

Stormwater Activity Guide

Environmental scientists investigate environmental problems hoping to find real solutions to improve the health of the earth.

The Job: Become an Environmental Scientist.

The Mission: Investigate an Environmental Problem.

The Problem: Stormwater Run-off.

What is Stormwater Run-off?

Stormwater run-off is rain that runs off streets, rooftops, parking lots, lawns, and other land surfaces into the nearest body of water. It is the rainfall that is not absorbed by the soil.

Stormwater run-off causes flooding and is often polluted. As it rains, water moves over the land, flowing to the nearest waterway. As it moves over land, the water may pick up many types of pollution. Normally, in undeveloped areas, water seeps through the soil to replenish freshwater in the aquifer. When surfaces are developed and paved, water is unable to seep through the soil and impervious surfaces increase the amount of stormwater run-off.

Common sources of stormwater pollution include:

- pesticides and fertilizers from lawns, parks, and roadsides
- bacteria and disease-causing organisms from pet waste and improperly working septic systems
- oil and grease from car leaks, gas stations, and industrial areas
- toxic chemicals from leaks, spills, auto wear and exhaust
- litter such as cigarette butts, cans, paper, or plastic bags
- sediment from construction sites and unvegetated areas



Important Terms

Detention Pond

A pond constructed to slow stormwater run-off and to allow the sediment in the run-off to settle to the bottom.

Impervious Surface

Material such as asphalt and concrete that does not allow water to pass through

Nutrients

Substances that provide sources of energy and growth for plants and animals

pH

Measure of the amount of hydrogen ions in a solution

Pollution

Contamination of water, soil, or air by harmful chemicals or waste materials

Retention Pond

Constructed pond where stormwater is held

Run-off

Rainfall that is not absorbed by the soil but flows to a larger body of water

Stormwater Run-off

Rainwater that runs off land surfaces into the nearest body of water

Stormwater Treatment Areas

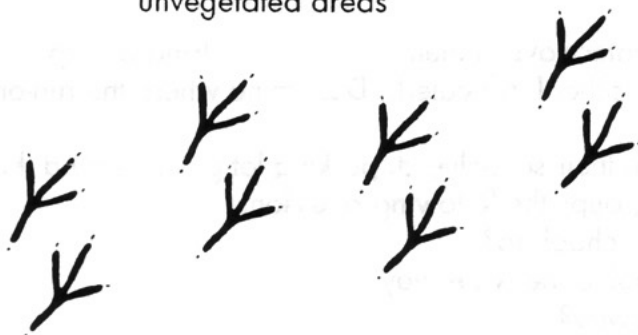
Constructed wetlands used to reduce nutrients and improve water quality; for example, stormwater ponds

Watershed

Land area that contributes run-off to a water body

Wetland

Areas where land meets water; wetlands support plants adapted to wet soil



Where Does Stormwater Go?

Before it reaches a larger waterway, stormwater run-off typically flows into stormwater drains in parking lots and curbs leading to stormwater sewers. These sewers do not offer any type of treatment to clean the water they collect. Therefore, the polluted stormwater run-off eventually enters our rivers, streams, or other waterways.

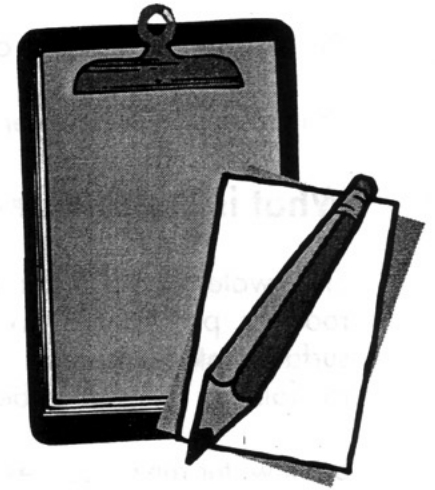
Activity 1: Identifying Sources of Pollution

In this activity, students will investigate stormwater pollution on their school grounds and take on the role of environmental scientists.

Materials:

- Clip boards
- Data sheets
- Pencils

Type of Pollution	Quantity
Trash	
Oil stains/other chemical stains	
Animal/pet waste	
Other	



1. Copy the grid above or design one of your own and distribute to students.
2. Take students to a parking lot or playground at your school. Have them work in small groups. Allow them to explore the playground or parking lot looking for evidence of stormwater pollution. Make sure they record all that they see, such as trash, oil stains, and pet waste.
3. Once the students have identified sources of pollution, pose a series of discussion questions:
 - a. What sources did you see?
 - b. What do you think will happen the next time it rains?
 - c. Where is the rainwater/stormwater going to go?

Activity 2: Identifying a Watershed

The land area that contributes run-off to a water body is called a watershed. Any type of pollution on land within the watershed can eventually reach and impact larger waterways. Once pollution has been identified, environmental scientists must think about where that pollution will go. Help students take the next step in stormwater investigation. In Activity 1, students identified possible sources of pollution in their schoolyard, playground and/or parking lot. This next activity will help students investigate where the pollution will go.

Materials:

- Maps (including topographic maps) showing elevation of the local community, streams, lakes, and rivers
 - Paper
 - Clipboards
 - Pencils
1. Have students investigate local maps showing the waterways in their community. Using a map, students should identify the watershed in which their school is located. Determine where the run-off eventually goes.
 2. After students have identified where stormwater from their schoolyard/parking lot goes, remind them of their data from Activity 1. Have them discuss in groups the following questions:
 - a. Where does the rainwater/stormwater from your school go?
 - b. What types of pollution will travel from your school to the waterway?
 - c. What effects will that pollution have on that waterway?

Testing the Water

How do scientists know if pollution reaches a waterway? You guessed it: They must test the water. Scientists can test the water to see if the chemistry is normal. Some of the tests they will perform include pH, dissolved oxygen, nitrite and nitrate levels, phosphorous, and turbidity, or how clear or cloudy the water is

Activity 3: Investigating Water Quality

Once environmental scientists have identified sources of stormwater pollution and determined where it may go, it is their job to test the water quality of waterways.

In Activity 3 students can test previously prepared water samples and learn how scientists monitor water quality in our waterways.

Materials:

- Water testing kit (tests for pH, nitrate, and ammonia are available at most pet stores)
- Tap water
- Vinegar
- Ammonia
- Plant Fertilizer
- Potting Soil
- 5 Glass jars
- Pipettes

1. Prior to the activity, prepare samples for students. Use 5 glass jars to prepare samples:

Jar #1 Tap Water (control)
Jar #2 Tap Water + few drops of vinegar (low pH)
Jar #3 Tap Water + few drops of ammonia (high ammonia)
Jar #4 Tap Water + few drops of liquid plant fertilizer (high nitrate)
Jar #5 Tap Water + small amount of potting soil to give cloudy appearance (high turbidity)

2. Have students break into five different groups. Each group should get one of the prepared water samples.
3. Each group should then perform each test on their sample. Students can follow test kit directions for pH, nitrate, and ammonia. To test turbidity, or cloudiness, students should hold their sample against a white sheet of paper.
4. Have students record their results and prepare to share them with other groups.
5. Once the students have shared their results with the other groups, ask some of the following questions to spark a discussion:
 - a. Do the test results indicate healthy water quality?
 - b. If the test results indicate poor water quality, what kind of negative effect can that have on the waterway?
6. Have the students do some research to find out what effects pollution, especially stormwater pollution, has on our waterways.
7. Have the students think about possible solutions to improve water quality.

How does polluted stormwater affect our waterways?

The pollutants in the stormwater can change the physical, biological, and chemical composition of the water and cause an unhealthy environment for fish, other aquatic organisms, wildlife, and humans. Poor water quality can be an indicator of problems in the waterway that could result in the death of aquatic plants and animals.



Fixing the Problem

What can we do about the stormwater pollution problem?

We know that stormwater picks up pollution that lies within a watershed, so one of the ways to deal with that problem is to clean the water before it reaches the waterway. Constructed wetlands called stormwater ponds are a step in the right direction. They help clean stormwater pollution while creating a beautiful natural experience in an otherwise busy urban setting.

What is a stormwater pond?

Natural ponds capture rainwater as it rushes over the ground, reducing erosion and floods in rivers and streams. By holding much of the stormwater, these ponds allow nutrients and chemical contained in the run-off to be filtered from the water before it moves through the soil and into rivers, lakes, and estuaries. Simulating natural ponds is one method to accomplish this in an urban setting. A stormwater pond is a man-made pond that holds and treats stormwater in developed areas. It is specifically designed to decrease downstream flooding and remove pollutants from water before it enters the nearest waterway.

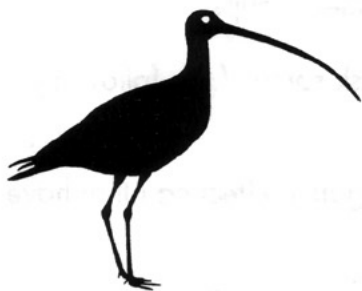
Stormwater ponds have lots of plants. More plants and soil mean more surface area for filtration and absorption of stormwater run-off. Rooted plants can absorb nutrients and facilitate transformation of certain pollutants, such as nitrogen-containing compounds, to less detrimental forms. Plant life may help protect receiving waters from pollutants present in surface water run-off.

Activity 4: Investigating a Stormwater Structure: A Stormwater Pond

Stormwater ponds can offer a beautiful natural setting in an otherwise busy urban place. Have the students investigate a stormwater pond, which is a possible solution to the problem of pollution run-off. Spend time examining at this environment.

Materials:

- Wetlands Identification Guides
- Clipboards • Pencils • Data sheet



Types of Organisms	Quantity
Wading Birds	
Insects	
Fish	
Turtles	
Frogs	
Emergent Plants	
Other	



1. Have students work in groups, looking closely at the stormwater pond. Allow them to use field guides to identify some of the wildlife around the pond.
2. After students have spent time exploring the diversity of the pond, engage them in a discussion about their findings. Use some of the following questions:
 - a. What types of living things did your group see around the pond?
 - b. Were you surprised by the diversity of plants and animals?
 - c. Besides functioning as a cleaning system for stormwater, what other functions do stormwater ponds have?
 - d. Do you think that stormwater ponds are important areas in need of management?