ACTIVITY 14

The Oil Spill – The Rest of the Story

Estuary Principle

Human activities can impact estuaries by degrading water quality or altering habitats; therefore, we are responsible for making decisions to protect and maintain the health of estuaries.

Research Question

How have humans had an impact on estuaries?

Introduction

Most Americans have heard about the terrible 2010 oil spill in the Gulf of Mexico. The oil spill started with the April 20, 2010 explosion on the Deepwater Horizon Oil drilling platform and did not officially end until the well was finally capped in September.

The oil spill from the Deepwater Horizon platform is an example of "point source" pollution. In this case, water pollutants came from one source at a specific location and were eventually stopped by capping the oil well. When people discover a point source of pollution, often they can work to cut off that source of pollution.

Unfortunately the oil that poured into the productive waters of the Gulf during this catastrophic event is only a small part of the total amount of oil that annually enters the rivers, lakes, and coastal waters of our country each year via polluted runoff from the land. Students need to understand that the world's estuaries are damaged on a daily basis by millions of small things, such as cars or boats leaking oil into the watershed hundreds of miles upstream. The non-point source pollution that eventually finds its way into estuaries and the ocean is an ongoing catastrophic oil spill.

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The National Oceanic and Atmospheric Administration (NOAA) and The National Estuarine Research Reserve System (NERRS)

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TEACHER GUIDE

The Oil Spill – The Rest of the Story

Essential Question

How have humans had an impact on estuaries?

Content Objectives

Students will understand that:

- A watershed or drainage basin is an area of land that delivers water run-off, sediment, and dissolved substances to surface water bodies such as rivers, lakes, or oceans.
- Non-point source water pollution moves through a watershed and accumulates in lakes, oceans, and estuaries.
- Polluted runoff can be prevented from getting into waterways.
- Water quality standards are levels of required cleanness that are set by State and Federal agencies to ensure people's health and give guidance to maintaining the health of waterways .

Exercises

Exercise 1: Watershed in a Box

Students exhibit their understanding of how non-point source water pollution enters the estuaries via the watershed by building a watershed model and using it to explore surface runoff.

Exercise 2: Water Quality Limbo

Students demonstrate an understanding of best management practices and how these practices influence keeping water clean by playing a game of water quality limbo.

Exercise 3: Say No to Non-Point Source Pollution

Students predict how possible ways to limit or prevent non-point source water pollution in the estuaries could be carried out by students or larger teams within the community.

Assessment Questions

Assessment questions based on content covered in *The Oil Spill – The Rest of the Story* can be downloaded on the web page for this activity in the Middle School Curriculum section of the Estuary Education website at estuaries.noaa.gov.

Vocabulary

Estuary – is a semi-enclosed body of water which has a free connection to the open sea and within which seawater is measurably diluted by fresh water derived from land drainage.

Drainage basin – or watershed is an area of land that delivers runoff water, sediment, and dissolved substances to surface water bodies, such as rivers, lakes or oceans. Every watershed consists of boundaries and the basin or collection area they surround.

Groundwater – water contained below ground in soil and rock.

Impermeable – not permitting passage through a substance or impervious material.

Non-point source pollution – refers to water contamination coming from many different sources, rather than a single, distinct source. Examples include petroleum products from the many roadways in a city or pesticides from many adjacent farms.

Pollution – contamination of natural environment.

Point-source pollution – water contamination from a single source at a specific location, such as a sewage outfall or oil spill.

Runoff – precipitation that drains into a water body from the surface of the surrounding land.

Taking It Further

Reusable Watershed in a Box

If you are looking for a reusable watershed model to use with your class instead of the disposable aluminum pan watershed model described in Exercise 1, please examine this extension found on the web page for this activity in the Middle School Curriculum section of the Estuary Education website at estuaries.noaa.gov. With a small amount of light construction, you can make a reusable watershed model that can be used over-and-over again to examine water runoff to creeks, rivers, lakes, wetlands, and estuaries.

EXERCISE 1

Watershed in a Box

Estuary Concept

While point-source pollution from something like an oil spill is devastating, non-point source pollution can actually be more damaging to fragile estuaries in the long-term.

Focus Question

What are the sources of water pollution in the estuaries?

Performance Tasks

Students will:

- Define the term watershed (also called a drainage basin).
- List several types of land cover typically found in a watershed.
- Explain what polluted runoff is.
- Differentiate between "point source" pollution and "non-point source" pollution.
- List at least five examples of non-point source pollutants in a watershed.
- Explain how changes in land use might affect the water quality in streams and rivers.
- List several ways to prevent polluted runoff from getting into waterways.

Teacher Background

How land is used is an important factor in determining the types and amounts of non-point source (NPS) pollutants being carried away from the land as precipitation runs off and moves downstream within the watershed. Pollutants common in rural areas are often different than pollutants found in urban areas.

In rural areas, the most common NPS pollutants are sediments due to soil erosion and nutrients from either agricultural fertilizers or from animal waste. Animal waste also has the potential for adding bacteria to runoff. Runoff from agricultural areas, construction sites, and from other areas of land disturbance carries these NPS pollutants into rivers, streams, and other bodies of water.

Urban areas have different types of NPS pollutants. In cities, the increased amount of pavement leads to faster runoff from rainfall as the water is unable to saturate the ground and percolate into the groundwater. Runoff from paved areas can contain NPS pollutants. Oil and chemicals can wash off of roads, parking lots, and driveways. Fertilizers and pesticides can wash off of lawns. Sediment can be carried away from construction sites. Bacteria can enter the water from failing septic tanks and sewer lines or from the improper disposal of pet waste. Other common NPS pollutants include salts, oil, grease, toxic chemicals, and heavy metals.

Overview

In this exercise, students begin their study of estuary water pollution by viewing a video on the 2010 Gulf oil spill and point source water pollution. Students then build a simple watershed model or box to explore how non-point source water pollution travels through watersheds and accumulates in estuaries.

Time Required

Two 45 minute class periods

Just because there are potential sources of NPS pollutants in both rural and urban areas doesn't mean that those places are always heavy polluters. Proper cultivation and use of ground cover on farms reduces soil erosion. Wastewater treatment works when septic tanks and sewer lines are properly maintained and operated. Proper disposal of oil and household chemicals helps keep them out of city storm sewers. With work, NPS pollutants entering watersheds and estuaries can be reduced, even if they perhaps cannot ever be eliminated.

Teacher Preparation

1. Watch the video about the 2010 Gulf of Mexico oil spill found on the web page for this activity on estuaries.noaa.gov. You'll find multimedia and other resources for this activity in the Estuaries 101 Middle School section of the website.
2. Watch the video, *Building a Watershed Model*, to become familiar with the procedures students follow to build their model watersheds.
3. Buy large disposable, aluminum roasting pans for your students to use as their watershed model base. These pans are readily available, and can be rinsed and reused several times.
4. Newspaper works best for the crumpled paper to support your watershed land forms and is readily available.
5. To avoid a sticky mess, purchase only unsweetened powdered drink mixes to use in this exercise. You need several flavor colors (red, green, purple) to represent fertilizer, pesticides, and oil from roads. Unsweetened hot cocoa mix is used to represent soil. The salt shakers are optional, but will make distributing the drink mixes easier and more even.
6. Make copies of Student Master: *Watershed in a Box*.

You'll find multimedia and other resources for this activity in the Middle School Curriculum section of the Estuary Education website: http://estuaries.noaa.gov.

Procedure

1. Show your students the video of the 2010 Gulf of Mexico Oil Spill. Ask students to describe what they think the oil spill impact was on estuaries. Ask the students if they can name other impacts on the estuaries. Record student responses for future discussions.
2. Distribute copies of Student Master: *Watershed in a Box*. Use the watershed diagram to introduce students to the concept of watersheds. Point out all of the land and water features. Ask students where the water in the watershed comes from and how it eventually ends up in lakes, estuaries, and the ocean.
3. If you have a local watershed with a drainage basin create a Google map of the area and let students use it to design their watershed for this project. You can also use the watershed illustration found on the Teacher Master: *Weeks Bay Watershed Land Use Map* as a guide.
4. Students will follow the instructions on the Student Master: *Watershed in a Box* to build and use their watershed model.
5. In Steps 1–4 on the Student Master: *Watershed in a Box*, students will construct a model of a watershed that includes a valley with central waterway and tributaries and an estuary.
6. In Steps 5–6, students designate areas for different types of land use in their

Materials

Per student

- Student Master: *Watershed in a Box*

Per team

- 1 aluminum roasting pan
- Permanent markers, variety of colors
- Crumpled paper
- Aluminum foil
- 2 types of unsweetened powdered drink mixes
- Unsweetened hot cocoa mix
- 3 empty salt shakers (optional)
- Spray bottle with water

model watershed.

7. In Steps 7–12, students demonstrate non-point source pollution run-off from agriculture, urban, and forest lands using their watershed model.
8. You may want to discuss the watershed diagram and have students build their watershed models in the first class period, and then have students use the model in the second class period. This will allow adequate time for both clean up and class discussion.
9. When students have completed the activity and cleaned up, have students answer the questions found at the bottom of the Student Master. You may choose to have students write out their answers on a separate sheet of paper, either individually or in their small groups. Students might be asked to be prepared to discuss their answers in class.

Questions and Possible Answers

Q1. What is a watershed?

A watershed or drainage basin is an area of land that delivers runoff water, sediment, and dissolved substances to surface water bodies, such as rivers, lakes or oceans. Every watershed consists of boundaries (divides) and the drainage basin they surround.

Q2. List several types of land cover and land uses found in your watershed model.

Students should be able to list and/or point out using their watershed model/box examples of land cover (e.g., meadows, wetlands, lakes, forests) and land use (e.g., crops, parking lots, roads). Students may understand that plants help prevent soil erosion.

Q3. When the polluted runoff from the farm and urban areas flowed into your model's estuary, was it easy to tell where it came from? Why or why not?

By the time pollutants reached the estuary, they had blended together. It was no longer possible to tell what they were or where they came from.

Q4. Water pollution is often categorized in two ways:

Non-point source water pollution comes from many different sources, such as oil and gas from the many roadways in a city or pesticides from many adjacent farms.

Point source water pollution is pollution from a single source at a specific location, such as a sewage outfall or oil spill.

Based on those two above definitions, answer the following:

Runoff enters an estuary from an urban area upstream. The runoff is carrying cooking oils from restaurants and salt washed from streets after winter snows. **Is this an example of point source or non-point source pollution?**

The pollution coming from many different urban sources is non-point source pollution.

An oil supertanker sinks in a storm and results in an oil spill. **Is this an example of point source or non-point source pollution?**

The pollution coming from a single wrecked oil tanker at a specific time and location is an example of point source pollution.

Q5. The estuary is located near the ocean, which is the final stop for all the water draining out of the watershed. How do you prevent water pollutants from the watershed from entering the estuary?

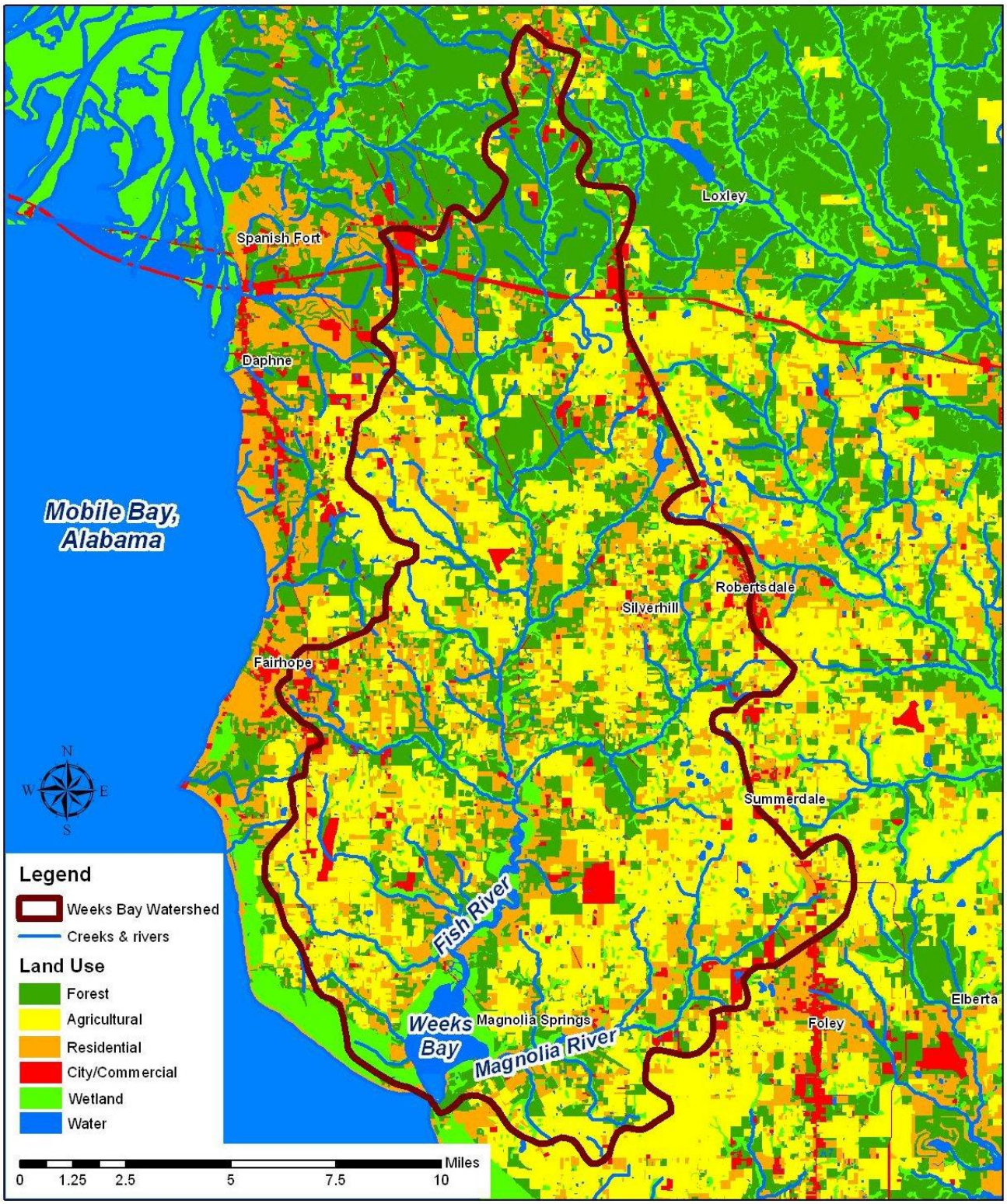
Water moves downhill in a watershed, making its way to the ocean. The estuary is where the rivers meet the ocean. The only way to prevent pollutants from the watershed from polluting the estuary is to control water quality throughout the watershed and reduce the amount of pollutants reaching the estuary.

Q6. The title of this exercise is, *The Oil Spill – The Rest of the Story*. What is the rest of the story?

The oil that poured into the productive waters of the Gulf during the 2010 oil spill is only a small part of the total amount of oil that annually enters the rivers, lakes, and coastal waters of our country each year via polluted runoff from the land. Students may suggest that the world's estuaries are damaged on a daily basis by the non-point source pollution in the watershed upstream from the estuary.

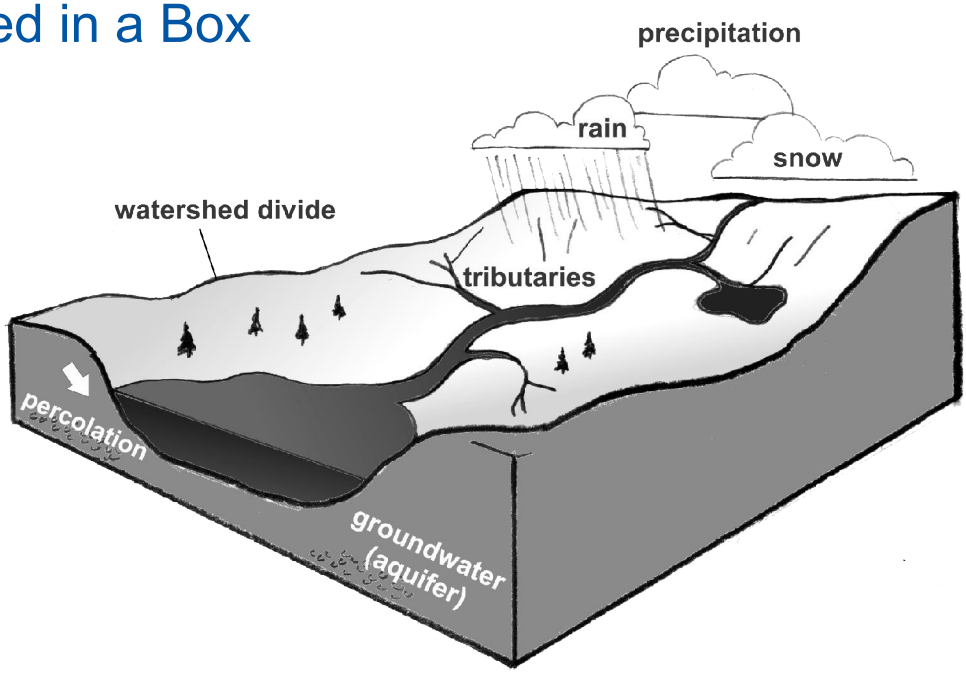
TEACHER MASTER

Weeks Bay Watershed Land Use Map



STUDENT MASTER

Watershed in a Box



A watershed — or drainage basin — is an area of land in which much of the precipitation that falls runs off to the same downhill location. Every watershed consists of boundaries (also called divides) and the basin they surround. The water within the watershed flows from higher elevations to lower elevations moving toward the basin.

The runoff water and whatever is carried with it gets carried into surface water bodies, such as streams and tributaries, rivers, lakes or oceans and into the groundwater. In this exercise, you are going to build your own model watershed and use it to explore how water and pollutants move through the watershed.

Procedure

1. Arrange pieces of crumpled paper in the bottom of the aluminum pan to represent hills and landforms of the watershed.
2. Cover the crumpled paper land forms with a large piece of aluminum foil, shiny side up.
3. Use a blue permanent marker to draw the river and streams in the main valley and tributary valleys of your model. Draw directly on the foil.
4. The area at the lower end of the river is your model's estuary. If the model were larger, you might see that eventually the estuary would lead into the ocean.
5. Use permanent markers to show different ways in which land is naturally covered in the watershed. Draw directly on the foil and show things such as fields, wetlands, forests, pastures, etc.
6. Shake unsweetened hot cocoa mix onto one of the field areas. This will represent an area of bare soil.
7. Next use markers to draw places on your watershed model that reflect how humans use the land. Draw such things as roads, homes, shopping centers, cities, factories, parking lots, etc.

Materials

Per student

- Student Master: Watershed in a Box

Per team

- 1 aluminum roasting pan
- Permanent markers, variety of colors
- Crumpled paper
- Aluminum foil
- 2 types of unsweetened powdered drink mixes
- Unsweetened hot cocoa mix
- 3 empty salt shakers (optional)
- Spray bottle with water

8. Continue work on the watershed model by using a different color powdered drink to represent different pollutants.
9. Start by shaking one of the pollutant colors on an agriculture area of your model.
10. Shake another pollutant color on an urban area.
11. Use the spray bottle to gently mist water onto your agricultural and urban areas. What does this water represent? Record what happens to the rain falling on these areas. Where does the polluted runoff go?
12. Describe what happens when two different pollutants run into the same area.

Questions

Q1. What is a watershed?

Q2. List several types of land cover and land uses found in your watershed model.

Q3. When the polluted runoff from the farm and urban areas flowed into your model's estuary, was it easy to tell where it came from? Why or why not?

Q4. Water pollution is often categorized in two ways:

- Non-point source water pollution comes from many different sources, such as oil and gas from the many roadways in a city or pesticides from many adjacent farms.
- Point source water pollution is pollution from a single source at a specific location, such as a sewage outfall or oil spill.

Based on those two definitions, answer the following:

Runoff enters an estuary from an urban area upstream. The runoff is carrying cooking oils from restaurants and salt washed from streets after winter snows. Is this an example of point source or non-point source pollution?

An oil supertanker sinks in a storm and results in oil spill. Is this an example of point source or non-point source pollution?

Q5. The estuary is located near the ocean, which is the final stop for all the water draining out of the watershed. How do you prevent water pollutants from the watershed from entering the estuary?

Q6. The title of this exercise is, *The Oil Spill – The Rest of the Story*. What is the rest of the story?

EXERCISE 2

Water Quality Limbo

Estuary Concept

People use water quality standards to help monitor and control sources of water pollution. In that way, people are responsible for making decisions and taking actions that have a positive impact on estuaries.

Focus Question

How do agencies that monitor and regulate water quality help protect estuaries while still allowing people to enjoy these natural resources?

Performance Tasks

Students will:

- Understand that water quality standards are levels of required cleanness set by State and Federal agencies to ensure people's health and give guidance to maintaining the health of waterways.
- Identify three levels of water quality based on whether water is safe to drink, to swim in, or to fish in for food.
- Explore different best management practices that are used to treat or clean water to meet specific water quality standards.

Teacher Background

The U.S. Environmental Protection Agency (EPA) works to improve the quality of estuaries. The EPA develops plans for reaching and maintaining water quality in an estuary. The goal of these plans is to: protect public water supplies; to protect and propagate a balanced, indigenous population of shellfish, fish, and wildlife; and to allow recreational activities in and on the waters of the estuaries wherever possible. The EPA achieves these goals by monitoring and controlling point and non-point sources of pollution.

Many federal and state agencies, including the EPA, work together to monitor the water quality and ensure the safety of water in rivers, estuaries, lakes, as well as the groundwater. These agencies and other local units of government are responsible for determining the quality of water, for setting acceptable or safe drinking-water standards, for monitoring changes in water quality, and for recommending best practices for water quality improvement.

Water quality standards are established based on the assumption that drinking water with levels of organic or inorganic compounds above a designated limit could cause health problems. Water sources that are used for human consumption must meet the highest water quality standards. Water bodies that people swim in have slightly lower water quality standards, followed by water used as wildlife habitat.

Today, non-point source (NPS) water pollution remains the nation's largest source of water quality problems.

Overview

Students will examine how the laws and policies created by regulatory agencies influence water quality and serve to limit non-point and point source pollution. Students will learn about best management practices with regard to activities or actions that can help protect estuaries and water quality.

Time Required

One 45-minute class period

Recommended

Margaret Sedlecky, Education Coordinator at the Weeks Bay Reserve in Alabama, recommends the activity, *Reaching Your Limits*, from Project WET International Foundation.

Teacher Preparation

1. Prepare the frame for use in the limbo game:
   a) Make two poles using thick dowels or PVC pipe. Drill holes 2 inches apart along the length of each pole.
   b) Insert nails for each hole in both poles.
   c) Cut a lightweight stick approximately 5ft. long to rest on nails between the poles.
   d) Use 2 flag stands, or Christmas tree stands, or build wooden stands to support the standards upright.
   e) Assemble your limbo stand and choose a limbo song (if any) before class.
2. Make copies of Student Master: *Water Quality Playing Cards*.

Procedure

How Can You Tell if Water is Safe to Drink?

1. Begin this lesson by showing students a glass of water. Ask how they might be able to tell if the water is safe to drink. Have students list things they would like to know about the water before they drink it. Ask why they would drink water from a faucet, but probably not from a stream?
2. Next show students three cups of water (2 with clear water, 1 with dirty water).
3. Pass around the 3 cups of water and ask the students to look closely at the water and to smell it, but warn them not to touch or taste it. Ask the students if they would consider drinking any of the water and, if not, why.
4. Once the students have passed all 3 containers back to the front, tell them that although the 2 clear water samples may look and smell clean, one sample was taken from the kitchen tap and the other was taken from the toilet! (Not really, but it could have been!)

Water Quality Standards

5. Explain to students that water quality standards are levels of required cleanness that are set by state and federal agencies to ensure people's health. City, state and federal agencies frequently test drinking water and water bodies that people swim in to make sure they are safe. If the water does not meet the cleanness requirements (water quality standards) for its intended use, steps are taken to either clean it or a warning is issued not to swim or fish in the affected area until it is safe.
6. Because water bodies (lakes, ponds, rivers, bays, oceans, etc.) that people swim in and that wildlife uses are so large, it would be too costly if not impossible to clean these waters once they become polluted so we must all help prevent pollution from getting into the water.
7. Ask students to brainstorm a list of things people do that pollute water. Then brainstorm a second list of things people can do to prevent water from becoming polluted (best management practices). Check items in the two lists against the items found on Student Master: Water Quality Playing Cards. Use

Materials

Per class

- 2 freestanding support poles with holes drilled 2 inches apart along the length for limbo game
- Nails for each hole drilled into the support poles
- 5ft long limbo-stick (wood or plastic dowel, thin wood molding, etc.)
- Limbo song to play during activity (optional)
- Student Master: *Water Quality Playing Cards*
- 3 clear cups or beakers
- 2 cups containing clear tap water
- 1 cup dirty water (containing soil)
- 15-20 3"x5" index cards

the student ideas to create additional playing cards; a separate table with blank cards is provided. Add the students' cards to the cards from the Student Master. Mix all of the cards together, and place them face down on a table or desk near the limbo stands and pole.

8. Tell students they are going to play the game of "limbo" to demonstrate the amount of effort required to treat or clean water to meet specific water quality standards. The height of the limbo bar represents how clean the water is. Students making it under the bar symbolize successfully treated water. As water becomes more polluted, the bar is lowered and the effort required to meet the standard gets more difficult.
9. For the purposes of this lesson and the limbo game described below, you will use three water quality standards:
   a) The highest (cleanest) standard is for water that people drink. Treating drinking water involves filtering the water, allowing sediments to settle, and adding a disinfectant (such as chlorine) to kill bacteria and other disease causing organisms (pathogens). Sources of drinking water include reservoirs, rivers, ground water, etc.
   b) The second water quality standard is for water that people swim in. Water bodies designated for swimming do not have to be as clean as water that people drink.
   c) The third water quality standard is for fish and wildlife to use. Water designated for use by wildlife is the least clean in our game.

Water Quality Limbo

10. Set the limbo bar at the median height position (i.e., the height at which half the students are taller and half are shorter). Most students should be able to pass under the bar at this height. This means little effort is needed to meet water quality standards.
11. Have students line up. Each "round" begins with a student drawing a water quality card from the top of the stack and reading it to the class. Have the students determine if the statement on the card would raise or lower the "cleanness" of the water. Move the bar up if the card's message improves the water quality and down if the message lowers the quality.
12. Once the pole has been moved, every player must try to go under the pole, "limbo style," following these rules:

Limbo Rules

a) Each player must pass under the limbo pole stomach side up,

b) No part of the player's body can touch the floor or the pole at anytime,

c) A player is declared "safe" only if their entire body has gotten past the pole in the correct way,

d) Students are out of the game if any of the above rules are broken.

e) The game continues in this manner with each player getting a chance to draw and read a water quality card.

f) When no students are able to make it under the bar "limbo style," this means the water is too polluted to meet the water quality standard for

which it was designed and the activity/game ends.

13. When students have completed the activity and straightened up, lead a class discussion of the following discussion questions:

Questions and Possible Answers

Q1. How do we know if water is safe for us to drink, to swim in, or for wildlife to live in?

Water sources must be tested by area agencies responsible for overseeing and regulating water safety. This may include agencies such as the health department, state and/or federal environmental management organizations.

Q2. Can you tell if water is safe to drink or swim in by looking at it and smelling it?

No, not always. Water may look and smell clean, but still contain pollutants or pathogens. Sometimes water may smell funny, but still be safe to drink. Appearance and smell are not reliable in determining water quality.

Q3. What kind of tests would you need to do on water before you could tell if it was safe to drink?

Depending on the designation of the water body (drinking, swimming, wildlife) specific tests would have to be done for chemical content and disease causing bacteria (pathogens).

Q4. Who is responsible for making sure identified point sources of water pollutants are working to reduce pollutants and help meet local and regional water quality standards?

The EPA, state and local health departments, and environmental agencies all may monitor known polluters.

Q5. Who is responsible for the non point sources of pollution that move downstream and wind up polluting the nation's estuaries?

Polluted runoff comes from non-point sources of water pollution. Everyone contributes to non-point source pollution, so we are all somewhat responsible for the polluted runoff that negatively affects the estuaries.

Q6. List several ways you personally can help keep our water ways clean.

These may include such things as following the directions carefully when using fertilizer and pesticides on your lawn, keeping animal waste away from near-by water ways, maintaining your home's septic tank, picking up litter, putting mulch on bare soil to prevent soil erosion, and maintaining the family car so it does not leak oil.

STUDENT MASTER

Water Quality Playing Cards

Cut out the playing cards on the next two pages. Write students' ideas on the blank cards.

Increase Water Quality	Decrease Water Quality
People can keep a trash bag in their car to dispose of litter properly.	People throw trash from their cars as they travel along roads. This trash washes into streams during heavy rains.
Cattle owners should fence off creeks or streams that flow across their property to keep cows out of the water.	Cows that have access to a stream or creek pollute the water with their excrement.
Homeowners should read and follow lawn care product (fertilizer & pesticides) labels carefully.	Overuse of lawn care products cause water quality problems when rain washes pesticides and fertilizers into storm drains.
Septic tanks should be checked and pumped out every three years to ensure they are functioning properly.	Failing septic tanks leak sewage into groundwater and nearby streams.
Planting crops on the contours of the land helps prevent soil erosion.	Erosion from improperly plowed cropland can flow into nearby streams.

Increase Water Quality	Decrease Water Quality
Sediment fences help stop sediment from entering waterways around construction sites.	During heavy rains, sediment runs into streams from construction sites.
Strips of vegetation should be left along creeks and streams to help prevent erosion when forests are cut by timber companies.	Clear-cutting forests along waterways without leaving vegetation along the edges causes sedimentation of streams.
School groups or clubs can stencil storm drains to inform the public not to pour oil, grass clippings or leaves down the drains. This will make people aware that the drain leads to a larger body of water such as the bay.	People often throw grass clippings and leaves into storm drains, which carry both water and grass clippings to streams, rivers, and bays. The rotting plant material uses dissolved oxygen in the water causing fish kills.
Students and civic organizations can “Adopt a Stream” and pick up trash from along the stream banks and bridge crossings.	People often use overpasses along streams and rivers as dumpsites for waste.
People who smoke can dispose of used cigarettes in proper waste receptacles.	Cigarette butts are not biodegradable. People throw them into the water where birds and other animals mistake them for food.
Many marinas provide pump out stations for boaters allowing sewage to be properly contained in a holding tank until it is taken to a sewage treatment plant.	Cargo ships and boats dump tons of garbage into the world’s oceans each year.

Increase Water Quality	Decrease Water Quality
Boaters should be careful when adding fuel or oil to their boats so spills do not pollute the water.	Oil and fuel can leak from improperly cared for boats, thus polluting waterways.

EXERCISE 3

Say No to Non-Point Source Pollution

Estuary Concept

Individual citizens are responsible for making personal and community-based decisions that can reduce water pollution and help protect and maintain the health of estuaries.

Focus Question

How can you prevent water pollution that could harm estuaries?

Performance Tasks

Students will:

- Identify types of pollution found in watersheds and estuaries.
- Identify good ideas to prevent pollution in estuaries.
- Understand that, no matter where you live in the watershed, you can help decrease the levels of non-point source pollution that contribute to estuary pollution.

Teacher Background

In the absence of a major disaster such as the 2010 Deepwater Horizon oil spill, much of the water pollution in our nation's waterways, estuaries, and coastal ocean waters is due to non-point source pollution. With over half of the U.S. population living near the coasts, some pollutants enter the ocean along the coasts directly and may enter estuaries from the sea. However, most of the pollution in our estuaries has come from non-point sources, somewhere within the watershed, perhaps hundreds of miles away.

A point source can cause high concentrations of pollutants in nearby waters, but the accumulated pollutants from millions of non-point sources throughout a watershed may, in fact, deliver much higher amounts of pollutants into estuaries and coastal ocean water. Controlling non-point source pollution is critical to maintaining estuary health.

Preparation

Make copies of Student Master: *Say No to Non-Point Source Pollution*

Procedure

1. Ask students what the difference is between point source and non-point pollution. Present your students with this analogy:
2. Which would you rather dispose of: a whole year's garbage from one family or a single day's garbage from a town of 1000 families?
3. Non-point source pollution is the equivalent of the garbage from 1000

Overview

In this exercise, students use prior knowledge about water pollution and water quality standards to examine water pollution solutions. Students are asked to identify good ideas for things people can do to lessen the impact of non-point source (NPS) water pollution on estuaries.

Time required

Half of one 45-minute class period

Materials

Per team

Student Master: *Say No to Non-Point Source Pollution*

families. If you take the accumulated pollution from hundreds, thousands, even millions of tiny sources within a watershed, the total amount of pollution is bigger than one single oil spill or one incident of accidental sewage overflow.

4. Ask students to read Student Master: *Say No to Non-Point Source Pollution*. Students make a list of good ideas to stop water pollution. Students then choose their favorite idea and predict what would happen if they could actually put a team of people together to carry out that good idea.

STUDENT MASTER

Say No to Non-Point Source Pollution

Estuary pollution starts upstream, perhaps hundreds of miles away, deep inside the watershed. No matter where you live in the watershed, you can help decrease the levels of non-point source (NPS) water pollution that contribute to estuary pollution. Take a look at the following good ideas for fighting water pollution:

Good Idea	Description
Properly dispose of oil and household chemicals.	If there's a leak of gasoline or oil from your car or lawnmower, have it fixed immediately. Do not dump old oil into storm sewers when changing the car's oil. Do not flush old prescription or non-prescription medicines. Take household chemicals (cleaners, paint, pesticides, etc.) and expired medicines to neighborhood Hazardous Chemical days and have professionals dispose of them properly.
Use lawn and garden products wisely.	Fertilizers used on lawns and gardens can lead to increased levels of nutrients and chemicals in runoff and groundwater. Read the labels on the package and do not over apply. Insecticides and herbicides can also cause problems and need to be used with care.
Let the water soak into the ground.	The best idea is to let water soak into the ground. This decreases rapid runoff, which decreases the chances of flooding and soil erosion. If your family washes your car at home, park it on the grass instead of on the driveway when you wash the car. That way the water will soak into the ground instead of running off into the storm sewer.
Recycle glass, paper, and plastic.	Organize a neighborhood or town Clean Up Day to remove paper, plastic, and glass garbage from roadsides, etc. The less waste there is, the less waste there will be washed into storm sewers or making its way down rivers and streams.
Control animal waste.	Pet waste (e.g., dog poop) is another non-point source of excess nutrients (and harmful E.coli bacteria) in the water. Make sure everyone picks up after their pets and disposes of pet waste properly.

Procedure

1. Can you think of any additional ideas for reducing the NPS pollution that pollutes the estuaries? Record your ideas on a separate sheet of paper.
2. Choose your favorite idea from the table above and from your list of additional ideas. Is this idea something you can do yourself or does it need a larger group or team? Is it something for individuals to carry out or does it require community effort? Predict what would happen if you could actually put a team of people together to carry out that good idea. Write your prediction on a sheet of paper.