

Lesson 8

Forest Watersheds



Objectives:

1. To understand what a watershed is.
2. To understand how water moves through the environment—water cycle.
3. To understand the concept of water quality and why it is important.
4. To understand how sustainable forestry practices protect and enhance water quality.

Subjects:

1. Science
2. Reading / Language
3. Art



Vocabulary:

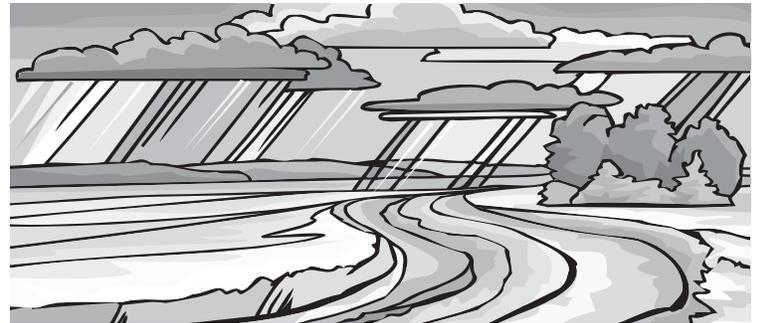
1. **Watershed:** an area of land where water and sediments drain into a common stream, lake or bay.
2. **Evaporation:** the process of liquid water turning into water vapor from water and land surfaces.
3. **Transpiration:** the process of water that has been taken up by plants, evaporating from the leaves of plants.
4. **Condensation:** the process of water vapor in the atmosphere turning into liquid water forming clouds.
5. **Precipitation:** occurs when so much water has condensed that the air can't hold it anymore and it falls back to Earth as rain, snow, sleet, hail, frost, dew, etc.
6. **Infiltration:** the process by which water from the ground surface enters the soil.
7. **Runoff:** water that does not infiltrate the soil, but runs off the surface of the land.
8. **Groundwater:** water that is stored beneath the surface of the land, in spaces between rocks and soil particles—this water often supplies wells or springs.
9. **Erosion:** the natural process by which Earth's surface is worn away by the forces of wind and water—water running downhill is the primary agent in shaping topography.
10. **Spring:** the point where groundwater flows out of the ground.
11. **Buffer:** a wide strip of vegetation along a body of water, retained for the purpose of protecting water quality and aquatic habitat.
12. **Riparian Area:** the area next to a river or stream inhabited by plants and animals that requires constant moisture.
13. **Topographic Map:** a map showing changes in elevation, land features, etc.



Focus:

1. Establish the Concept of a watershed

Ask your students if they know where the water they use every day comes from? **Did you know that 75% of the water in California comes from a forested watershed?** Forests are very important for filtering water that falls as precipitation and allowing it to infiltrate the soil to become stored as groundwater. This is kind of like water going through a coffee filter on its way to the coffee pot. The soil, shade and organic materials under trees help hold moisture so it can be absorbed and replenish groundwater, or be taken up by plants.



VOCABULARY

Activity:

To help students understand the concept of a watershed, have them create their own mini watersheds using a piece of **paper**, **spray bottle with water** and **water soluble markers**.

1. Crumble up a piece of paper.
2. Smooth out the paper, but do not flatten completely. This paper represents a topographic map showing landforms and changes in elevation.
3. Use one color of marker to trace along the highest mountain ridges of your map.



4. Use a second color to draw in where you think creeks, rivers and lakes might be.
5. The teacher will spray the finished maps with “rain” from the spray bottle. Predict how the water will move through the watershed and observe how it flows when it “rains”. Observe how the ink runs down your paper, showing how surface water would flow through the watershed.



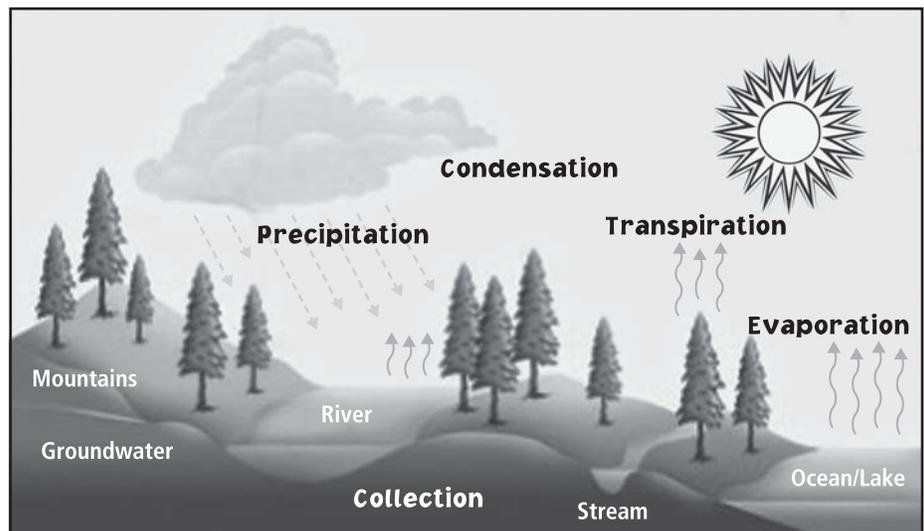
6. Have a class discussion regarding the mini watersheds. Point out how numerous watersheds combine to make large watersheds. An example of a very large watershed is the Mississippi River Basin. Ask your students to define the concept of a watershed in their own words. Ask them to identify small watersheds in their neighborhoods or on your school campus.
7. Which watershed do you live in? Use a large map of California and smaller maps that represent your local area to trace where the water that you depend on comes from. Where is the nearest forest? Looking at the topography of your local area, does some of your local water originate in that forest? Do research to find out the source for your community’s water supply. This map of major California watersheds from The California Watershed Portal may help: <http://cwp.resources.ca.gov/browser/>
8. **EXTENSION IDEA:** Visit your local municipal water district facility or ask a representative to come in and be a guest speaker to discuss your local water supply, methods for conserving water in our homes, waste water treatment, etc.

Learn the parts of the water cycle

The water cycle never stops. The earth has a limited amount of water and that same water has cycled through the rivers, oceans, ground water, plants, animals and atmosphere for just about as long as the earth has been around. Have you ever stopped to think where that glass of water that you drank this morning has been? Maybe it was once taken up by the roots of a Redwood tree, transpired from the tree’s leaves into the atmosphere, condensed into a cloud and then fell into a lake?

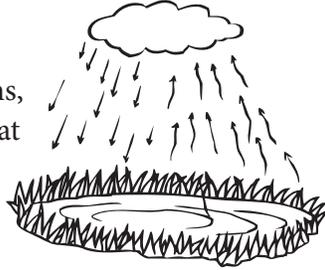
Approximately 97% of Earth’s water is in the oceans. Only 3% of our water is fresh water and most of this is frozen in ice caps and glaciers. Groundwater is the next largest source of fresh water. You may be surprised to know that only 0.3% of Earth’s fresh water is contained in lakes, rivers and streams!

Study the water cycle diagram below to see how water is constantly moving between the ocean, land, vegetation, atmosphere, groundwater, streams and lakes.



Parts of the water cycle:

1. Evaporation is when oceans, rivers, lakes and streams heat up and the water turns into vapor or steam and goes back into the atmosphere.



2. Transpiration is when water evaporates from the leaves of plants.

3. Condensation is when water vapor in the air cools, changes back into liquid and combines with miniscule dust, salt or smoke particles to form cloud droplets.

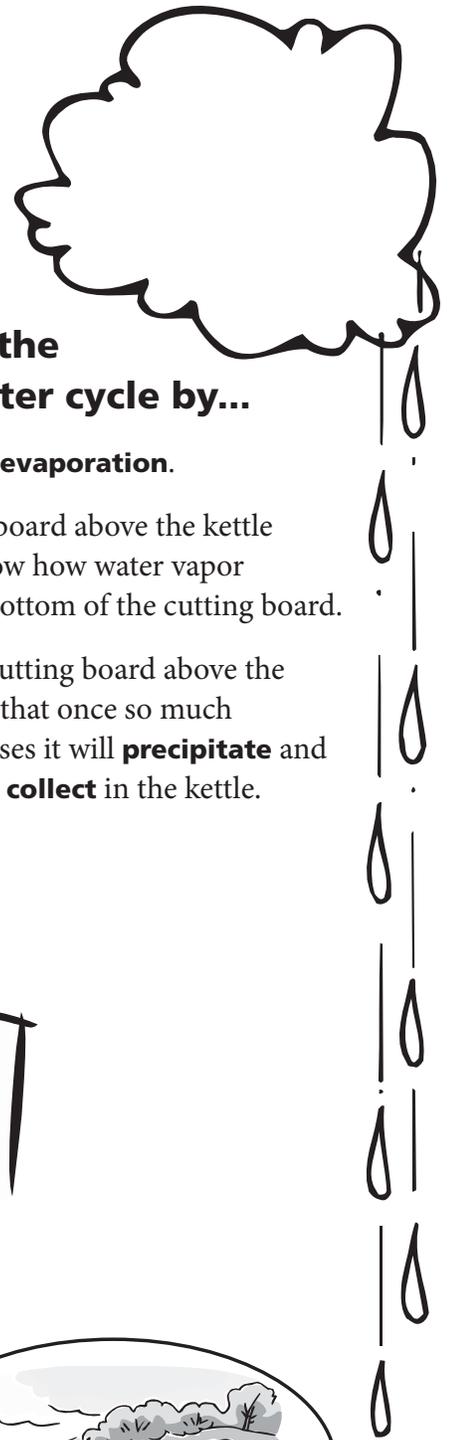
4. Precipitation occurs when so much water has condensed that the cloud cannot hold it any longer and it falls to Earth as precipitation.

5. Collection occurs when water that has fallen back to the earth accumulates in oceans, rivers, lakes or ground water.

Now the cycle starts all over again!

DEMONSTRATE the steps of the water cycle by...

- boiling water to show **evaporation**.
- hold a plastic cutting board above the kettle of boiling water to show how water vapor **condenses** onto the bottom of the cutting board.
- continue to hold the cutting board above the boiling water to show that once so much water condenses it will **precipitate** and fall back and **collect** in the kettle.



Writing Activity:

Have students write a one page story about the history of the water that they drank this morning. They should include and explain all of the steps of the water cycle in their story. Be creative—that water droplet might have been consumed long ago by a Giant Sequoia tree, transpired into the atmosphere, rained down on a pond, consumed by a fish.....etc.!

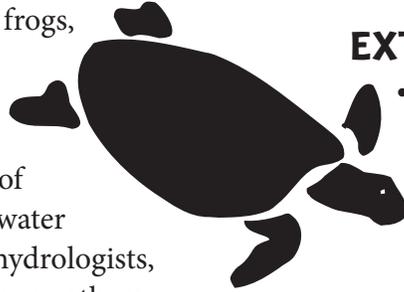


Importance of Healthy Forests for California's Water Supply

Forests are very important in the water cycle and to water quality. Trees help hold soil in place and filter out unwanted sediment to keep water clean. They shade creeks and regulate water temperature for the many aquatic species



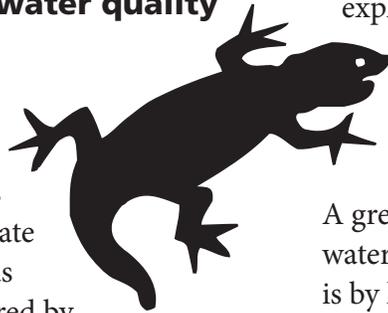
that need clean, cool water. Many different animals live in the forest near water. Otters, beavers, deer, herons, salamanders, snakes, frogs, turtles and many others depend on healthy forest streams and lakes for food, water, homes and protection. Forests are the source of approximately 75% of California's water supply. For this reason, foresters, hydrologists, geologists, aquatic biologists and many others work together to manage healthy forests and watersheds.



What do forest managers do to manage healthy forests and protect water quality and aquatic habitat?

1. Minimize Soil Erosion:

while some soil erosion is a natural process, forest managers take precautions and abide by state laws to minimize erosion. Roads and water crossings are engineered by experienced road builders and are maintained and inspected on a regular basis.



2. Buffer Zones: areas of trees/vegetation around water courses are left undisturbed and act to filter out sediment and shade streams to keep them cool for the fish and other organisms living there. Root systems of streamside plants hold soil in place and increase infiltration of water.

3. Monitoring: hydrologists and fisheries biologists monitor water quality and health of aquatic organisms to ensure that management activities are not harming either.

4. Reducing Forest Fuels: harvesting some trees and removing accumulated biomass reduces the threat of large, intense wildfires which degrade water quality by decreasing soil permeability, increasing erosion and sediment in streams, and destroying vegetation that shades streams and provides wildlife habitat.

5. Restoration: placement of large woody debris in streams helps to create deep pools needed by fish, improvement of road systems mitigates erosion, keeping sediment out of streams.

EXTENSION...

- <http://ga.water.usgs.gov/edu/> is the *USGS Water Science for Schools* website. Explore this site as a class by projecting on an LCD display.
- Divide the class into small groups and have each group choose a topic from the site to research, for. Example... under the "special topics" link: acid rain, water shortage, ground water quality, etc.
- The groups should create visual aids to present their explanation of the topics to the class.
- Invite a forestry professional into your classroom to talk about the relationship between healthy forests and healthy watersheds.

A great way to visualize just how much of California's water for drinking and agriculture originates in forests is by looking up "Shasta Dam" on Google Earth or a topographic map of California. Inspect the topography of the surrounding landscape. How big is the Shasta Lake Watershed? How much of this is forestland? From Shasta Dam, follow the Sacramento River south to its confluence with San Joaquin River. Point out the agricultural fields that are irrigated with water from the river. These two rivers form the Sacramento-San Joaquin Delta which flows into the San Francisco Bay and out into the Pacific Ocean. Nearly two-thirds of Californians (about 20 million people) get their drinking water from the Delta! (USGS)

