Ideas for Science Fair Projects on Surface Water Quality Topics

for Middle School Students and Teachers

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Why Choose a Science Fair Project on Surface Water Quality?

Surface water quality projects address real-life water issues occurring in streams, rivers, lakes and other types of surface waters across the United States.

- **More than 40 percent of the waterways that are tested in the United States do not meet their water quality standards—the minimum requirements for healthy waters.**
- **The majority of the U.S. population lives within 10 miles of a polluted waterway.**

Your science fair project will help bring attention to surface water quality problems and could develop solutions!

Need Information on Your Watershed?

Find the name of your watershed and nearby waterways at EPA's ***Surf Your Watershed*** Web site (***www.epa.gov/surf***). Be sure to visit the *Citizen-based groups at work in this watershed* link. The Web sites of these groups could provide water monitoring data and other information that may be helpful for your project.

Information on runoff issues in your community, surface water problems in your watershed, and current water monitoring efforts can be obtained by calling or visiting the Web site of your local Stormwater Division or Department of Public Works. Before calling, work with your teacher or parent to think of questions you can ask the water professionals that will help you develop a focused project.

Need Background Information on Water Monitoring?

EPA's ***What's Up With Our Nation's Waters?*** provides background information on water quality monitoring for students (***www.epa.gov/owow/monitoring/nationswaters/waters2.pdf***).

Science Fair Surface Water Topics

The following list of project topics is not comprehensive, but it is a starting place to consider the numerous options that exist within this field. You can adapt the following topics to your watershed and to your interests. Always follow your school's safety rules, tell an adult where and when you will be collecting your data, and never test a waterway when there is a risk of a flash flood.

Fertilizers and Algal Growth

Background: Fertilizers contain nitrogen and phosphorus, two nutrients that are necessary for plants to grow. When found in excessive quantities, nitrogen (usually in the form of ammonia) and phosphorus (usually in the form of phosphate) cause algae to grow in large quantities in local waterways.

Topic: Using several small aquariums or similar containers that will hold water and allow light to penetrate, place an equal amount of water and rocks in each (be sure that the rocks are of a similar size). Add a different kind of fertilizer to each aquarium. Does one fertilizer cause more algae to grow than the other?

The Effect of Stream Health on Macroinvertebrate Diversity

The stonefly must have good water quality.

Background: Small organisms called macroinvertebrates live in freshwater streams. They do not have backbones, can be seen with the naked eye and are an important part of the stream food web.

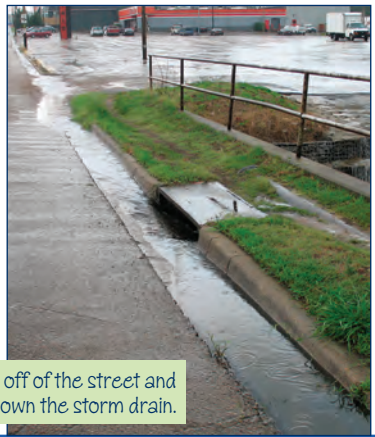
Some macroinvertebrates can live only in very good water quality, while others can live in waterways with fair or poor water quality. Therefore, the macroinvertebrate populations you find will indicate good, fair or poor water quality for the waterway. Macroinvertebrate pictures and information can be found at ***www.epa.gov/bioindicators/html/invertebrate.html***. To learn more about macroinvertebrate stream habitats, visit ***www.epa.gov/owow/monitoring/rbp/wp61pdf/ch_05.pdf***. Pay particular attention to the pictures and descriptions of poor and good quality stream habitats on pages 13 and 14.

Topic A: Select a local waterway and compare the diversity of macroinvertebrates that live downstream from different land uses (for example: residential homes, athletic fields, roads, malls). Is there a connection between the land use and the types of macroinvertebrates found?

Topic B: In areas that experience dangerous driving conditions due to snow and ice, sand is often applied to the roadways. After the snow and ice are gone, the sand is often washed into a storm drain (a pipe that carries water from the streets to a local stream or to a treatment plant). If the storm drain empties directly into a stream, the sand fills in spaces between rocks on the bottom of the stream. This is a problem because many species of macroinvertebrates use the inter-rock spaces for their habitat. Consult a map of your local watershed, streets and stormwater outfalls and hypothesize where the most sand would accumulate in your stream. Does your data show different macroinvertebrate populations in areas where the stream bottom is sandy versus rocky?

The Effect of *First Flush* on Water Quality

Background: The initial runoff during a rain event flows over the ground and often carries more pollutants with it than runoff that occurs later in the storm. This *first flush* can be thought of as the first cleansing of the ground. Examples of pollutants that might be washed away in the first flush include excess fertilizers, oil, soaps that have dried on the ground following a car wash, and pet waste.



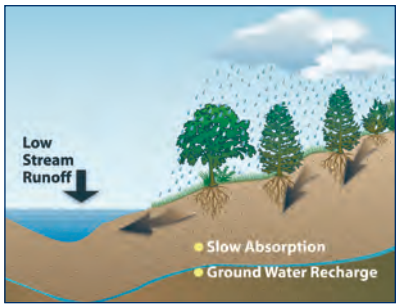
Rain runs off of the street and down the storm drain.

Topic A: To learn if your locality already has a method for testing the first flush, contact your town or county Stormwater Division or Department of Public Works. Is there a way to combine your project with what they have implemented or to use their data?

Topic B: Install collection containers to collect a sample of the first flush from stormwater outfalls in several stream locations. Following a rain event, compare water samples for one water quality parameter (for example: ammonia, pH, phosphate). Are there differences in the concentration of the pollutant across the samples? If so, do the amounts correlate with the various land uses?

The Effect of Buffers on Water Quality and Algae

Background: When water washes over surfaces in a watershed (for example: roads, lawns, forested areas), it carries pollutants with it. The water and pollutants will flow directly into a waterway or percolate through the ground (see graphic).



Buffers are vegetated areas adjacent to streams and rivers; a lawn does not constitute a buffer. The combination of trees, shrubs and grasses in buffers do the following:

- Stabilize the streambank and reduce streambank erosion
- Reduce the amount of sediment and other pollutants entering the stream
- Improve aquatic habitat

Topic A: Select a local waterway that has several different types of buffers or areas that lack buffers. Compare the width or plant composition of the buffers. In your hypothesis, will more algae be found growing in the water downstream of a particular type of buffer or buffer width?

Topic B: What happens when water percolates through the ground? Assemble several containers of equal size that will allow water to be collected after it percolates through a substrate. Fill the containers with equal amounts of different substrates—soil, sand, rock, a combination of the three, living plants in soil, and so on. Do not forget to include a *control* container! Add equal amounts of the same fertilizer to each container and test the water that is collected after it flows through the container. Were the recorded levels of nitrogen and phosphorus different amongst the containers? Was more water collected from one container than from another? How does this information affect your thoughts on stream buffers?

Cleaners and Their Effect on Water Quality

Background: Soaps and cleaners that wash into storm drains and waterways affect the chemistry of the water.

Topic: Test the pH of different cleaners and determine which will have the greatest effect on the water quality. Hypothesize which cleaners will have the greatest effect on pH. Should these cleaners be used at all?