What's in a Watershed?
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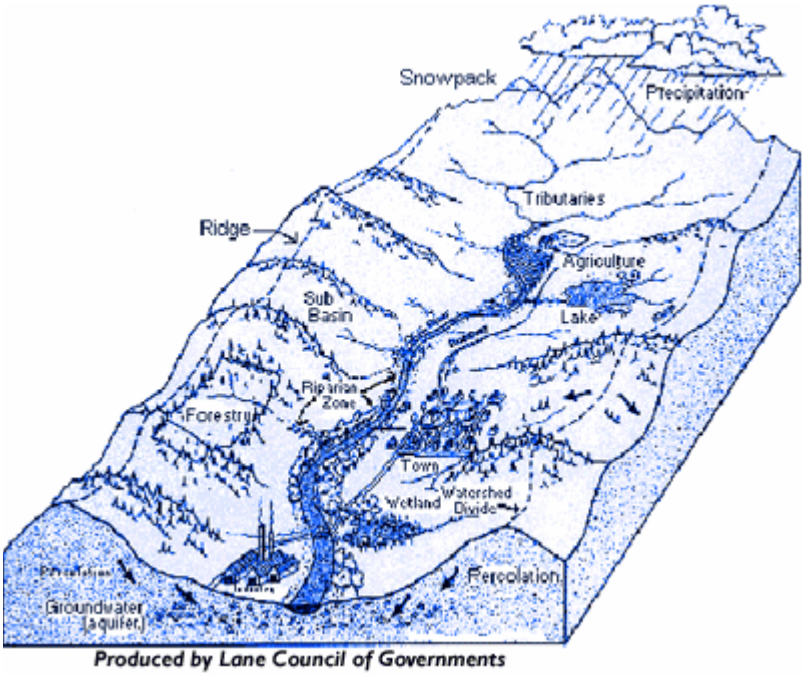
What is a watershed? A watershed is the area of land that drains to a particular body of water.



http://www.epa.gov/owow/watershed/whatis.html

You can select any body of water (stream, pond, river, lake, bay, etc.) and trace all of the land that drains to it to find its watershed. Many smaller watersheds can be found in the watershed of a large body of water. All land is part of at least one watershed, and often multiple watersheds through a watershed-within-a-watershed system.

Why is it important for us to understand what a watershed is, and why should we look at environmental issues in relation to watersheds? Each of us lives in a watershed and uses water from a watershed, therefore we all affect watersheds. The impacts we have on our watershed affect all of the organisms connected to the watershed through the downstream effect. Because water is essential to all life on Earth, it is important for us to understand and mitigate the negative impacts we have on our watersheds.

For more information on why it makes sense to address environmental issues in relation to watersheds (taking a "Watershed Approach), visit
http://www.epa.gov/owow/watershed/why.html

A Watershed Approach:

- Is hydrologically defined
    - geographically focused
    - includes all stressors (air and water)
- Involves all stakeholders
    - includes public (federal, state, local) and private sector
    - is community based
    - includes a coordinating framework
- Strategically addresses priority water resource goals (e.g. water quality, habitat)
    - integrates multiple programs (regulatory and voluntary)
    - based on sound science
    - aided by strategic watershed plans
    - uses adaptive management

To learn more about implementing watershed approaches, try out the Watershed Plan Builder and see EPA's draft *Handbook for Developing Watershed Plans to Restore and Protect Our Watersheds.* This document follows the watershed planning process and highlights specific technical tools for use in each step in the watershed planning effort. EPA's Watershed Academy and the Watershed Academy's Webcasts also provide training and information on implementing watershed approaches. Also, check out EPA's Watershed Tools Fact Sheet (PDF) for a list of hot Web sites and other watershed resources.

What are some common pollutants in watersheds? Pesticides are poisons and are not specific to pests. Fertilizers act as pollutants by throwing off the natural balance of an ecosystem. They help algae grow in water, shading and cooling water. When the algae dies, decomposers consume oxygen along with the algae, potentially causing eutrophication. Fecal matter and soaps/detergents act as fertilizers. Sediment can be a major source of pollution if there is an excess amount washing into water bodies. It can cause heating of the water. It can clog the gills of animals. It can shade the water, killing plants. Plastics can entangle animals. If eaten, they cannot be digested and can cause animals to feel full and starve. Oil is often poured down storm drains or washes off of paved surfaces into waterways. Even pure, hot water, a byproduct of some factories, can act as a pollutant, because some organisms can't tolerate the temperature change. *These are very simplified explanations of an abbreviated list of pollutants.*

How can we lessen our impact? There are many different practices, called Best Management Practices (BMPs) that we can implement in our homes and communities. Here are a few examples:

- Compost food waste instead of throwing out with trash or garbage disposal.
- Minimize the use of chemical products in the house.
- Use fertilizers sparingly. Get soil tested to find out what is an appropriate type and amount of fertilizer.
- Don't bag leaves or grass clippings.
- Plant native plants, which can grow without extra fertilizer, pesticides, or water.
- Maintain vehicles so they are more fuel-efficient and don't leak oil.
- Recycle, reuse, **REDUCE.**

Activities

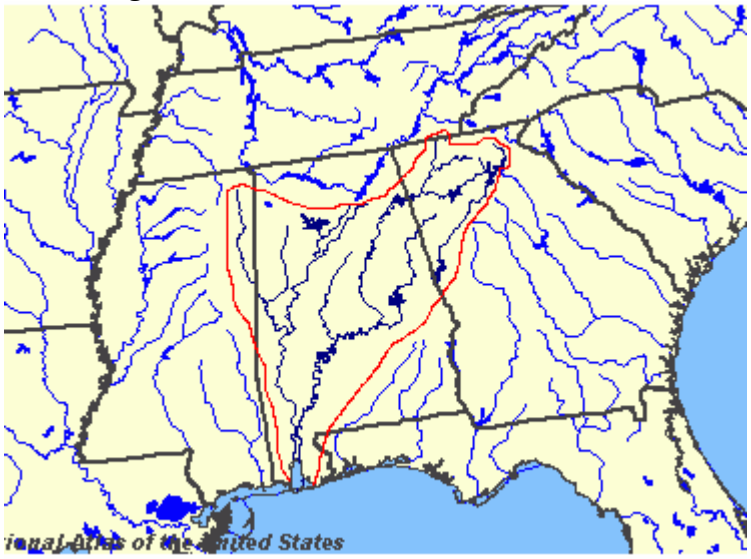
What is a Watershed?

For information on EnviroScapes, visit http://www.enviroscapes.com/

Watershed in a Box (Make the Model): see attached sheet.

Alternately: "Branching Out" from Project WET Curriculum and Activity Guide http://www.projectwet.org/

Trace your watershed: Select a watershed to identify, and acquire maps that encompass the watershed. This is a good source for maps: http://nationalatlas.gov/natlas/Natlasstart.asp and can be manipulated. The maps should include rivers and streams (political boundaries are optional). Depending on your preference, have students trace the rivers and streams that flow into the selected watershed, on the map itself, on the computer, on transparency paper, or on tracing paper (you can find rolls of large tracing paper at art supply stores). The boundaries of the watershed can be roughly traced by drawing a line between those streams that flow into the selected water body and those that flow away from the water body. This would roughly show ridge lines.



I did this by copying this map showing rivers from www.nationalatlas.gov into Paint, then zooming in and drawing over the rivers with a darker blue, then drawing a red line around those rivers.
More advanced students could do this activity with topographic maps. http://topomaps.usgs.gov/ordering_maps.html or 1-800-USA-MAPS

Pollution in a Watershed

A common misconception about pollution is that most pollution is industrial, point-source pollution.

Non-point source pollution activity: Fill a clear container (the size can vary) with water. This represents a water local body. Put one drop of food coloring in the container, swirl and show students. This represents the (non-point source) pollution that one person puts in the watershed (through fertilizing his yard, washing his car in the driveway, pouring motor oil down a storm drain, etc.) and is not very apparent. Then pass the container and food coloring around to students, asking that they put just one drop into the container. Show the collective impact that the non-point source pollution has had on the water body. *If a student chooses not to add a drop, or someone accidentally adds more than one, explain that some people make less pollution and some more than average.* I got this activity from a poster produced by the USDA Forest and National Association of State Foresters. The item number for the poster is HASF-2M.

Watershed in a Box (add the pollution): see attached sheet.

Mitigation of Pollution in the Watershed

Brainstorm BMPs, discuss, and implement them on the model.

Alternately: Research BMPs, discuss and implement them on the model.
I prefer to encourage students to think, rather than read and regurgitate.

Other Watershed Topics

Water on Earth proportions activity: Discuss the importance of water to all life on Earth. Emphasize the finite amount of water on Earth (we don't get more water when it rains). Discuss the uses humans have for water and how much of Earth's water is available for those uses. You can find a breakdown of proportions at http://ga.water.usgs.gov/edu/earthwherewater.html
Decide which proportions you would like to demonstrate. For example: Fresh Water on Earth vs. Salt Water, Surface Water vs. Groundwater vs. Icecaps and Glaciers, etc.
Use clear, graduated cylinders (100 mL cylinders make percentages easy to translate) to show these proportions. Use cylinders of the same size to help students better visualize comparative amounts. If you are using only two comparative percentages (Fresh vs. Salt Water on Earth), you can do them in the same cylinder using water and oil. Color the

water with food coloring and the oil with something oil soluble such as powdered Tempura paint.

Water quality testing: Get involved with a citizen water monitoring group such as the Alabama Water Watch: https://aww.auburn.edu/

- Test water chemistry of a local stream (or simulate in the classroom). Water chemistry test kits are available through science education suppliers.
- Do a bioassessment of a local stream (or simulate in the classroom). Research local aquatic organisms and their various levels of tolerance for pollution. Then do a survey of a local stream and assess its "health." http://www.epa.gov/waterscience/biocriteria/

Make a topographic map: Use a grading rod and transit with laser level (you can get this set at a building supply store for around $60) to create a topo. map on school grounds. This can be done in a simplified way by selecting a hill or area of relatively higher elevation and setting up transect lines radiating from a set point on top of the hill. Determine the relative elevations along the transect lines, and then connect the dots. *You **can** use string and meter sticks instead of the rod and transit system.*

You can also make a topographic/bathymetric map using a model. See NOAA's Ocean Explorer lesson plan, A Watered-down Topographic Map, found at the following url: http://oceanexplorer.noaa.gov/explorations/02fire/background/education/media/ring_topographic_6_8.pdf

"Take a Watershed Approach" role-playing activity: Identify (or make up) a planned development project that would have a potential impact on a local watershed. Find interest groups including resource and regulatory agencies (there may be many different agencies with different roles in the same building project - for example: the State's Department of Natural Resources, the State's Department of Environmental Quality, the U.S. Fish and Wildlife Service, the U.S. Army Corps of Engineers, the EPA, etc.), citizens, and other interested parties (for example – the owner of the land and proposed building project, the builder, the State's Bureau of Economic Development, local non-profit NGAs, potential beneficiaries of proposed project, neighbors to the land, area residents, environmental consultant). Give these roles to different students, and have them research ways they can protect their interests. Have the owner submit a proposal to the panel of resource and regulatory agencies, and, after a public hearing, have the students representing these agencies decide whether to accept or decline the project, perhaps making suggestions. Have the owner resubmit modified proposals until one is accepted by all regulatory agencies, or until you run out of time.