



STEM Activity: Storm Water Runoff Investigation

Type of Teacher Tool: Whole Class, Small Group

Targeted Grade Level(s): 5th through 12th

Targeted Curriculum Areas: Science and Social Studies

Learning Objectives:

The learner will:

1. develop mapping skills and will observe how rainwater flows.
2. calculate the amount of runoff caused by impervious surfaces.
3. will observe how non-pollutants are washed out of the ground.

Featured National Standards:

1. Grade: 5

5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

2. Grade: 7

MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

3. Grade: 9

HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.

HS-ESS3-6. Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.

4. Grade: 10

HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.

HS-ESS2-2. Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth's systems.

5. Grade: 11

HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.

HS-ESS2-2. Analyze geoscience data to make the claim that one change to Earth’s surface can create feedbacks that cause changes to other Earth’s systems. list of the national standards the activity is targeted to.

Additional State and National Standards related to the content of our videos listed below for this lesson are also provided on the Educate.Today page where you find the video.

Resources/Materials Needed:

1. Environment 70: A Sewer Runs Through It
2. Infrastructure 3: The Science Behind Sewer Systems
3. Environment 54: Celebrate the Earth with Plants: Stormwater, Pollution, and Plant-Based Solutions
4. Environment 55: How Stormwater Runoff Pollution Affects the Environment.
5. Environment 56: What Is a Watershed?
6. Environment 57: Rainscaping: A Solution to Damaging Stormwater Runoff
7. Environment 61: Are there stormwater solutions that are better for a crowded urban area?
8. Environment 62: How do you set up your own rain catching system?

You will also need:

9. Boots, raincoats, paper, pencils, topographical sheets, foam board, clay, eyedroppers

Teacher Instructions:

1. Use any combination of the Educate.Today videos listed above, or excerpts from the videos, to provide context, background, and frame of reference information on the subject of storm water runoff before conducting, or while conducting, the activity. Or use them as extension options for students to continue learning on the subject once the activity has been completed.
2. Take your students out to map the school’s property. Their maps should show elevation, foliage and human constructions.
3. During a light rain, take your students outside to investigate your school’s drainage patterns. They should map impervious surfaces and map symbols to chart the path of rainwater runoff.
4. Have them follow the runoff as far as possible to determine whether it enters a stream or storm water drain. Once they return to the classroom, they should use topographical sheets to follow any streams to see how far any pollutants might travel.
5. Using foam board or clay, have your students create a three-dimensional representation of the topographical sheet. Use eyedroppers to “rain” on the project and have the students chart the direction the water flows.
6. Using the mapping information, students should form a hypothesis on the impact of impervious surfaces on storm water drainage.

Extension Activity Options:

Students should propose answers or solutions to these questions:

1. Does rain soak into the ground best from impervious surfaces, grass, gravel or dirt?

2. Where does the water that falls on the school's roof go?
3. How do impervious surfaces affect a stream in both the short term and long term? Answers to this question should include the following: Water and non-point source pollutants are carried directly into streams in the form of runoff, raising water levels quickly. Banks may fail, the bottom may be scoured out and the non-point source pollutants are carried downstream to eventually settle there. The impervious surfaces prevent water from soaking into the ground, which may affect stream flow later, as there is not enough ground water to replenish flow.
4. How would you mitigate problems caused by impervious surfaces? They may suggest retention ponds, directing storm water to vegetated areas, or "green" parking lots and roofs.

Assessment/Evaluation Options:

1. Teacher will monitor discussions during outdoor investigation and indoor mapping phases.
2. Teacher will monitor completion of the maps and the students' ability to answer questions about their work.
3. Teacher will review the hypotheses formed to see if these address the impact of impervious surfaces and rainwater runoff completely.