



Division of Outdoor Experiences

Stormwater & Sustainable Development

Grade Level: 7

Length of Program: 1 seven-minute intro video, and 3, ten-fifteen-minute sessions

Setting: Asynchronous Remote Learning

State Standards:

Topic: Cycles and Patterns of Earth and the Moon

7.ESS.1 The hydrologic cycle illustrates the changing states of water as it moves through the lithosphere, biosphere, hydrosphere and atmosphere.

Topic: Cycles of Matter and Flow of Energy

7.LS.1 Energy flows and matter is transferred continuously from one organism to another and between organisms and their physical environments.

Theme:

Systems cycle matter and energy in observable and predictable patterns.

The number, growth and survival of organisms and populations depend on biotic and abiotic factors.

Objectives:

- Review the watershed concept by examining a 3-D topographic map model & tools.
- Observe stream energy and causes of erosion and flooding by observing the EM River model in action.
- Discuss features of the build environment that can slow energy and mitigate negative impacts to the environment.

Vocabulary:

- Weathering - the process of wearing or being worn by long exposure to the atmosphere.
- Erosion - the process of eroding or being eroded by wind, water, or other natural agents.
- Deposition - the action of depositing something.
- Sedimentation - the process of settling or being deposited as a sediment.
- Watershed - an area or ridge of land that separates waters flowing to different rivers, basins, or seas.
- Groundwater - water held underground in the soil or in pores and crevices in rock.
- Impervious surface/impermeable surface – an object that does not allow fluid to pass through.
- Infiltration - permeation of a liquid into something by filtration.
- Stormwater - surface water in abnormal quantity resulting from heavy falls of rain or snow.

- **Runoff** - the draining away of water (or substances carried in it) from the surface of an area of land, a building or structure, etc.
- **Floodplain** - an area of low-lying ground adjacent to a river, formed mainly of river sediments and subject to flooding.

Program Outline:

1. **Intro to Watersheds Video A**
 - a. Allows students to be primed for upcoming topics by providing a brief overview and some definitions.
2. **Video B: Interactive Topographic Map**
 - a. While demonstrating the various simulations, discuss “what is a watershed?” Review the water cycle. Where does the rain go when it flows over the land in the storm simulation? How have landforms and human features on the landscape changed the way this watershed looks, compared to what it may have looked like 500 years ago.
 - b. Discuss GIS map layers and how erosion, sedimentations, runoff, non-point source pollution and impervious surfaces relate to these layers.
 - c. Discuss where and how stormwater travels...in relation to rivers and Lake Erie on a broader scale.
3. **Video C: EM River Model / Stream Table**
 - a. Demonstrate how rivers and streams function, with an emphasis mechanisms of erosion and sedimentation, creation of floodplains and features like oxbows, braided channels, and estuaries.
 - b. Explain velocity of stream flow and volume of water in relation to matter and energy. Consider alternative development options.
4. **Video D – Tour of the Stormwater Management Features**
 - a. Show features that allow water to percolate into the landscape, e.g. pervious pavers
 - b. Show features that prevent erosion, e.g. splash blocks with rocks
 - c. Show features that provide storage of stormwater for future use, e.g. cistern, rain barrel
 - d. Show features that restore or simulate natural system, e.g. bioswale, created wetlands, native planting beds

Enrichment Activities:

Runoff simulation: <https://runoff.modelmywatershed.org/>

Map and plan reduction of runoff on school property:

WikiWatershed: <https://modelmywatershed.org/>

Instructions for using WikiWatershed:

- First, go to <https://modelmywatershed.org/>
- Type in your school’s address in the search bar in the upper right hand corner
- Then click the “*Get Started* →” button to begin your project
- Once zoomed in on your school, go to the **Layers** box in the bottom middle of the screen
- In that box on the right side click on “*Basemaps*” (the layered rectangles icon)
- In **Basemaps**, click on “*Satellite with Roads*”

- Click on the **Draw area** box on the left, then click “Free Draw” and draw an area to capture your school. Click on the first point to end the drawing process.
- On the left-hand menu click “Model”
- Choose “Site Storm Model”
- This will give you a 24-hour hypothetical storm event *record the data to compare to the conservation practices you will create*
- The data is “Runoff Partition, Water Depth (cm), and Water Volume (m³)”
- **Now is the time to start adding Conservation Practices to your school to help your watershed!**
- In the top right corner, click on “+Add changes to this area”
- You will be using the button “+Conservation Practice” to add the changes to your school
- **Now watch the changes as you add a new conservation practice and see how much you can help your watershed by reducing stormwater runoff.**

Get a report on your school’s watershed:

USGS Stream Stats App: <https://streamstats.usgs.gov/ss/>

Instructions for Stream Stats:

- **Go to:** <https://streamstats.usgs.gov/ss/>
- Close the pop-up notes of changes made to the app
- Search for your school by inputting the address in the search on the left hand side of the screen
- Select “Ohio” on the left hand side of the screen
- Click the “Delineate” button
- Find the nearest stream to your school, and click on a blue square just downstream of the school
- Click the “Continue” button when your watershed is delineated
- Click the arrow next to “Basin Characteristics” and click the “Select All Basin Characteristics” button
- Click the “Continue” button
- Click the “Continue” button again
- A report has now been generated showing the watershed upstream of your school. This report contains information such as drainage area, % forested area, % developed, annual precipitation and more.
- To find the total watershed area, run the app again, and follow your stream to the confluence (where it flows into another stream or lake) and select that blue square.
 - By subtracting the drainage area of the upstream watershed from the total watershed, you will have the total downstream drainage area that your school impacts.