



What is happening to Our Water?

Summary:

Students will learn about water resources, uses, groundwater and watersheds of Milwaukee and Puerto Rico. Students will be able to compare and contrast island ecology to continent ecology through a series of water conservation lessons. This will lead to a final discussion/project that will have the students problem-solve water conservation issues on an island.

Background:

Water covers about 70 percent of the Earth, but only 3 percent of it is fresh water. About three fourths of fresh water is frozen in glaciers and ice with the remaining fresh water found underground or in lakes and rivers.

Most living things consist of water and must have water to live. The human body is about two thirds water. Each person in the United States uses about 100 gallons of water a day in the home. But the single largest user of water is industry, which accounts for over 50 percent of the water used in the United States.

Since water is constantly being recycled through the water cycle, one glass of water contains water molecules that have been used countless times before.

A watershed is a land area from which water drains into a receiving body of water. Receiving bodies of water can include streams, lakes, wetlands, estuaries, and groundwater. Watersheds come in different shape and sizes, and local watersheds are sub watersheds (or sub basins) of larger, regional ones.

Unlike pollution from factories and sewage treatment plants, non point source pollution, come from many different areas with no particular place of origin. It is cause by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries

Grade Level: 2nd-3rd

Goal: Students will realize that island ecology and environmental issues are the window to the future of continental environmental issues

Key Concepts: Affects of human overuse of natural resources (water), water cycle, effects of human intervention, watersheds, pollution, water conservation, saltwater, fresh water, consumptive and non-consumptive use of water, allocation, water rights, water lens, groundwater

Objectives:

- 1) Understand and apply the meaning of water conservation
- 2) Know what a watershed is and how people can affect the process of clean water and natural water storage (groundwater).
- 3) How the current water conservation issues of an island like Puerto Rico is a window to the future of continent water conservation
- 4) Realize that everyone in the world has the right to clean water and that it is our responsibility to be a steward to the environment through water conservation and proper waste disposal.

Teaching Location:

classroom, gymnasium, school neighborhood, playground, Environmental Education Classroom

Subject Areas for Infusion:

Major: Science, Environmental Education, Language Arts, Social Studies

Minor: Mathematics, Health

away natural and man-made pollutants, finally depositing them into rivers, lakes, wetlands, coastal waters and even underground sources of drinking water. Pollutants include: fertilizer, herbicides, insecticides from farms, cities, and suburban streets; oil, grease and toxic chemicals from urban runoff and energy productions; sediment from improperly managed construction sites, crop and forest lands, and eroding stream banks; salt from irrigation practices and acid drainage from abandoned mines; bacteria and nutrients from livestock, pet waste and faulty septic systems.

Standards:

See Milwaukee Standards chart below.

Acid rain and changes to stream flow, such as dams and concrete channels, are also sources of non point source pollution. Acid rain, much of which is caused by power plants is rich in nitrogen, which can over stimulate the growth of aquatic weeds and algae. This in turn can deplete oxygen and kill aquatic life. Structures such as dams and concrete channels change stream flow, reducing the ability of streams to absorb waste and disturbing fish and breeding areas.

Groundwater:

Beneath the land's surface, water resides in two general zones the saturated and the unsaturated. The unsaturated zone lies directly beneath the land surface where air and water fill in the pore spaces between the soil and rock particles. Water saturates the zone beneath the unsaturated one.

The term groundwater refers to water in the saturated zone this water is an important natural resource and is used for many purposes, including drinking water, irrigation, and livestock raising.

Surface water replenishes (or recharges) groundwater when it sinks or percolates through the unsaturated zone. Therefore, the unsaturated zone can act as a pathway for groundwater contamination. Groundwater can move sideways and emerge at openings in the surface, such as springs on hillsides, or seep to streams, lakes, wetlands, and oceans. In this way polluted groundwater can contaminate surface waters. Conversely, some surface waters, such as wetlands, hold floodwaters and allow them to soak slowly into the groundwater. When wetlands are filled or drained groundwater may dry up. Half of the drinking water in the United States comes from groundwater.

Wetlands

Wetlands are areas of land that are wet at least part of the year. They are populated by plants well adapted to grow in standing water or saturated soil. There are many different types of wetlands including marshes, bogs, and bottomland hardwood forests. Wet lands may not always appear to be wet. Many dry out for extended periods of time. Others may appear dry on the surface but are saturated underneath.

Wetlands share three basic characteristics: hydrology (Water), hydric soils (soils that form due to the presence of water), and hydrophytic vegetation (plants adapted to living in saturated soils.)

Wetlands play an important role to the health of our environment. Wetlands provide support for: fish and wildlife habitats, complex food webs, water absorption to reduce storm flooding and damage, sediment traps, erosion control, water quality, groundwater replenishment (maintaining flows in streams by releasing water during dry periods), and open space and recreational opportunities.

Wetlands are a sponge because of its low-lying position on the landscape, a wetland traps runoff water that flows into it during a rainstorm and slowly releases the water later. This sponge helps prevent flooding. Polluted runoff moves slowly through a wetland, finding its way around plants and through small spaces in the soil. While it moves, nutrients are absorbed by the plant roots that poke through the soil spaces. Some spaces are very small and pollutants get trapped. Sometimes the pollutants just stick to the soil. By the time the water leaves the wetland, it is much cleaner than it was when entered. This is why many people think of wetlands as nature's filter system.

Puerto Rico: Water Conservation

Freshwater Lens

http://www.mclaneenv.com/portfolio/island_freshwater_lens.pdf

-Definition of a freshwater lens

Adequate water supplies are critical for the well being of an island economically as well as natural ecosystems. Water resources or access to them are limited.

Financial resources are limited, limited surface areas, greater sensitivity to natural disasters, isolation and a natural resource base

The most important aquifers in Puerto Rico are in costal areas. These aquifers have been negatively impacted since the early part of this century by large agricultural land reclamation and malaria control projects through the construction of drainage and dewatering works. This has lead to a wide spread of saline encroachment from the coast and thinning of the freshwater lens. Within the past 30 years this problem has been exasperated by aquifer overdraft and increased withdrawal of water from streams which has altered the hydrodynamic equilibrium of the saline water wedge. Creating human made channels in Puerto Rico has also altered the surface-water ground-water relationships.

Small islands have limited capacity to store water, therefore depend on groundwater resources as fresh water lenses containing limited amount of water. Due to increasing withdrawals of the lenses can lead to saltwater intrusion, destroying the freshwater lenses.

Major hydraulic hazards in Puerto Rico are floods, droughts, and landslides. In the last ten years four hurricanes have struck the island: Hugo, Marylin, Hortense and Georges.

There have also been three major droughts in this decade. Due to the damaging destruction of hurricanes water supply is most venerable.

Increased urban population and tourism increases water consumption and the need to find and develop additional sources of potable water. Strategies to draw upon other aquifers are in place to support larger populated areas. Due to their small size and isolation, many islands including Puerto Rico face chronic water shortages and problems with waste disposal.

Increasing populations, the use of fertilizers, solid waste disposal sites, and the landscape of an island can cause problems for the safety of water supplies.

Because financial resources are limited many islands depend on tourism. Despite its economic potential the development of tourism has negative impact on the freshwater supply, increasing consumption and increasing waste.

Education is key. The Thames Water project in England, educates children about water conservation. By making a daily small reduction in the average 60 gallons of water per day per capita consumption of water, the project hopes to reduce the effects of drought. Small changes can greatly affect a small island's water lens.

Milwaukee Public Schools Learning Targets: Science

Learning Targets	WI Model Academic Content Standards	WI Model Academic Performance Standards
1) Science Connection: Begin to connect the themes of science with knowledge about ourselves and the world around us	A) Science Connection: - Understand unifying themes: systems, order, organizations, and interactions: evidence, models, and explanations: constancy, change, and measurement: evolution, equilibrium, and energy: form and function among scientific disciplines	A.4.1 A.4.2 A.4.3 A.4.5 A.4.6
3. Science Inquiry: Conduct investigations using science vocabulary and the processes and understandings of scientific inquiry	C. Science Inquiry: Students will investigate questions using scientific methods and tools, revise their personal understanding to accommodate knowledge, and communicate these understandings to others	C.4.1 C.4.2 C.4.3

6. Life and Environmental Sciences: Identify the characteristics of living things/organisms, explore the life cycles, explore how organisms survive in distinct environments	F. Life and Environmental Sciences: Students will demonstrate an understanding of the characteristics and structures of living things, the process of life, and how living things interact with one another and their environment	F.4.1 F.4.2 F.4.3 F.4.4
8. Science in Social and Personal Perspectives: Practice safety; explore the impact of science/technology on our personal lives; identify types of resources; describe how environment change	H. Science in Social and Personal Perspectives: Students will use scientific information and skills to make decisions about themselves, Wisconsin and the world around them	H.4.1 H.4.2 H.4.3 H.4.4
Grade 3:		
8.Science in Social and Personal Perspectives: Practice safety; explore the impact of science/technology on our personal lives; describe the characteristic and changes in population; explore the importance of resources; describe changes in the environments	H. Science in Social and Personal Perspectives: Students will use scientific information and skills to make decisions about themselves, Wisconsin and the world around them	H.4.1 H.4.2 H.4.3 H.4.4

Wisconsin’s Model Academic Standards for Environmental Education:

*The goals listed are touched upon in prior grade levels so that the students can accurately achieve their fourth grade learning benchmarks in fourth grade.

By the end of fourth grade Students will:

A. QUESTIONING AND ANALYSIS

- 4.1 Make observations, ask questions and plan environmental investigations
- 4.2 Collect information, make predictions, and offer explanations about questions asked
- 4.3 Develop answers, draw conclusions, and revise their personal understandings as needed based on their investigations
- 4.4 Communicate their understanding to others in simple terms

B. KNOWLEDGE OF ENVIRONMENTAL PROCESSES AND SYSTEMS

- 4.8 Describe and give examples of natural resources (water, mineral, soils, air)
- 4.10 Describe how they use natural resources in their daily lives

4.12 Determine different types of pollution

C. ENVIRONMENTAL ISSUES INVESTIGATION SKILLS

4.1 Identify environmental problems and issues

4.2 Apply ideas of past, present and future to specific environmental issues

4.3 Identify people and groups of people that are involved in the issue

4.4 Identify some of the decisions and actions related to the issue

4.5 Identify proposed solutions to the issue and discuss arguments for and against the issue

D. DECISION AND ACTION SKILLS

4.1 Demonstrate knowledge of a decision-making process that includes selecting and using data, suggesting possible alternatives, predicting consequences, and being aware of available resources

4.2 Identify and give examples of short-term and long term solutions to a problem

4.3 Identify two or more ways to take positive environmental action (posters, letters, and speeches)

4.5 Explain how they can influence an environmental issue

4.6 Develop a plan, either individually or in a group, to preserve the local environment

Introduction to the Unit

To motivate the students to comparing and contrasting Wisconsin's water resources to that of Puerto Rico we will spend several small lesson times looking and exploring books about islands, specifically that of Puerto Rico. At this point some may not be able to read all of the content, however in small groups and/or partners they will be able to peer mentor and peer discuss. In addition present pictures of island ecology. Discuss the island freely, charting ideas, thoughts, questions or interests about the island. This is a regular classroom routine designed to allow free exploration of our thinking about a new topic as well as build some beginning knowledge of Puerto Rico. A map of Puerto Rico will be displayed for reference, water shed map of Puerto Rico and Wisconsin, world map, along with a picture of what an island water lens looks like.

After the foundation has been created, introduce two specific topics-water and water conservation. The students will have a future opportunity after the unit is over to pick a topic about Puerto Rico for individual research.

Give the students the scope and sequence of the unit so that they can do independent inquiries through further research, questions or discussions at home.

First we need to identify the different ways water is part of our lives. Since we live on a large piece of land called a continent our water usage and supply is different to that of an island.

Questions for Discussion:

- Who do you think has more water the North America Continent or the Island of Puerto Rico? Why?
- Compare Wisconsin to Puerto Rico-what is different or the same? Why?
- What are some words we already know about water and the environment?
- What do you think water conservation means?