Reading the River, Summer 2001

Watersheds and Streams – A unit for 8th Grade Science

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Watersheds and Streams

Grade Level: 8

Objectives

In this lesson, Students will be able to:

1.) Identify components of what makes a watershed for a stream.
2.) Identify and diagram the area of the stream and its path to the Salt River.
3.) Develop a stream management plan that incorporates environmentally safe, best management practices.
4.) Conduct stream monitoring tests stream to assess environmental hazards.
5.) Design an educational plan to inform community members about the clean up and environmental maintenance of streams.
6.) Implement a plan of continuous watershed watch data collection for purposes of environmental stream safety.

Program of Studies

Scientific Inquiry

- Identify and refine questions that can be answered through scientific investigations combined with scientific information.
- Use appropriate equipment (e.g. water thermonator), tools (e.g. map), techniques (e.g. computer skills), technology (e.g. computer s), and mathematics in scientific investigations.
- Design and conduct different kinds of scientific investigations to answer different kinds of questions.
- Communicate (e.g. write, graph) designs, procedures, and results of scientific investigations.
- Review and analyze scientific investigations and explanations of other students.

Conceptual Understanding

- Plan, demonstrate, relate, analyze, and recommend actions of discovery of stream watershed and environmental safety.
- Be able to solve problems using the scientific method.
- Be able to use scientific equipment appropriately.
- Apply knowledge of the relationship between humans, the environment, and the earth's resources.
- Be able to use modern technologies to sort and arrange data.

- Be able to explain the changes in life and environmental conditions.
- Be able to demonstrate the role science plays in everyday life and explore different careers.

Applications/Connections

- Investigate how science can be used to solve environmental quality problems.
- Examine the interaction between science and technology.
- Apply scientific theory and conceptual understandings to solve problems of technological design.
- Recognize that scientific knowledge comes from empirical standards, logical arguments and skepticism, and is subject to change, as new evidence becomes available.

Core Content

Investigate the structure of the Earth System (e.g. Water Cycle)

- SC-M-2.1.5 Water, which covers the majority of the Earth's surface, circulates through the crust, oceans, and atmosphere, in what is known as the water cycle. Water dissolves minerals and gases and may carry them to the oceans.

Investigate and analyze populations and ecosystems.

- SC-M-3.5.1 A population consists of all individuals of a species that occur together at a given place and time. All populations living together and the physical factors with which they interact compose an ecosystem.

- SC-H-3.5.3 Organisms both cooperate and compete in ecosystems. Often changes in one component of an ecosystem will have effects on the entire system that are difficult to predict. The interrelationships and interdependencies of these organisms may generate ecosystems that are stable for hundreds or thousands of years.

- SC-H-3.5.4 Living organisms have the capacity to produce populations of infinite size. However, behaviors, environments, and resources influence the size of populations. Models (e.g., mathematical, physical, conceptual) can be used to make

predictions about changes in the size or rate of growth of a population.

Materials

1.) Books handouts, electronic sources and other information on what makes a watershed and ecosystems.
2.) Pen, Paper, Pencil, clipboard, notebook and county map.
3.) Ecosystem and watershed survey checklists.
4.) Water monitoring kits and or equipment (temperature probes, ph probes, or kits, DO probes, or kits, Calculators, LabPros or CBL's, any other physical/chemical probes, kits as desired and available, depth gauge, tape measure, compass and protractor).

Activity Procedures

1.) Discuss what makes a watershed, stream, river and an ecosystem. What makes a good Vs bad watershed stream, and clean vs. dirty environmental stream area. Also what do students expect to see at the stream watershed and its ecosystem?
2.) Have students work in pairs.
3.) Students will have previously researched resources, whether print or electronic, on watersheds and ecosystems.
4.) Field trip to follow classroom discussion. Have students take (notes, sketch, photograph, video) of stream area and start point of stream.
5.) Students will take trash bags to collect garbage at site(s) along the stream. Students will mark on maps the items that could not be picked up on the field trip to be able to report for pick-up by community.

Definition and Explanation of Concepts

Students need to understand the water cycle model and how it is important, even in an urban environment. With this understanding, the students can model stream flow and damage by any type of organism that does or does not belong in that stream watershed and the ecosystem of that area. Students have the need to understand that any action causes a reaction in the environment that can be both helpful and harmful.

Ecosystems consist of all different species making up a population and physical factors that these species interact with. Those

organisms both compete and cooperate in ecosystems. What are the interrelationships and interdependencies that organisms generate for both helpful and harmful impacts? Can human beings and other organisms share the same stream watershed? Does Agriculture help or hurt a stream ecosystem? New housing areas and deforestation around the stream environment cause ripple effects that effect organisms that live downstream of the start point of the stream.

Any behaviors, environment, and resources influence the living area of organisms. What models do we use to predict the changes and effects on the environment or stream life cycle? How can you, a student, make a difference to this stream? What about family, friends and others that live in your neighborhood? What about your state and country?

Assessment

Monitor what work the students are doing and ensuring that they understand the task laid out before them.

Check what material the students are reading and researching and provide guidance or channel work to reach the desired goal of the class on this field trip.

Write letters to family, neighbors and the community in which the student resides. Ensure that student includes finding of class from the field trip about the environment impact of the streams health.

Have class vote, elect and respond by writing a letter to the editor of local newspaper, prepare a video informing of damage and clutter of stream watershed, or a presentation for the school or community on water issues impacting the community and relationship to the stream or watershed.

Reference

This lesson was adapted from “Adopt a stream –stream walk”, found in:

“*Splashing in Kentucky*!: An Educator’s guide to Nonpoint Source Water Pollution”, by Neeley, Cathy L., Kentucky Waterways Alliance,

The Earth Mobile, Kentucky Division of Water, Nonpoint Source Section 1998.

Rubric for Evaluating Model

___1.) Was student able to identify all components making up a stream watershed?

___2.) Did student accurately draw a map of stream area and its path to the Salt River?

___ 3.) Did the plan of management for an environmentally safe stream incorporate best management practices?

___4.) Did student demonstrate proper & accurate recording of monitoring results from the stream to the proper worksheet?

___5.) Was a letter written to the editor of local newspaper or Community leaders?

___6.) Did the implementation of the plan for the continuous stream watershed watch & safety incorporate best management practices?

60 points possible for this class field trip. Each Question is worth 10 points.

Lesson Context

This is was adapted from several different sources of study on watershed and streams:

What is a watershed? It's land that water flows across or under on its way to a stream, river, or lake.

How do Watersheds work?
The landscape is made up of many interconnected basins, or watersheds. Within each watershed, all water runs to the lowest point – stream, river, or lake. On its way, water travels over the surface and across farm fields, forestland, suburban lawns, and city streets, or it seeps into the soil and travels as ground water. Large Watersheds, like the ones for the Mississippi River, Columbia River and Chesapeake Bay, are made up of many smaller watersheds across the several states.

Are all watersheds the same?
Not at all. Watersheds come in many different shapes and sizes and have many different features. Watersheds can have hills or mountains or be nearly flat. They can have farmland, rangeland, small towns, and big cities. Parts of your watershed can be so rough, rocky, or marshy that they're suited only for certain trees, plants and wildlife.

Your Watershed community
Everyone lives in a watershed. You and everyone in your watershed are part of the watershed community. The animals, birds, and fish are part of a watershed, too. You influence what happens in your watershed, good or bad, by how you treat the natural resources-the soil, water, air, plants, and animals. What happens in your small watershed also affects the larger watershed downstream.

"What is a Watershed", United States Department of Agriculture, Natural Resources Conservation Service, Program aid #420, Slightly revised November 1999.

What is a Stream?

What are its boundaries? Where does it begin? Where does it end? As it is described in Maine laws, a "stream" is a complex concept, modified by many qualifying terms that help in regulating abuses and uses of it, but an actual stream is even more complicated than its legal definition suggests.

Watershed to stream bed

Is the boundary of the stream the edge of the water, where you start to get your feet wet in soggy soil, the area that floods in heavy rains, or all the land that contributes surface runoff or groundwater to that stream? It is all of the above.
The land area from which water drains into a body of water, either above or below ground, is called its *watershed*. The watershed may cover many square miles, extending far beyond the sounds of a brook or the smell of damp earth at the water's edge. Anything that affects the watershed will eventually impact the stream. A stream that winds through a wooded watershed, for example, will be a much different stream than one that flows through parking lots or golf courses.
The borders of a stream are much broader than they appear to be at first sight.

Clouds, rain and runoff

Have you ever been in the woods during a storm and watched where the rain goes? Some falls directly onto a stream, but most of it falls on the land. There it collects in depressions and sinks slowly into the soil or evaporates into the air. In a hard rain, the water overflows into rivulets that race downhill to streams or pond. The water that percolates into the soil then becomes groundwater. It trickles through pore spaces in sand or gravel or between fractures in rocks to discharge into a spring or a stream.

Plant roots absorb some of the groundwater, pull it up their stems and trunks to their leaves, and release it into the atmosphere. There it joins other water vapor evaporated from streams, lakes, or the ocean. Water droplets condense around microscopic particles of dust and salt to form clouds. When the clouds become saturated, the water falls back to earth as rain or snow and rejoins the stream's journey to the sea. In Maine, over 33,000 mapped miles of flowing water are part of this process that has been recycling water for billions of years. This process is called the *hydrologic cycle*.

From its source to the sea

Streams are like the capillaries and blood vessels that connect to the major arteries, the rivers. But unlike our body's circulation system, the smaller channels deliver most of the water and food to the bigger ones. Without feeder streams, our rivers would not exist.

You could say a stream begins at its *headwaters*, often in the mountains, fed by an underground spring or the runoff from rain and snow melt. Rivulets of water flow downhill, merging together to become a stream which continues, mixing with other tributaries, until they all become a river flowing to the sea. Here in Maine the *mouth* of a river usually opens into the ocean in a broad bay where fresh water and salt water mix, called an *estuary*. The length of a stream may be only a few feet from where it emerges until it joins another stream, or it may traverse hundreds of miles, from the mountains to the sea. Some streams flow year-round, others only after a storm or when snow melts in the spring.

What could be more dynamic than a stream? It is constantly changing its flow, its depth, even its bed, as anyone knows who has observed a stream in different seasons or at different places along its course. It scours, shifts channels, meanders, floods, erodes, carries and deposits silt. Squeeze a stream in one place, and like a water balloon, it bulges in another. Where it is restricted, the stream speeds up to compensate, eroding downstream banks or spreading out to flood adjacent property.

Many factors shape the character of a stream as it progresses from its headwaters to its mouth: the slope and current, the amount of water being transported, its temperature and water chemistry. These, in turn, influence the vegetation, the animals, the bottom sediments, and the shape of the channel at any point along the stream's journey.

So just what is a stream?

Its boundaries are as wide as its watershed, as long as the entire river system from source to sea, and as fluid as the water cycle itself.

Work sited from web page, “Ask Jeeves,” What is a Stream?

Resources:

Ask Jeeves, “What is a stream”,“Ask.com” 2001.

“What is a Watershed”, U.S. Department of Agriculture, Natural Resources Conservation Service, Program aid #420, Revised Sept 1994, Slightly revised Nov 1999.

“Studying Watersheds: A confluence of Important Ideas”, Haury, David L., Digest, SE 064315 ERIC EDO-SE-00-07.

“Splashing in Kentucky: An Educator’s Guide to Nonpoint Source Water Pollution”, Neeley, Cathy L., Kentucky Waterways Alliance, The Earth Mobile, Kentucky Division of Water, Nonpoint Source Selection, 1998, pages 70-73.