



# Rain Drop Relay

This activity allows students to simulate the journey of a rain drop while learning about the water cycle and common stormwater pollutants.

For grades K - 5

Created by the Athens-Clarke County Stormwater Management Program

## Lesson Summary

Students learn about the water cycle, stormwater runoff, and the different types of pollutants that can get into our water sources. After a brief lesson and discussion, students will act like rain drops while traveling through a multi-stage obstacle course. The elements of the interactive obstacle course represent different types of pollution, so students will understand that rain drops come into contact with different things on their journey from the sky, to the street, to the stream.

## Objectives

- Students will learn the parts of the water cycle.
- Students will learn that stormwater runoff is the number one source of water pollution.
- Students will learn about common water pollutants, including animal waste, litter, excess fertilizers and pesticides, oil, and sediment.
- Students will learn several simple ways for humans to reduce their impact on water quality, i.e. pick up after pets and routinely check cars for oil leaks.

## GSE Science Major Concepts

### 1st Grade:

S1L1. Obtain, evaluate, and communicate information about the basic needs of plants and animals.

### 2nd Grade:

S2E3. Obtain, evaluate, and communicate information about how weather, plants, animals, and humans cause changes to the environment.

### 3rd Grade:

S3L2. Obtain, evaluate, and communicate information about the effects of pollution (air, land, and water) and humans on the environment.

### 4th Grade:

S4E3. Obtain, evaluate, and communicate information to demonstrate the water cycle.

S4L1. Obtain, evaluate, and communicate information about the roles of organisms and the flow of energy within an ecosystem.

### 5th Grade:

S5P1. Obtain, evaluate, and communicate information to explain the differences between a physical change and a chemical change.

## Materials

- 2 collapsible tunnels
- Fake stream/pond (can be replaced by a kiddie pool if permitted by summer camp/school)
- Spray bottles or water guns (optional - for instructors to spray at students)
- Fake dog poop
- Colorful plastic balls
- Clean trash
- Plastic bags
- Wooden stakes
- Rubber mallet
- Yarn or string
- 2 trash cans
- 1-2 pieces of chalk

## Background Information

This activity focuses on the water cycle, stormwater runoff, and common household pollutants. Some information about the water cycle was taken from the USGS Water Science School's website.

### The water cycle

The water cycle describes the existence and movement of water on, in, and above the Earth. Earth's water is always in movement and is constantly changing states, from liquid to vapor to ice and back again.

The water cycle consists of evaporation, evapotranspiration, condensation and precipitation. Water continuously moves through this cycle.

- **Evaporation:** As liquid water in streams, rivers and oceans is heated by the sun, it turns into water vapor.
- **Condensation:** As water vapor rises, it begins to cool, causing the water vapor to condense into clouds in the sky.
- **Precipitation:** As clouds move across the sky, water particles can drop out of the sky as rain, snow, or sleet.
- **Evapotranspiration:** The process by which water evaporates from soil and plants.

Not all runoff flows into rivers, though. Much of it soaks into the ground as infiltration. Some of the water infiltrates into the ground and replenishes aquifers, which store huge amounts of freshwater. Some infiltration stays close to the surface and can seep back into surface-water bodies as groundwater discharge, and some groundwater finds openings in the land and emerges as freshwater springs. Yet more groundwater is absorbed by plant roots to end up as evapotranspiration from the leaves. Over time, all of this water keeps moving, some to reenter the ocean, where the water cycle "ends."

### Stormwater runoff and household pollutants

Stormwater runoff is rainwater or snowmelt that flows over the ground. In natural areas, most rainwater soaks into the ground, because the ground is pervious, allowing water to pass through it. In developed areas, the ground is hard and impervious, which prevents stormwater from infiltrating, resulting in runoff.

As runoff moves across the landscape, it can pick up many different pollutants. In Athens-Clarke County, when runoff enters a storm drain, it carries those pollutants directly from the streets and sidewalks to the streams and rivers. There is no stop for treatment. Some common pollutants include:

- **Sediment.** Sediment can cloud the water and harm aquatic plant and animal life. Sediment also presents points of nucleation for bacteria, promoting the growth of harmful bacteria.
- **Bacteria and pathogens.** Present in animal waste, bacteria and pathogens can enter the stream through septic tank leaks, pet waste and wild animal waste. Once there, the bacteria can make the water unsafe for recreation and drinking.
- **Nutrients.** Found in fertilizers and animal waste, plant nutrients such as nitrogen and phosphorous can cause problems. Once in the stream, nutrients promote algae growth, resulting in algal blooms and the disruption of aquatic ecosystems.
- **Litter.** Trash and dumped items can suffocate, choke or otherwise harm aquatic animal life.
- **Household chemicals.** Soaps, pesticides, paints and other commonly used household chemicals can enter streams and rivers and poison aquatic life.

## Set-up

This activity should be done outside and works best in a large field or play area. All materials can be borrowed from the ACC Stormwater office.

You will set-up two different relay lines made up of four different stations.

- At station 1, lay a plastic bat on the ground.
- At station 2, draw a hopscotch pattern on the ground with chalk and make a large pile of fake poop and plastic bags at the beginning or end of it.
- At station 3, set up 6 stakes (3 on either side of the relay lane) and run yarn in between the stakes at a height for the students to be able to crawl under. Make a pile of clean trash in front of the stakes and set a trash bin behind them. Spread the colorful plastic balls out under the yarn to represent different types of pollution.
- At station 4, lay out a collapsible tunnel leading to the fake stream (blue cloth or a kiddie pool).

## Procedure

Start by discussing the stages of the water cycle and the way water transforms between two, sometimes three, states of matter (liquid, gas, solid). Ask the students where our water comes from and see if they can name the parts of the water cycle. For K-3 students, ask the students to stand up, stretch, and do the water cycle dance. First tell them to imagine they are water droplets on the ground. The water cycle dance involves 1) evaporation (students crouch down and stand up slowly while wiggling as the leader tells them the sun's rays are warming them up), 2) condensation (students clap their hands as the leader tells them that the air is cool so far from earth, forming clouds), and 3) precipitation (the students move toward one another to form a clump and once it is formed, they quickly crouch down or fall to represent rain falling).

Next, start a discussion about stormwater. Ask the students what happens to rain when it hits the earth. The students should generate a list that includes soaking into the ground, going into a river, or hitting infrastructure or homes. Discuss what happens to the water when it soaks in [becomes groundwater, gets used by plants, can evaporate in evapotranspiration]. Then ask what happens to the water when it runs off the ground [picks up pollutants, can heat up, goes into a storm drain and enters the water quickly]. Ask students to compare/contrast stormwater in natural areas and urban ones [what happens when it rains on top of a forest vs. what happens when it rains on top of a parking lot].

Ask students to name pollutants that runoff can pick up and explain how those pollutants harm the ecosystem and affect humans. Fill in the gaps of their list with pollutants from the background information. For older grades, ask students to explain what can happen when multiple pollutants enter our waters [algal blooms and warm water can both lower dissolved oxygen, harming fish, for example].

To begin the relay, split the students into two groups and line each group up in front of a relay lane. Instruct the students that they are racing each other to the stream at the end of the lanes by completing the obstacles as quickly as possible. In order to win, students must return to their lines and sit on the grass.

Explain the rules of each station:

- Station 1 (Dizzy Bat): While keeping the fat end of the bat on the ground, lean over to hold the other end against your forehead and circle around the bat 5 times.
- Station 2 (Hopscotch): Grab a piece of fake poop, toss it onto one of the hopscotch squares, then begin hopping onto the squares. When you pass the poop, bend down and pick it up with a plastic bag (using the proper pooper scooper technique). Complete the hopscotch and keep holding on to the bag of poop.
- Station 3 (Trash Crawl): Pick up a piece of trash, in addition to the poop, and army crawl underneath the yarn. Toss both the poop and trash into the trash bin when you get to the end.
- Station 4 (Through the storm drain): Crawl through the tunnel (storm drain/pipes) and jump into the stream.

The first team member of each line begins, and the next team member begins after the first has completed the Hopscotch station. If you need to take more time, let every student go through the obstacle completely before starting the next student. The first team to have all members through the relay wins!

## Assessment

In the closing discussion, students will be asked the following questions:

- What are the parts of the water cycle?
- What are the different types of water pollution and when do they enter the water cycle?
- Was it harder or easier to get through the relay with the “pollution” obstacles?
- What can you do to help keep Athens-Clarke County streams clean?
- Why is it important to prevent stormwater runoff pollution?