



Rivers and Trees

Grade: 3

Subject Areas:

Physical Science, Earth
Science, Language Arts

Skills: observing,
modeling, investigating,
recording, predicting,
writing

Duration: 1 hour

Connections:

ecology, forestry, land
management, health

Vocabulary

water cycle

precipitation

watershed

basin

mouth, estuary

tributary

ridges

headwaters

habitat

upland

runoff

transpiration

riparian zone

deforestation

Objective:

Students will be introduced to water quality, parts of a watershed and how forests can benefit the health of a stream ecosystem.

Materials

- pictures of local watersheds
- pictures of drainage patterns (see attached)
- pieces of paper
- permanent marking pens (blue, black, brown, green)
- paper towels
- watershed worksheet
- pens and pencils
- a few spray bottles full of water paper
- a place outside with clean sand (optional)
- monopoly pieces or other toys used for houses, people, fences, trees, etc. (optional)
- old carpet and other dense materials (optional)
- several watering cans or bottles with holes in the bottom to act like "rain". (optional)

Standards

Strands: Excellence in Environmental Education Guidelines

Strand 1 — Questioning and Analysis Skills: B) Designing investigations: Learners are able to design simple investigations.

F) Working with models and simulations: Learners understand that relationships, patterns, and processes can be represented by models.

Strand 2.1 — The Earth as a Physical System: A) Processes that shape the Earth: Learners understand are able to identify changes and differences in the physical environment.

Strand 2.2 — The Living Environment: C) Systems and Connections: Learners understand basic ways in which organisms are related to their environments and to other organisms.

Strand 2.4 — Environment and Society: A) Human/environment interactions: Learners understand that people depend on, change, and are affected by the environment.

California State Educational Standards:

Life Sciences (LS) 3a: Students know plants and animals have structures that serve different functions in growth, survival, and reproduction.

LS 3c: Students know living things cause changes in the environment in which they live; some of these changes are detrimental to the organism or other organisms, and some are beneficial.

LS 3d: Students know when the environment changes, some plants and animals survive and reproduce; others die or move to new locations.

Background

Ways of a Watershed

Liquid water is an essential ingredient for life. All living things from the tiniest single-celled organism to the tallest tree need water to survive. Organisms that live on land need a fresh source of water. The amount and quality of freshwater constantly changes as it moves through the **water cycle**. The amount of water on Earth is limited. It can move through the sky, the ground, the ocean, plants, animals, and even people. Every drop of water that hits an area of land falls on a watershed.

A **watershed** is an area that captures water and drains it into a common outflow point like a lake or the ocean. No matter where you live, your source of fresh water comes from a watershed. Watersheds come in various sizes depending on the amount of surface area they drain. No matter what the size, watersheds are drained by a series of streams and rivers. There can be small watersheds within larger watersheds forming a group called a **basin**. A watershed is usually named after the biggest stream or river. Depending on the size of a river, water can flow for hundreds of miles or just a few miles before it is finally released. Rivers release their contents at their **mouth**. Sometimes the mouth of a river meets a protected area called an estuary. An **estuary** is a type of wetland where a river meets the sea.

As water flows down hill it moves from small drainages into larger and larger tributaries. A **tributary** is a stream that feeds into a larger stream. A stream can have many different tributaries forming branch-like

patterns sort of like the branches on a tree or the veins in your body. Most water collects after snow melt or rain. Snow and rain are types of precipitation. The rate of flow in a river or stream depends on the amount of precipitation along with physical features like steepness of slope and the amount of rock present.

Water begins to collect at the highest places called **ridges**. Several different watersheds can meet at the tops of ridges. Ridges divide which way water will flow downhill. Because a watershed begins at the highest point, this area is called the headwaters. The **headwaters** is the first place water begins to collect and is usually the steepest.

Rivers and their associated watersheds are important aquatic habitats. A **habitat** is another name for a home. A healthy river can support a wide range of plants and animals like ducks, turtles and fish. Many things can influence the health of a watershed including erosion, vegetation, pollution, invasive species and human activity that occurs above a stream or upland. Healthy watersheds are not only good habitat, but provide for the capture, storage and safe release of clean water.

When water reaches the ground it can be absorbed, evaporated, transpired or it can run off the surface. **Transpiration** is when water is lost from plant leaves. Surface **runoff**

Local Connection

On December 31, 1996 a large catastrophic landslide directly linked to logging practices occurred above the town of Stafford. Pacific Lumber Company (PL), the largest employer in Humboldt County at the time, was clear cutting dozens of acres in the hills above this small hamlet located next to Highway 101. PL went into the area three times and cut on nearly vertical slopes. Apparently some of the logging was done on Barnum Timber land as well. Exposing soil on steep banks during the rainy season sent a wall of mud a mile long and 100 yards wide down slope destroying seven homes. By chance, further disaster was averted because of a log jam of big trees that held back tons of additional mud just out of the debris flow.

This devastating slide began a legal battle that lasted four years. It occurred at a time of intensive logging and a slew of lawsuits. PL agreed to a \$3.3 million settlement which was dispersed among the residents of Stafford. The money paid the people of Stafford but it did nothing to alleviate the problem—irresponsible logging on steep slopes. After a series of long and bitter battles between PL and multiple groups and agencies, PL changed ownership and became Humboldt Redwood Company (HRC). This deal was widely supported by many environmental organizations because the parent company Mendocino Logging Company had a good environmental record. HRC is currently practicing sustainable logging and has FSC certification.

picks up substances like oil, garbage and chemicals that it comes across. Sometimes runoff flows over exposed dirt and carries sediment into streams which harms fish and other wildlife downstream. Sediment can work its way into the spaces between gravel and may suffocate little fish and insects living there.

Forests that Filter

Healthy forests serve to slow down runoff. They are an important feature of many healthy watersheds. Trees help provide clean water by capturing and filtering water. They provide shade, anchor soil in place and lose leaves and branches adding organic matter to the forest floor. Organic matter acts like a sponge and protects the underlying surface. Trees adjacent to streams provide shade which helps cool water, and their roots stabilize river banks. Vegetation that lines the bank of a river is called a **riparian zone**. Trees are also important for wildlife because they provide important food, shelter and habitat.

Forests need Fixing

The King Range National Conservation Area (NCA) and surrounding area is covered with many different forest types including oak woodlands and coniferous forests. Many of the watersheds here have been impacted by human activity like road building and logging. When removal of trees takes place on a large scale, **deforestation** occurs. Many communities have fouled their drinking water and have upset the natural balance of their streams because of deforestation. Deforestation of the eastern United States took place before the 1900s. Back then trees were highly prized for ship building and making railroads and bridges. Wood was burned for

cooking food and heating homes. After the early 1900s, most of the forests in the western region of the United States were cut down. As people learn more about deforestation and the affects on watersheds, more energy is being put into replanting and restoring damaged forests.

Trees are removed because wood is a valuable resource. We use wood for heat and as a material to make things with. Buildings, furniture, paper, musical instruments and a host of other things are made of wood. Sometimes trees are removed to clear land for growing crops. Many of the fields you see today use to be forested. In tropical places, large tracts of forest are removed to plant crops like coffee, soy, corn, and oil palm. Only with proper monitoring and management can people help mend the damage done to our forests and streams.

Logging in and near the King Range NCA has been viewed as an important local industry. This heavily forested region has some of the largest and most desirable kinds of trees including Douglas fir and redwood. Unfortunately, so much deforestation has happened in the surrounding watersheds that decades of restoration have been put in place attempting to bring back important habitat. Populations of fish and the animals that depend on fish like Osprey and river otter, have been reduced due to logging in upland regions.

In the United States, water quality has been degraded by deforestation for almost one hundred and fifty years. Modern technology has attempted to replace the function of forests, but with a cost. Billions of dollars have been spent to clean our drinking water through construction and upgrades of treatment plants. Reforestation projects have tried to heal the land, however, planting trees

never brings back the quality of an original forest. Old growth forests especially have unique structures and provide essential habitat for many plants and animals that are becoming rare. The U.S. Forest Service reports that one million acres of forested land has been converted every year on average in the United States for the last twenty years. Forested lands are converted to roads, farm land, shopping malls, etc. Forests are important components of a healthy watershed. They not only provide important habitat for wildlife, they also provide clean freshwater. Finding ways to live within our means and save resources will bring us closer to living in a world with healthy watersheds.

Activity 1: Parts of a Watershed

Preparation

In this activity, students will learn about the various parts of a watershed. It is recommended that you make a model watershed with a piece of paper beforehand to show the class a model.

Procedure

1. On the board, write down a K-W-L chart. Three columns should be labeled: K—What we Know, W—What we Want to Know, L—What we Learned. Gather the students around and ask them what they already know about watersheds. During the discussion jot down a few key points under the appropriate heading. While you are asking questions, write down some vocabulary words like headwaters, tributary, ridges, and river mouth.

- *Does anyone know what a watershed is?*
- *Where is the closest watershed?*
- *Where does water that flows into a watershed come from?*
- *To where do rivers take water?*
- *How far can rivers travel?*
- *What is the difference between a stream and a river?*
- *Are all rivers and streams healthy?*
- *What types of things can harm a watershed?*
- *What does a healthy watershed look like?*
- *How can trees help clean water?*

2. During the questioning period, have the students place their hands in a way that models a river valley. Students should make two fists and place their fists together to form a “V” shape. Little knuckles together and large knuckles far apart. Large knuckles should model two ridge tops.

3. Once the questioning period is over, show a few pictures and maps of healthy and unhealthy watersheds. The unhealthy watersheds should show deforestation (note: the second activity will emphasize trees and their benefits). Focus on various parts of a watershed here.

4. Pass out the labeling worksheet. Have the students label the correct parts to the simplified watershed. Once they are finished ask them if this watershed is healthy or not and why or why not (the picture does not show riparian habitat). Before they make a watershed outside, have them make a paper watershed model. Model how this should be done and show a pre-made model.

- *What do you think the paper represents?*
- *What do you think the blue marker represents?*
- *What happened to the red ink?*
- *Where would the pollutants in a stream go?*
- *How could water be slowed down?*
- *How do trees help clean water?*

Materials

- pictures of local watersheds
- pictures of drainage patterns (see attached)
- pieces of paper
- permanent marking pens (blue, black, brown, green)
- paper towels
- a few spray bottles full of water
- watershed worksheet

5. Each student can make their own model or work in pairs. Begin by having each student crinkle a piece of paper into a loose ball. Next, have them smooth it out a little bit to represent a topographic map (see example). Have them set it on a paper towel in a way that it looks like a mountain with several streams. Using colored pens, they should mark the highest points of their mountain with a dark color to represent the ridge line. They should trace the low lines with a blue pen to represent tributaries. It is optional to have the students draw in sediments or pollutants with water soluble pens. The instructor should come around and spray their model so they can observe how water flows from it after a “rain”.

6. Ask these follow-up questions. Fill in the K-W-L chart accordingly.

Activity 2: Building your own Watershed

Procedure

1. Once the students have made their 3-D paper model of a watershed (Activity 1) have them draw one of their own design.

2. Pass out drawing paper, pencils and pens. Students should include themselves in the watershed. Structures, vegetation, rivers and their tributaries should be included. Colors should be representative. Dashed blue lines can be used for tributaries and solid blue lines for the main river.

3. An outside option is to have students build a model watershed in a sand box or against a tree using sand. This is best done in small cooperative groups. Once they build up a mound, they can begin to add drainage patterns. After the drainage patterns have been sculpted, they should add houses, trees, people and other items to it using toy pieces.

Materials

- paper
- pens and pencils
- a place outside with clean sand (optional)
- monopoly pieces or other toys used for houses, people, fences, trees, etc... (optional)
- old carpet and other dense materials (optional)
- several watering cans or bottles with holes in the bottom to act like “rain” (optional)

4. Students can add observe what happens to their watershed with or without vegetation. Have the students model “rain” by sprinkling water from a watering can atop their model. They should observe how the water flows off and what happens to their hillsides. Next have them add old carpet and other fabric to model area of vegetation. Have them sprinkle water atop their model again and observe the difference.

5. Conclude the investigation of watersheds by gathering the students back in the classroom. Refer to their K-W-L chart from Activity 1 and answer any questions they had. Fill in additional things they have learned.

Extensions

- Investigate reasons for deforestation. Compare local deforestation to tropical forest deforestation.
- Read the Kapok Tree or other literary books about reverence for trees.
- Make posters about the benefits of trees.
- Visit a source for drinking water or have someone from a municipal water supply come in and talk about drinking water.
- Act out the roles of animals and plants of a forest in an environmental play.
- Sing songs about forests or watersheds
- Adopt-a-tree. There are many ways students can adopt a tree. The class can adopt as well.
- Look at maps of major rivers. Have the students learn about the important uses of rivers.
- Have students plant trees!

References

- Brazil, Eric, Pacific Lumber to Pay Millions In Landslide Suit, http://articles.sfgate.com/2001-03-09/news/17589463_1
- Characteristics of a Healthy Watershed, http://www.coquillewatershed.org/watershed_char.html
- HRC, <http://www.getredwood.com/about-hrc/history/>, 2011
- Label a Watershed, <http://sfr.psu.edu/youth/sftrc/lesson-plan-pdfs/watershed>
- Summary of the Water cycle, <http://ga.water.usgs.gov/edu/watercyclesummary.html>
- The Giving Tree Lesson, http://www.nceestore.com/lessons/childrens_lit_sample.pdf
- Watersheds, <http://www.watersheds.org/places/shed.htm>
- Watersheds, <http://webpub.alleggheny.edu/dept/envisci/ESInfo/comps/anglebk/Page16.htm>
- Watershed Academy Web, <http://cfpub.epa.gov/watertrain/pdf/modules/WatershedEcology.pdf>
- Watershed Forestry Research Guide, <http://www.forestsforwatersheds.org/urban-watershed-forestry/>
- What is a Watershed? <http://learningtogive.org/lessons/unit374/lesson2.html>

FOSS Connection

Grade 3
Earth Science:
Earth Materials, Water
Alternative Modules:
Matter and Energy



Weyerhaeuser cutting in Stillman Creek drainage
<http://seattletimes.nwsourc.com>, photo by Steve Ringman



Sample of a paper watershed

Name: _____

Date: _____

