

MSD Clean Water Education | Using the EnviroScape® With Your Class

Thank you for choosing to partner with the MSD Clean Water Education program to bring stormwater education and awareness to life in your classroom. This short guide will help you in creating your own unique EnviroScape® presentation. Make adjustments to this script for your students' grade level, specific focus, and/or learning abilities.

What is the EnviroScape®?

The model you will be using is the Non-point Source Model, representing a community watershed. This hands-on model will allow students to visually see the relationship between human land use and water quality.

Essential Questions

Consider the following questions as you guide your students through the EnviroScape® experience:

- How does water move through a community?
- How does water behave in our watershed? Why is it important?
- How does our community change local and regional watersheds? How can our community work together to protect our local watersheds?
- Why do humans and animals depend on healthy watersheds?

Watershed Vocabulary

Best Management Practices (BMP) – systems, activities and structures that humans can construct or practice to prevent non-point source pollution.

Combined Sewer System – A system where wastewater and stormwater move through the same infrastructure. Excessive stormwater added to the wastewater already in the system causes overflow of untreated water directly into lakes, rivers, and streams. Much of St. Louis City has a combined sewer system.

Non-Point Source Pollution – Pollution that cannot be traced to a specific origin or starting point.

Point Source Pollution – Pollution discharged into watersheds from specific, identifiable points, such as a factory.

Separate Sewer System – A system where wastewater and stormwater are kept separate, wastewater is transported directly to a treatment plant and stormwater is collected in separate pipes that drain to nearby creeks and streams.

Stormwater - Generated when rain or snowmelt is not able to be absorbed into the ground because it falls on a hard or impervious surface, the ground is already saturated, or it rains faster than the water can be absorbed. This excess water flows over the ground and then into stormwater inlets, sewers or directly to local ponds and streams.

Watershed – An area of land that drains all the streams and rainfall to a common outlet such as the outflow of a reservoir, mouth of a bay, or any point along a stream channel.

Presentation Outline in Brief

Introduction – Students define key vocabulary words and build understanding of the term watershed

Part I: Exploring Pollutants – Students discuss the various pollutants that can contaminate a local watershed and the environmental impacts of these pollutants. Pollutants are applied to the model to visual demonstrate impact on watershed.

Part II: Pollution Solutions & Best Management Practices – Students discuss activities and practices that a community can do to prevent non-point source pollution to the model and observe changes in water quality.

Conclusion – Students discuss their observations and reflect on the demonstration experience. For a more challenging conclusion, have students evaluate or compare and contrast the different BMPs applied.

Introduction

Have students observe the model and let them know that today the focus is on stormwater and water quality. Ask students to describe what they see. Have students define key terms such as stormwater or watershed.

Use the map provided to examine where the school is, where students live and identify the watershed name. Do students know of any nearby rivers? Discuss the big picture and importance of understanding watersheds.

Have the students visualize how our watershed empties into the Gulf of Mexico. Have students identify the Missouri, Mississippi, Meramec and River des Peres rivers as appropriate.

Ask students to describe their definition of pollution. Ask them to define non-point and point source pollution. Have them “point” out examples of point and non-point source pollution on the EnviroScape®. The Factory is the point source on the model and a good place to start.

Part 1: Exploring Pollution

Ask the students to now consider the non-point source pollutants. Explain that these are issues the whole community must work together on to solve. Refer to the **Pollution Chart** on page 3 of the Teacher Guide to review pollutants and their environmental impacts.

As the students are looking at the EnviroScape® model, ask if they spot any areas where there are potential pollutants.

For each pollutant in the kit describe, or let students describe, the general area these pollutants may come from, why, and the potential environmental impact.

As you or your students describe each pollutant pollute the model with the matching “pollutant”. This can be done by the teacher or students for a more hands-on demonstration.

Once the model is polluted, Ask students to reflect on the health of the main river. Did it change? Now, ask students to think about what will happen when it rains.

Have two students using the spray bottles provided to “rain” on the model. As the “rain” is falling, have students make observations about what is happening. Where is the water flowing? What happened to the pollutants? You may want to demonstrate upstream flow and show how the yard waste and trash can cause blockages at bridges.

Ask students reflect on the health of the main river again. Do they think the water is safe to drink? Would they like to swim in the lake/river? Eat fish out of that lake/river? This is a good opportunity to discuss where we in St. Louis get our drinking water.

Part 2: Pollution Solutions & Best Management Practices

Ask the students to consider what could be done to prevent the pollution from going into the lake/river.

Define the term *best management practices (BMPs)* and have the students brainstorm ways to apply the BMPs to the watershed model to prevent pollution. Refer to the **Best Management Practices Chart** on page 4 for guidance. If time permits you may run the demonstration again applying different BMPs and observing changes.

Wrapping Up and Learning More

As you begin to conclude the demonstration have students discuss or journal the experience. Suggested prompts reflection:

- Have you ever witnessed pollution in your neighborhood? At school?
- What could you say to someone to help encourage them to act in protecting the watershed?
- After viewing the watershed model, what new thoughts or ideas do they have about the importance of protecting our watershed?
- What questions do you have about your own local watershed? Have students research the quality of their own local watershed, rivers, streams and creeks.
- Respond to an Essential Question listed on page 1 of the Teacher Guide.



The MSD Clean Water Education program is presented by the EarthWays Center of the Missouri Botanical Garden in partnership with the Metropolitan St. Louis Sewer District.

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Pollution Chart

Pollutant	Area	Represented By	Environmental Impact
Fertilizer	Golf Course Farm Residential Home	Pepper	A nutrient (food) for plants that contains chemicals like nitrogen, phosphorous, and potassium that plants use to grow. When these chemicals go into our lakes, they can also cause algae to grow. Too much algae is a problem, though. When lots of algae die, they use up the oxygen in the water to decompose, causing a problem for fish. Too much algae at the surface of the water can also block sunlight from reaching other plant life at the bottom of lakes.
Pesticide	Golf Course Farm Residential Home	Pepper	A chemical used to treat for unwanted pests. Can be toxic to the environment. When pesticides enter our water bodies they can be transferred to organisms living in the water. For example, fish can absorb pesticides through their skin by swimming in the water. They also breathe in pesticides through their gills. Fish might also drink the pesticide-contaminated water or feed on other organisms that have eaten pesticides. Other animals eat fish, and thus the pesticide toxins travel up the food chain. When fish eat, drink or breathe pesticides, it can cause them to have trouble reproducing, to be more susceptible to diseases, and to have trouble escaping from predators.
Loose Soil/Sediment	Construction Site Farm Deforestation/ Logging operation on mountain area	Cocoa Powder	Loose soil adds sediment to our water. Loose soil increases the cloudiness of the water, which increases the temperature, and decreases the amounts of oxygen in the water. The sediment also forms like a "slip-in-slide" on the lake floor and many organisms cannot lay eggs and reproduce. Sediment can also build up on the bottom of a river or stream, which affects the depth of the water. This could then cause a problem for boating and recreation.
Animal Waste	Farm Near Dog	Chocolate Sprinkles	Animal waste and septic sewage adds harmful bacteria to the water. This can cause people and animals to become ill. Excess sewage in a body of water can even cause officials to close portions of a lake for swimming and recreation.
Litter & Yard Waste	Household areas Vacant areas & bridges Stream banks (illegal dumping)	Litter: black hole punches/ paper scraps Yard Waste: Parsley Flakes	Litter can injure people and animals. This pollutant can also cause blockages in creeks and streams. <i>Optional: Discuss or show Peanut the Turtle, a turtle that became entangled in a soda ring and was rescued by the Missouri Department of Conservation.</i>
Oil & Other Chemicals	Factory (Point Source Pollution) Spilled Oil Tanker, cars, Houses Storm drain	Soy Sauce	The used oil, as well as detergents, dirty water and soaps from washing your car, are carried through city drains into nearby watersheds. Used oil from a single oil change can pollute up to one million gallons of freshwater. When factories pollute, they are often not following the law. Either the factory hasn't obtained written authorization, does not have the right equipment to treat contaminated water or is in violation.
Salt	Roads Houses	Salt	Road salt and other de-icing products contain harmful chemicals for our waterways.

Best Management Practices Chart

BMP	Area	Represented By
Filter	Factory	Sponge – place in front of factory drain
Infill Redevelopment; Keeping buffers and wetlands	Deforestation/Logging Operations	Add felt strips and plant trees around area.
Reduction in application of fertilizer and pesticide	Golf Course; Farm	Reduce the amount of pepper applied to model.
Planting more vegetation; planting native vegetation that doesn't require as much fertilizer or pesticide to grow	Golf Course; Farm; Houses	Add felt strips to areas; reduce amount of pepper applied to the model; discuss reduction in application and timing (for example, don't spray when rain is expected).
Inlet Markers	Houses	Show Storm Drain Marker and discuss importance of signage to build community awareness; eliminate oil poured in storm drain tube. This is a key BMP for students to help put in place.
Pick-up pet waste; waste stations; sealed bags	Houses	Reduce/Eliminate number of sprinkles near the houses.
Fix car leaks; maintain septic tanks;	Houses; Roads	Reduce oil spilled on roadways.
Plant rain gardens; native gardens; install community gardens; bioswales	Houses	Add bean-shaped green felt strips to areas.
Shovel snow; use brine	Houses; Roads	Reduce salt sprinkled in the area.
Reduce illegal dumping and dumping of yard waste in stream banks	Houses, along stream banks	Reduce the amount of pollutant on the board; add fence near stream banks; discuss signage and community efforts.
Cut grass higher, use mulching blades	Houses	Reduce pollutant added to the model.
Planting buffer of grasses or berm	Construction Site; Farm	Add green felt near construction site; add a clay wall along edge of construction site and farm to stop soil erosion.
Carpool; hybrid cars; and alternative transportation methods	Roads	Reduce oil spilled on roadways.
Clean-up Events	Stream banks; Bridges; Houses; Vacant areas	Reduce "litter" spilled.
Plant a riparian buffer	Farm	Add a green felt strip to the edge of the farm.
Contour plowing	Farm	Plow so water runs away from channel to watershed.
Build fence to control livestock	Farm	Add fence to model; prevents livestock from reaching stream banks.
Composting	Farm; Houses	Discuss composting of yard waste and manure; reduce pollutants added to model.
Planting Trees	Deforestation/Logging Operations; Farm	Add additional trees to the model – planting trees holds soil in place.

Photo Guide: EnviroScape® Watershed Model

EnviroScape® with some BMPs



Deforestation/Logging Area



Farm berm with trees



Construction Site with berm



Community rain garden