

Watersheds: Where does the Water Go? Lesson Plan

Students learn about their own watersheds and how water moves through them.

Lesson Summary: Human activity and changes we make to the landscape affect the water quality and health of the watershed in which we live. All land uses have an impact on water quality, either positively or negatively. In this lesson, students will learn about the importance of our watersheds.

Grade Level: 4-6

Time Allotted: Approximately 2 Class Periods (100 Minutes).

Performance Objectives

References are to the Next Generation Sunshine State Standards (2007).

Science

- SC.4.N.1.1 Raise questions about the natural world, use appropriate reference materials that support understanding to obtain information (identifying the source), conduct both individual and team investigations through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.
- SC.4.N.1.2 Compare the observations made by different groups using multiple tools and seek reasons to explain the differences across groups.
- SC.5.N.1.1 Define a problem, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types such as: systematic observations, experiments requiring the identification of variables, collecting and organizing data, interpreting data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions. SC.5.E.7.2 Recognize that the ocean is an integral part of the water cycle and is connected to all of Earth's water reservoirs via evaporation and precipitation processes. SC.6.E.7.2 Investigate and apply how the cycling of water between the atmosphere and hydrosphere has an effect on weather patterns and climate.

Language Arts

- LA.6.2.2.3 Organize information to show understanding (e.g., representing main ideas within text through charting, mapping, paraphrasing, summarizing, or comparing/contrasting).

Prior Knowledge

No prior knowledge necessary.

Topic Overview:

A watershed is an area of land through which water travels on its way to a particular destination—a lake, river, estuary or ocean. Other names for watersheds are basins or catchments. A large watershed can contain other, smaller ones. The watershed of a large river, for example, might contain the basins

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of each of the river's tributaries, and the basins of lakes located within the larger watershed. Although we often imagine rain falling on a watershed and running over the surface of the earth into a waterbody, water also moves below ground in a watershed, traveling through soil or moving through porous rock, as it does in underground aquifers comprised of Florida limestone. The "water cycle" consists of water evaporating from the ground, being carried through the atmosphere, and being redeposited as precipitation—in Florida as rainfall, in other places as rain or snow. The quality and quantity of water that travels through a watershed is affected by the character of its land cover (urban, agricultural, industrial, forest), and by human activities that occur within it.

Each of us lives in a watershed. The actions we take affect the water quality and health of the watersheds in which we live.

Key Vocabulary

Erosion

Wearing away of land surfaces by wind or water.

Groundwater

Water found below the earth's surface.

Reservoir

A place where water is collected and stored for people to use.

Runoff

Water from rain or irrigation that doesn't soak into the ground, but flows into the nearest body of water.

Sediment

Particles of soil that are carried by water flow and deposited in rivers, lakes or other water bodies.

Surface water

Water found above ground, such as in rivers, lakes, estuaries and oceans.

Water cycle

The process by which water moves from the surface of the earth into the atmosphere and back to earth again as precipitation

Watershed

An area of land that collects, stores, and transports precipitation (rainfall and snow melt). It may include any or all of the following: streams, lakes, reservoirs, aquifers, estuaries, and wetlands. Another name for a watershed is a basin.

Materials

- Computer with Internet access

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- Maps of Orange County, Florida
- Notepads or notebooks.
- Camera (Still or Video)
- Pens or pencils

References

The following documents are available in the [Water Atlas Digital Library](#).

[Climate of Florida](#). 2006. National Climatic Data Center.

[EnviroScape Model: Exploring Watersheds and Riparian Forests](#) (lesson plan). 2011. Audubon Naturalist Society.

[EnviroScape Rental Information](#). 2011. Orange County Environmental Protection Division.

[Stormwater Consequences Game](#)

Sources: Suwannee River Water Management District, St. Johns River Water Management District. 2004.

[Take the Stormwater Runoff Challenge](#) (Crossword Puzzle)

Source: Nonpoint Source Program, U.S. Environmental Protection Agency. 2003.

Other references:

[Think About Personal Pollution](#) website. City of Tallahassee Stormwater Management.

Gardner, Karen. 2010. [Watershed Concerns: Lake Langanore Needs Better Tree Cover](#). *Frederick News Post*, December 19, 2010.

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Procedure

Engage/Elicit

Pose these questions to the class, to help students think about watersheds.

Where does the water go after it rains?

How are freshwater system connected to the ocean?

What role does the ocean play in the water cycle?

Explore

1. Show students the **Florida** map below (source: <http://www.dep.state.fl.us/water/watersheds/>). Explain that it shows the major watersheds in Florida, and that Orange County falls within four of them: Upper St. Johns (#14), Kissimmee River (#20), Ocklawaha (#24), and Middle St. Johns (#25). Tell them that each of these is named after the river into which water flows as it completes its journey through the watershed.

Explain that within each major watersheds there are smaller watersheds. Show them the map of **Orange County** below. Have students answer the following questions:

In which smaller watershed is their school located? What about their home?

To find out, have students visit the [Advanced Mapping Tool](#) on the Orange County Water Atlas, and enter the address of their school or home in the search box at top right, and click **GO**. Help students to use the zoom in/zoom out and pan tools to identify the watershed.

What impact, if any, does the health of watersheds have on us?

What are some of the things people do that might affect what happens in a watershed?

What are some ways changes in our climate might affect what happens in a watershed?

Explain

Have students read the article **Watershed Concerns: Lake Linganore Needs Better Tree Cover** and answer the related questions.

Extend

1. Allow students to work in small teams consisting of 3-4 students. Have each team produce a report on the "State of the Watershed" (the watershed where their school is, their home is, or some other one that they may be able to visit), including the following:
 - a. Encourage students to make detailed observations of water resources, activities, land use, significant natural, animal and human disturbances, etc. in the watershed. They may wish to illustrate these with photos or sketches.
 - b. Which water resources will collect most of the water when it rains?
 - c. Overall, what is the water quality of the different water resources?
 - d. What kind of soil does the watershed have? Sandy, or clay-like? Will water soak in easily?

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- e. What are some of the possible sources of water pollution in your watershed?
 - f. How could some of the human-caused water pollution in the watershed be reduced?
 - g. Have each team write a report about the watershed or create a multimedia presentation.
2. Use an EnviroScape® Model to increase awareness of water pollution an overall watershed concept. The model is designed to be an interactive demonstration to show how waterways flow into a larger water body, which is representative of a lake, river, bay, or ocean. The unit can be “rented” by teachers for classroom use (for free) from the Orange County Environmental Protection Divison and comes complete with a kit containing everything you need to demonstrate the movement of water through a watershed and the pollution that runoff may cause. (See references for rental information and a lesson plan.)

Exchange/Evaluate

Student teams should present their report or multimedia presentation to the entire class:

1. Accuracy of the information in their presentation.

Creativity in their presentation

Clarity of their presentation

Completeness of their presentation

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Map of Major Watersheds in Florida



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Lake Linganore is the focus of a program this spring that encourages residents to plant trees to help slow the buildup of sediment in the reservoir. (Photo by Graham Cullen)

Watershed Concerns: Lake Linganore Needs Better Tree Cover

By Karen Gardner

(Story and photo reprinted with permission of The Frederick News-Post and Randall Family, LLC, as appearing in the online edition at www.fredericknewspost.com.)

Lake Linganore is a source of drinking water for residents of the City of Frederick and Frederick County. It is also filling up with **sediment**.

While all **reservoirs** eventually fill with sediment, removal of forests for agricultural or urban use can speed up this process. The Center for Watershed Protection in Ellicott City hopes to get residents in the Linganore watershed to plant trees to help increase that forest cover.

This spring, residents will be encouraged to take advantage of the Marylanders Plant Trees program, which provides \$25 coupons toward trees worth at least \$75 from participating nurseries.

There is also a preservation easement program, which encourages owners of large areas of open and forested land to preserve their property from development at the rate of \$10,000 an acre.

Trees provide a real benefit to soil. "Trees in the watershed intercept a lot of the rainfall, which prevents **runoff**," said Karen Capiella, director of research for CWP. When rainwater pours off open land into lakes and rivers, it often carries dirt and sediment along with it. The dirt and sediment then clog the streams and change the chemical makeup.

"The lake has been filling it with sediment," Capiella said. One-quarter of the soils in the Lake Linganore watershed are prone to **erosion**. Farms and developments are responsible for much of this erosion, she said.

Lake Linganore was originally built in the early 1970s as a water supply and a place of recreation, Capiella said. "But then they did all this development, and that wasn't the best for the water supply," she said.

About 30 percent of the Lake Linganore watershed has forest cover. Development in the pipeline would lower that to about 28 percent, she said. "Within the community growth areas, there could be 40 percent loss of tree cover, she said.

Adding to the tree cover could have another benefit, and that would be to lower the amount of phosphorus and nitrogen that make their way into the lake and downstream. Phosphorus and nitrogen

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are the two main causes of unhealthy nutrient buildup in the Chesapeake Bay, and some of that originates in the streams and rivers in Frederick County.

These nutrients are found in fertilizer, animal manure and sewage, as well as a few other pollutants. The U.S. Environmental Protection Agency is requiring Maryland and the other states in the Chesapeake Bay watershed to come up with ways to limit the nutrient content into all streams and rivers that feed into the bay. A high concentration of these nutrients, which tend not to degrade as they flow into the bay, has contributed to lower numbers of oysters, rockfish and crabs in the bay, severely depleting the state's seafood industry.

The federal plan gives the states until 2025 to cut nitrogen runoff by 25 percent. Runoff control and improved wastewater treatment plants are the best ways to lower what is known as total maximum daily load, or TMDL, Capiella said.

"One of the things we thought was interesting about this watershed is that the drinking water from the lake is mostly used by the City of Frederick, but these people don't have any ownership of the land draining to the lake, or necessarily know where their water comes from," she said.

Frederick County is doing its part to preserve land in the Linganore watershed by offering nearby landowners money if they agree the land should forever be preserved, according to Mike Wilkins, environmental planner for the county's development review office. If the land is sold, the preservation easement would transfer with the property.

The money to buy the land comes from the county's Forest Resource Ordinance. This requires developers to set aside forested land for preservation when building on open or forested land. Developers can choose to put money into a preservation fund rather than actually preserving land. This is known as a fee in lieu system.

"We've decided to use 75 percent of the funds to increase tree cover in the Linganore watershed," Wilkins said. "We've sent letters to property owners and offered to purchase forest conservation easements." His office has sent out 190 letters, and so far, 25 property owners are interested.

"This is the first time the county has tried to purchase forest conservation easements," Wilkins said. The county has \$1.1 million to spend on the Linganore easements, he said.

The 25 properties will be evaluated and ranked, then presented to the county commissioners before the easement offers are made. "We're hoping to start visiting sites in January, and hope by spring to be in a position to execute settlements," he said.

His office will work with the state Department of Natural Resources to develop planting plans for each property, and organize tree plantings. He's hoping to have those completed within about a year.

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Questions:

1. Where is Lake Langanore located (city and state)?

How would the planting of trees to increase that forest cover protect and preserve its watershed?
Please explain.

What other benefits can you think of that trees provide to soil and to watersheds?

How might preserving property from development protect watersheds? Please explain.

In your opinion, whose responsibility is it to preserve our watersheds and why?

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