Reading the River

Summer 2002

A Home Water Study for Students

A Curriculum Project for Grade 10 Biology

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Goals and Objectives

In this lesson, students will be able to:

1. Locate the source of clean water in the home and analyze the alternatives if the current supply of clean water is no longer available for an indefinite period of time.
2. Evaluate the ecosystem in which they live by determining the factors that are necessary to establish a healthy ecosystem, including water, air, space, shelter and food.
3. Analyze the influence humans have on the ecosystem in a measurable distance from the student's home by preparing a map that includes both natural and man made features.
4. Assess the total impact of the student's neighborhood on the natural environment.

Essential Questions

Do you rely on a public water supply or does your home have a cistern or a well to collect water? Where does the public water come from? How is water from a river purified for drinking? What system allows for water to be carried from the river to your home safely? Do natural water supplies exist for the plants and animals in your neighborhood? Where does precipitation and runoff flow in your neighborhood? Is there evidence that humans, animals or industry have an effect on the ground water supplies in your neighborhood?

Connections

Students are asked to give serious consideration to the impact that humans have on the ecosystem within which we all live. Many people take for granted the fact that clean drinking water will always be available from the tap. This lesson is designed to make students aware of the limited availability of fresh, clean water and the need to protect our most valuable resource. In class assignments will focus on discussions of existing conditions and the use of scientific methods to calculate the influence of man on the environment. Students will determine if best practices exist in their own neighborhood and efforts will be developed to encourage good stewardship to assure future generations will enjoy our earth's bounty.

Program of Studies

Scientific inquiry:

- identify and define questions and identify scientific concepts to guide the design of scientific investigations.
- design and conduct different kinds of scientific investigations for a wide variety of reasons.
- use equipment, tools, techniques, technology and mathematics to improve scientific investigations and communications.
- Communicate designs, procedures and results of scientific investigations.
- Review and analyze scientific investigations and explanations of others.

Conceptual Understandings

Geochemical Cycles

- recognize that the Earth contains a fixed amount of each stable chemical atom or element.

Interdependence of Organisms

- investigate the cycle of atoms and molecules within the biosphere.
- analyze energy flow through ecosystems.
- examine interrelationships and interdependencies of organisms in ecosystems and the factors that influence the interactions between organisms.
- explore how human activities alter ecosystems.

Matter, Energy and the Organization in Living Systems

- analyze the flow of matter and energy through and between living systems and environments.

Context

Water cycles through the atmosphere and within the earth as it changes form, from solid to liquid to gas. In the water cycle impurities can be carried by the water and must be filtered and purified in order to provide clean, safe drinking water. Ecosystems are made up of all the biotic and abiotic factors within a defined area. Man plays a vital role in the existence of urban ecosystems and students are made aware of the impact that man has upon the environment. By using Internet resources and available reference materials the students prepare survey materials to collect data for analysis and assessment of information relative to the water quality within a predetermined area. The information collected may be organized and evaluated to determine the effective land management practices that exist or need to exist to promote water quality.

Resources

- Prentice Hall, Biology Text, URL: http://www.phschool.com/atschool/biology/ Dragonfly/Student_Area/PHB_S_CHAP4
- URL: http://water.usgs.gov/ Water Resources of the United States U.S. Department of the Interior, U. S. Geological Survey
- URL: http://maps.yahoo.com
- URL: http://www.nwf.org/backyardwildlifehabitat/ National Wildlife Federation, Backyard Wildlife Habitat Program Information
- URL: www.epa.gov/ebtpages/water.html
- URL: http://water.nr.state.ky.us/dow/dwover.htm Kentucky Division of Water
- URL: http://www.nkywater.org/archives/archives.html Northern Kentucky Water District, includes information regarding events associated with clean water. The Northern Kentucky Water District has also provided reference material and maps to identify management of water resources in the Northern Kentucky region.
- URL: http://www.sdl.org Sanitation District No. 1
- URL: www.SGCoalition.org Smart Growth Coalition for Greater Cincinnati and Northern Kentucky, Publication Guide to Smart Growth in the Tri-state.
- Home Water Study Survey Handout
- Environment and Pollution, Matching Test

Procedures

1. Journal entry: Imagine that you wake up to the news that your water supply in the home and in your community has been contaminated. You are not able to drive to the store or call someone to deliver water. How far do you have to travel to collect two buckets of water for use in the home? Students respond to the question by analyzing available water near their home.
2. Class discussion will focus on identification of available water. Students must decide if the supply will satisfy the entire neighborhood or if it will run out. Students must discuss uses of the water collected and methods to insure collection for an indefinite period of time. Students must discuss treatment of water if it is to be consumed or used in food preparation.
3. Lecture will be provided to outline the importance of water in an ecosystem for the plants and animals. Terrestrial and Aquatic ecosystems will be identified as well as the factors necessary to insure maintenance of the ecosystems.
4. Students will diagram the water cycle to identify the natural flow of water, determine the boundaries of a watershed, and the possible elements that may contaminate water in a watershed.
5. A list of key terms associated with the environment and pollution will be identified. Students must test their understanding of the terms and relate them to their lesson on the ecosystem. A test may be administered as a concept check.
6. As a class, Students will gather information from internet resources and available maps and personal knowledge to construct a large scale map of the ecosystem in which they live. The abiotic factors will be identified on the large scale map and major roadways, urban areas and industries that isolate the natural terrestrial and aquatic ecosystems will be determined.
7. Students will retrieve a map of their own home environment using Yahoo map maker and be responsible for developing one piece of the larger map in detail. Students must recognize scale when placing structures and land features that will impact the amount of runoff that will be associated with the cycle of water. A report must be attached to the map that will list human impact on the study.
8. The class will assemble pieces of the puzzle that individual students create from the Yahoo maps. There may be empty squares, there may be overlapping squares. As a class the discussion will focus on the general understanding of the environmental study. Do the missing pieces represent unpopulated natural areas or do they represent developed areas that provide no contribution to the natural environment.
9. Closure will focus on the impact that the Home Water Study will have on the students. Correlation to the natural habitats must be identified. A final written report will identify factors that help to sustain an ecosystem and factors that limit or destroy an ecosystem and must site specific examples from the home study.

Student Assessment & Evaluation

Students will write daily journal entries that provide reflection on the topic of discussion. Assessment will be based on clarity of response and degree of insight towards problem solving. Students will complete individual maps of their home environment using the Yahoo map directory and provide pieces of the quilt that identify the number of residences, businesses, natural areas (including farm land, pasture, woodland, parks and bodies of water), and estimates of human occupation and industrial activity. Discussions that promote environmental consciousness will be evaluated. A final written report will evaluate the ability of each student to apply scientific information to a real life situation.

Reflection/Analysis of Teaching and Learning

This lesson may be a challenge, depending on the ability of the students to construct accurate diagrams of residential areas. Many students are unfamiliar with neighborhood features as most are too young to drive and do not concern themselves with the world around them. It may be necessary to first plot major landmarks and begin the assignment with mapping techniques. The willingness of the students to explore their neighborhood may also be determined by the safety factors associated with specific neighborhoods. It may be beneficial to assign groups to areas that are selected for safety and accessibility.

Lesson Extension/Follow-up

Students that choose to tackle specific water quality issues may select topics from the Environmental Protection Agency Web Site that identifies related water topics.
A public awareness campaign may be initiated by the students to encourage other students to understand the significance of water quality and environmental management.
Field trips to local agencies that manage water quality may be scheduled to provide students with a personal inspection of the facilities that exist to provide safe, clean drinking water.