

Rob the Ridley Watershed Lesson Plan



How Our Water Use Affects our World

Activity Summary

This activity allows students to physically see how our water use affects the local watershed and organisms that live here. While learning background information, the students will be asked open ended questions before participating in an experiment.

Objective

Students will learn what a watershed is and how it works. They will identify the various ways we use water including municipal, agricultural, industrial, recreational, and electrical generation.

Students will be able to define and identify point sources and non-point sources of pollution.

They will also learn how humans impact our local watershed.

Students will learn how our local watershed directly influences sea turtles in their ecosystem.

TEKS:

Elementary school:

3rd grade: 1A, 2A, 10A

4th grade: 1A, 2A, 10A

5th grade: 1A; 2B- F, 4B, 9A-C

Middle school:

Grade 6: 1A, 2A-C, 2E, 3A&D, 4B,

Grade 7: 1A, 2A, 2C&E, 3A, 10B,

Grade 8: 1A, 2A, 2C&E, 3A&D, 11C&D

High School:

Aquatic Science: 1A, 2E-H, 3E, 11B, 12A-E

Biology: 1A, 2E, 2G, 3B, 11B, 12D, 12F

Environmental Systems: 1A, 3B, 9A-B, 9E-F

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Background

The Gulf of Mexico produces some of the best fisheries in the world. Bordered by five U.S. states and 6 Mexican states, this area serves as an economic and ecological driver for both countries. "The Flower Garden Banks National Marine Sanctuary in the Gulf of Mexico is a underwater treasure trove of biodiversity. It is home to endangered sea turtles like the Kemp's ridley and many other type of fascinating marine wildlife," said Joanna McWilliams of Turtle Island Restoration Network.

There are seven species of sea turtles in the world and five can be found in the Gulf of Mexico. All five have been documented to nest on our shores, however, other than Mexico, Kemp's Ridley sea turtles only nest in Texas. They are also the Texas State Sea Turtle and one of the most critically endangered species in the world. All sea turtle populations have suffered from anthropogenic issues (human caused), including shrimping, oil spills, hook and line interactions, climate change and habitat alteration.

Female sea turtles return to the beach they hatched from to lay their eggs and then go back to sea. Male turtles never return to land after they hatch. The babies spend about 45-60 days incubating in the sand before hatching, and then immediately they venture towards the water. (There are indications that the sand is warming due to climate change, meaning that the sex ratio could be altered.) Many predators try to eat them throughout their lifespan, but as tiny eggs or hatchlings they encounter the most predation.

Only one in 400 eggs will make it to adulthood. Once in the water, the tiny turtles will travel hundreds of miles to float with seaweed out in the open ocean. When they are a little larger, they will venture to certain areas they utilize as foraging grounds. Different species eat different things, so these locations vary. One area that loggerhead and green turtles go to is Flower Garden Banks National Marine Sanctuary off the coast of Texas and Louisiana. There are also areas they designate as breeding grounds, where adult female and male turtles meet to procreate.

Kemp's Ridley turtles travel throughout the Gulf, and around the Atlantic extending as far north as New England. Other species travel the entire world, mostly staying in temperate zones.

Point source pollution: The U.S. Environmental Protection Agency (EPA) defines point source pollution as "any single identifiable source of pollution from which pollutants are discharged, such as a pipe, ditch, ship or factory smokestack" (Hill, 1997). Factories and sewage treatment plants are two common types of point sources. This type of pollution is fortunately less common these days due to rigorous restrictions and fines for any incidents.

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Nonpoint source pollution: Most nonpoint source pollution occurs as a result of runoff. When rain or melted snow moves over and through the ground, the water absorbs and assimilates any pollutants it comes into contact with. Examples include agricultural and urban runoff.

Both types of pollution coming from the Mississippi River can make it as far out as Flower Garden Banks National Marine Sanctuary, especially following periods of heavy rainfall.

Materials:

Lesson Plan

Rob the Ridley Activity:

Rob the Ridley Data and Observation Sheet (enough copies for the class)
Measuring spoons
Watershed activity kit
Food coloring
Brown sugar
Water
Molasses
Shredded paper

Procedures:

A. Introduction to water uses.

- Introduce vocabulary: agricultural, electricity, industrial, municipal, non-point source pollution, point- source pollution, recreational, turbidity. Definitions are included throughout this lesson plan.
- Ask students to define a watershed and what activities are included in the local watershed.

B. Students read each description and answer the questions below.

Agricultural

The two main agricultural uses of water are ranching and farming. Water is a necessity in keeping farming and ranching equipment clean as well as keeping plants and animals alive. In farming, run off from plants often carry a variety of pesticides and ranching requires water to not only hydrate the animals that live there but keep them and their area clean as well.

What is irrigation? Irrigation is the watering system that provides water to crops with special sprinklers or through canals.

What are some crops grown in Texas? Various vegetables, fruit, cotton, rice, trees etc.

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Where are most of the farmlands found in Texas? Central Texas

Are there alternatives to reduce the amount of pesticides used in agriculture? Organic

Electrical

Water is used to generate electricity by forcing giant turbines to turn as the force of the water flows through them. This is a good use of water and renewable resource, as the water is already running downstream.

Industrial

Some thermoelectric power plants use what is known as once-through cooling, a process that pulls in cool river, lake or coastal water to lower the temperature of the steam and equipment in a plant and then release the heated water back into the environment.

Where in our area can we see a lot of power plants? Texas City, along the Houston Ship Channel and the Gulf.

Are these industries important? Yes, these plants provide energy to various parts of Texas. Some of these industrial businesses provide other types of energy such as fuel for our cars and machines.

What are some alternative forms of energy? Solar, wind and hydro

Do you have family or friends who work in this industry? Various answers.

Can you think of a different way to cool the steam and equipment? Various answers, wind cooling systems, recycled water systems.

Municipal

Municipal water includes any water that cities or towns provide to the people living there. This includes drinking water and water for homes and businesses that will eventually travel down drains through the sewage system. This also includes water used externally, such as watering gardens or washing cars.

Do you think drinking or bathing uses more water? Bathing.

What are some ways we use municipal water? Drinking, bathing, flushing toilets, drinking fountains at school, washing hands, watering plants etc.

What happens to water once it is flushed down drains? Travels through sewage system to wastewater management facility.

Recreational

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Recreational water use includes anything done for fun involving water, such as swimming, fishing, boating, etc.

How do we use recreational water in our area? Various answers.

How does your family use recreational water? Various answers.

Is this an important use of water? Various answers.

C. Point source vs nonpoint source pollution

Discuss the definitions of point source and nonpoint source pollution.

Discuss how our various forms of water use contribute to both types of pollution.

Can watering your yard lead to point source or nonpoint source pollution? How so? Nonpoint source, due to the runoff from fertilizer or pesticides.

How do our roads, parking lots and driveways contribute to nonpoint source pollution? Oil and gas can drip from cars and be caught by rain in runoff.

What are other ways people add to nonpoint source pollution? Improper disposal of household chemicals, oil and other products.

Does new development add to nonpoint source pollution? It could if they have dirt or other debris caught in run off.

D. Rob the Ridley Investigation

Complete the Rob the Ridley activity by reading through the provided story and completing each task asked.

To prepare for the experiment, set up the watershed activity kit with each of the materials listed at the beginning of this packet.

Read each point in the story and add to the watershed as directed. Discuss each point with students and ask them to identify point source vs nonpoint source pollution.

Students will determine the impact of point source and non-point source pollution on sea turtles and other marine life.

Resources:

<https://seaturtles.org/campaigns/kemps-ridley-protection-2/?parent=sea-turtles>

<http://oceanservice.noaa.gov/education/kits/pollution/03pointsource.html>

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http://www.oceanconservancy.org/places/gulf-of-mexico/?gclid=CK6vng_41c4CFVUvgQoddTgGDA

<http://www.seaturtleinc.org/education/about-sea-turtles/kemps-ridley/>

<http://www.epa.gov/students/inyour.htm>

http://www.waterwisetexas.org/texas_water_demand.htm

<http://flowergarden.noaa.gov>