Silverlight, Quicktime, Real Player

PHYSICAL SPACE

- Classroom
- Computer lab

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

ACCESSIBILITY NOTES

None

OTHER NOTES

If students need more time to explore background materials and learning FieldScope, Steps 1, 2, and 3 could be done during one 55-minute lesson. Steps 4, 5, and 6 could be done in another 55-minute lesson.

BACKGROUND & VOCABULARY

Background Information

The main science content of this activity includes an introduction to the Chesapeake Bay watershed and issues around water quality. Using GIS technology through FieldScope, students will identify the states and major rivers within the Chesapeake Bay watershed. They will also observe salinity patterns throughout the watershed—higher levels will be found closer to the ocean.

Students will learn that there are concerns about declining water quality. Building on their prior knowledge, students are motivated to investigate variables that influence, or tell something about, water quality: dissolved oxygen levels, levels of nutrients, and land use in different areas. Students will make a decision about where to implement an action plan to improve water quality in the Chesapeake Bay watershed.

Prior Knowledge

["Algae blooms can be an indicator of poor water quality.","One cause of frequent algae blooms (and poor water quality) is too many nutrients—nitrates and phosphorous—in the water.","An effect of frequent algae blooms is that they block sunlight from reaching bay grasses so the grasses cannot grow.","When bay grasses cannot grow, they cannot put oxygen into the water.","Frequent algae blooms and a decline in bay grasses can result in poor water quality.","Poor water quality will lead to a decline in animal populations, such as the blue crab and oysters."]

Recommended Prior Activities

- Introduction to GIS

Vocabulary

Term	Part of Speech	Definition
algae	*plural noun*	(singular: alga) diverse group of aquatic organisms, the largest of which are seaweeds.
blue crab	*noun*	crustacean with a greenish body and blue legs, native to North America.
citizen science	*noun*	science project or program where volunteers who are not scientists conduct surveys, take measurements, or record observations.
dead zone	*noun*	area of low oxygen in a body of water.
estuary	*noun*	mouth of a river where the river's current meets the sea's tide.
geographic information system (GIS)	*noun*	any system for capturing, storing, checking, and displaying data related to positions on the Earth's surface.
habitat loss	*noun*	the reduction or destruction of an ecosystem, making it less able to support its native species.
oyster	*noun*	type of marine animal (mollusk).
photosynthesis	*noun*	process by which plants turn water, sunlight, and carbon dioxide into water, oxygen, and simple sugars.
riparian buffer	*noun*	area of grass, trees, or shrubs near a river bank.
salinity	*noun*	saltiness.
stakeholder	*noun*	person or organization that has an interest or investment in a place, situation, or company.
striped bass	*noun*	marine fish native to the north Atlantic Ocean.

Term	Part of Speech	Definition
water quality	*noun*	chemical, physical, and biological characteristics of water for a specific purpose such as drinking.
watershed	*noun*	entire river system or an area drained by a river and its tributaries.
wetland	*noun*	area of land covered by shallow water or saturated by water.

FUNDER

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