# 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.

**Background**

The Gulf of Mexico produces some of the best fisheries in the world. Bordered by five U.S. states and 6 Mexican, this area serves as an economic and ecological driver for both countries. "From its extensive salt marshes to deep-water corals, the Gulf provides sustenance to sea birds, dolphins, whales, sea turtles and many varieties of fish. Healthy fisheries are critical to healthy communities and the Gulf ecosystem. The Gulf of Mexico accounts for 40 percent of the commercial seafood caught in the continental United States and 41 percent of all fish caught recreationally" (Ocean Conservancy).

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 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 days incubating in the sand before hatching. Immediately they venture towards the water. Many predators try to eat them throughout their lifespan, but while they are tiny eggs or hatchlings, they encounter the most. 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. 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.

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.

**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 what they think our local watershed consists of.

**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 required to keep plants pest- free. 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.

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

**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.

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**

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? Yes, 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, various answers.

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.

**E.** Include other activities? **Extending the lesson:**
Students can conduct a site analysis on a nearby water source and identify areas of point source and nonpoint source pollution.

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Procedure:

Have students develop a hypothesis for their chosen area.

Students can then visit the area for investigation. Make sure they take notes according to their scientific guidelines.

Students should analyze their data and develop their conclusions on the site.

Questions for them to answer:

Before investigation: Will it have pollution? Which kind? Where is it located on our watershed? Flowing into a river, stream, drainage system, Gulf, etc?

After investigation: What were the results? Did they support your hypothesis? Does anything need to be done in this area to prevent pollution? How can this area be better managed to prevent pollution?

**Resources:**

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

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

http://www.oceanconservancy.org/places/gulf-of-mexico/?gclid=CK6vnq_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

**Education Standards – Texas Essential Knowledge and Skills (TEKs):**

**Grade K**

Science. K.2.A: ask questions about organisms, objects, and events observed in the natural world.

Science. K.2.B: plan and conduct simple descriptive investigations.

Science. K.2.C: collect data and make observations using simple tools.

Science. K.2.D: record and organize data and observations using pictures, numbers, and word

Science. K.2.E: communicate observations about simple descriptive investigations.

Science. K.3.A: identify and explain a problem such as the impact of littering and propose a solution.

Science. K.3.C: explore that scientists investigate different things in the natural world and use tools to help in their investigations.

Science. K.7.B: observe and describe physical properties of natural sources of water, including color and clarity

# Rob the Ridley Watershed Lesson Plan

**Grade 1**

Science. 1.1.B: identify and learn how to use natural resources and materials, including conservation and reuse or recycling of paper, plastic, and metals.
Science. 1.2.A: ask questions about organisms, objects, and events observed in the natural world.
Science. 1.2.B: plan and conduct simple descriptive investigations.
Science. 1.2.C: collect data and make observations using simple tools.
Science. 1.2.D: record and organize data using pictures, numbers, and words.
Science. 1.2.E: communicate observations and provide reasons for explanations using student-generated data from simple descriptive investigations.
Science. 1.3.A: identify and explain a problem and propose a solution.
Science. 1.5.C: classify objects by the materials from which they are made.
Science 1.7.B: identify and describe a variety of natural sources of water, including streams, lakes, and oceans

**Grade 2**

Science. 2.2.A: ask questions about organisms, objects, and events observed in the natural world.
Science. 2.2.B: plan and conduct simple descriptive investigations.
Science. 2.2.C: collect data and make observations using simple tools.
Science. 2.2.D: record and organize data using pictures, numbers, and words.
Science. 2.2.E: communicate observations and provide reasons for explanations using student-generated data from simple descriptive investigations.
Science 2.2.F: compare results of investigations with what students and scientists know about the world.
Science 2.3.A: identify and explain a problem and propose a task and solution for the problem
Science 2.7.B: identify and compare the properties of natural sources of freshwater and saltwater; Science Science 2.7.C: distinguish between natural and manmade resources.

**Grade 3**

Science 3.1.B: make informed choices in the use and conservation of natural resources by recycling or reusing materials such as paper, aluminum cans, and plastics.
Science 3.2.A: plan and implement descriptive investigations, including asking and answering questions, making inferences, and selecting and using equipment or technology needed, to solve a specific problem in the natural world.
Science 3.3.A: analyze, evaluate, and critique scientific explanations by using evidence, logical reasoning, and experimental and observational testing.

**Grade 4**

Science 4.1.B: make informed choices in the use and conservation of natural resources and reusing and recycling of materials such as paper, aluminum, glass, cans, and plastic.
Science 4.2.A: plan and implement descriptive investigations, including asking well defined questions, making inferences, and selecting and using appropriate equipment or technology to answer his/her questions

Science 4.2.D: analyze data and interpret patterns to construct reasonable explanations from data that can be observed and measured.
Science 4.3.A: analyze, evaluate, and critique scientific explanations by using evidence, logical reasoning, and experimental and observational testing.

**Grade 5**
Science 5.1.B: make informed choices in the conservation, disposal, and recycling of materials.
Science 5.2.B: ask well defined questions, formulate testable hypotheses, and select and use appropriate equipment and technology.
Science 5.2.D: analyze and interpret information to construct reasonable explanations from direct (observable) and indirect (inferred) evidence.
Science 5.3.A: analyze, evaluate, and critique scientific explanations by using evidence, logical reasoning, and experimental and observational testing.
Science 5.9.C: predict the effects of changes in ecosystems caused by living organisms, including humans, such as the overpopulation of grazers or the building of highways.

**Grade 6**
Science 6.1.B: practice appropriate use and conservation of resources, including disposal, reuse, or recycling of materials.
Science 6.2.A: plan and implement comparative and descriptive investigations by making observations, asking well defined questions, and using appropriate equipment and technology
Science 6.2.E: analyze data to formulate reasonable explanations, communicate valid conclusions supported by the data, and predict trends.

**Grade 7**
Science 7.1.B: practice appropriate use and conservation of resources, including disposal, reuse, or recycling of materials.
Science 7.2.A: plan and implement comparative and descriptive investigations by making observations, asking well defined questions, and using appropriate equipment and technology.
Science 7.2.E: analyze data to formulate reasonable explanations, communicate valid conclusions supported by the data, and predict trends.
Science 7.8.C: model the effects of human activity on groundwater and surface water in a watershed.

**Grade 8**
Science 8.1.B: practice appropriate use and conservation of resources, including disposal, reuse, or recycling of materials.
Science 8.2.A: plan and implement comparative and descriptive investigations by making observations, asking well defined questions, and using appropriate equipment and technology.
Science 8.2.E: analyze data to formulate reasonable explanations, communicate valid conclusions supported by the data, and predict trends.
Science 8.11.C: recognize human dependence on ocean systems and explain how human activities such as runoff, artificial reefs, or use of resources have modified these systems.

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**High School**

Aquatic Science

Science 10.1.B, 11.1.B, 12.1.B: demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.

Science 10.2.A, 11.2.A, 12.2A: know that scientific hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power which have been tested over a wide variety of conditions are incorporated into theories

Science 10.2.E, 11.2.B, 12.2.B: plan and implement investigative procedures, including asking questions, formulating testable hypotheses, and selecting, handling, and maintaining appropriate equipment and technology

Science 10.2.J, 11.2.J, 12.2.J: communicate valid conclusions using essential vocabulary and multiple modes of expression such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports.

Science 10.3.A, 11.3.A, 12.3.A: in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student

Science 10.4.A, 11.4.A, 12.4.A: identify key features and characteristics of atmospheric, geological, hydrological, and biological systems as they relate to aquatic environments

Science 10.5.D, 11.5.D, 12.5.D: identify the interdependence of organisms in an aquatic environment such as in a pond, river, lake, ocean, or aquifer and the biosphere.

Science 10.7.A, 11.7.A, 12.7.A: identify sources and determine the amounts of water in a watershed, including rainfall, groundwater, and surface water.

Science 10.11.B, 11.11.B, 12.11.B: evaluate the factors affecting aquatic population cycles.

Science 10.12.D, 11.12.D, 12.12.D: analyze and discuss how human activities such as fishing, transportation, dams, and recreation influence aquatic environments

Biology

Science 9.1.A, 10.1.A, 11.1.A: demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.

Science 9.3.A, 10.3.A, 11.3.A: develop explanations and propose solutions supported by data and models and consistent with scientific ideas, principles, and theories;

Science 9.4.A, 10.4.A, 11.4.A: analyze, evaluate, and critique scientific explanations and solutions by using empirical evidence, logical reasoning, and experimental and observational testing, so as to encourage critical thinking by the student

Science 9.13.D, 10.13.D., 11.13.D: explain how environmental change, including change due to human activity, affects biodiversity and analyze how changes in biodiversity impact ecosystem stability.