

Storms and Streams

Time Period: 4-5 class periods over several weeks

National Benchmarks: Benchmarks 5A: Diversity of Life; 5D Interdependence of Life; 5E: Flow of Matter and Energy; 9B: Symbolic Relationships; 9D: Uncertainty; 12B: Computation and Estimation; 12D: Communication Skills; 12E: Critical-Response Skills.

National Science Content Standards: *Science as Inquiry: A*; *Life Science: C*: Biological Evolution; The Interdependence of Organisms; Matter, Energy, and Organization in Living Systems; *Science and Technology: E*: Abilities of Technological Design; Understandings about Science and Technology; *Science in Personal and Social Perspectives: F*: Population Growth; Natural Resources: Environmental Quality; Natural and Human-induced Hazards; Science and Technology in Local, National, and Global Challenges

New York State Standards: 1, 2, 3, 4, 5, 6, 7

Objectives: Students will hypothesize how a storm event might change the physical and chemical characteristics of a local stream and be able to collect data to support or negate their hypotheses.

Lesson Outline:

1. Students visit a local stream to collect baseline data
2. Students return to the stream after a storm event to observe changes & collect data again
3. Students discuss implications of storm events

Materials:

Rain gauge
Metersticks
Measuring tape
Thermometers (air and water)
Orange
Stopwatch
Waders or appropriate shoes
Dissecting trays, tweezers, nets to observe benthic material (optional)
Test kits for DO, phosphates, nitrates, pH, chloride and other appropriate tests
Goggles, gloves

*** Data sheets: You will need copies of the chemical and physical data sheets for the baseline study, the hypothesis worksheet to help students come up with ideas, and more copies of the chemical and physical data sheets for the post-storm tests. ***

Preparation: Based on students' familiarity with the equipment, you will want to do a practice run in the classroom with water samples from the stream. This will allow students to practice using the chemical test kits, and give everyone time to think through their hypotheses. You should also decide whether you want to include macroinvertebrates in your survey. Use the collection techniques in the lesson titled "An Aquatic Ecosystem" in Module 1, or in the Pollution module.

Engage: Set up a rain gauge outside the classroom. Designate a student to collect data routinely from the rain gauge. Ask: Why do we collect precipitation data? How much rain do you expect in the next week, the next month? How much rain is associated with a ‘storm event’? How much rain would be needed in order to change the local stream? What impact would a storm event have on a local stream? In order to understand how a storm event affects a stream, what do you have to know? Together with students, define baseline data. Baseline data refers to data that is collected before a study begins, to provide comparison for assessment later. Ideally, students should go out two or three times to get enough information for their baseline data. Review safety procedures for outdoor work.

Explore 1: Baseline: In groups, students will test the water quality and make observations about the physical characteristics of the stream. Based on the size of your class, you will want to assign groups different variables to test. Decide as a class how you want to sample the stream; do you want to split groups up to sample different areas, or will everyone work in one area? Visit the stream and allow the students to gather their respective data for about 20 minutes (or when all groups seem finished with the survey). All students should do a detailed site drawing.

Explain 1: After you return to the classroom, discuss student findings. What did students notice? If students collected macroinvertebrates, discuss the connections between the organisms that live in/near stream with the physical characteristics of that stream. The data below can help students understand what is normally expected in the area for one year. Additional data can be found online at:

http://www.ecostudies.org/emp_purp.html .

Total monthly precipitation data for Millbrook, NY, from Nov. '06 to Nov. '07.

Month	Precipitation monthly total (in inches)	Month	Precipitation monthly total (in inches)
Nov 06	4.39	June 07	2.64
Dec 06	2.0	July 07	6.01
Jan 07	2.82	Aug 07	4.28
Feb 07	2.62	Sept 07	1.80
Mar 07	4.86	Oct 07	4.57
Apr 07	7.94	Nov 07	3.71
May 07	1.66		

Explore 2: Storm Event Monitoring: When students have discussed the initial surveys, allow time in their groups to develop hypotheses. Have the group hypothesize how each stream characteristic that they observed might change (or not) during a storm event. Return to the site after a storm event and complete the survey again comparing it to the baseline data.

Explain 2: Depending on the length of time after the storm event, students should notice physical changes as well as some chemical changes. Since most streams return relatively quickly to pre-storm chemistry, these parameters will be the most difficult to measure. If possible, return to the stream a few more times to collect more data. Another way to

encourage students to design their tests is to figure out how long it takes a stream to return to the pre-storm chemistry levels. If possible, return to the stream a few more times to collect more data. Encourage students to determine the validity of their data based on the limitations of a school setting (ie limited class time, inability to measure *during* the storm). While students are writing up their lab reports, they are asked to think about the difference between a ‘bend’ and a ‘break’ in an ecosystem (a temporary vs a permanent change). If this is a difficult concept for students, spend some time discussing what this might mean for a stream versus a larger ecosystem such as a river. Ask students to classify different environmental problems as ‘bends’ or ‘breaks’.

Extend: Students can create a presentation on their research for community members or other audiences within the school.

Evaluate: Students turn in the completed hypotheses and data sheets, along with a lab report.

Comments: