

### *Community Pollution Activity*

#### **Goals**

Identify the various ways that pollutants are introduced and flow through watersheds. Discuss the impacts that these pollutants have and ways to reduce impacts throughout the watershed.

#### **Introduction**

Land-based activities generate all sorts of waste products that can travel to the ocean via watersheds through rivers, runoff, and wind. Work with students to create a model watershed in order to demonstrate the creation and movement of common pollutants through urban areas on a more tangible scale.

#### **Next Generation Science Standards**

##### Practices

- Planning and carrying out investigations

##### Core Ideas

- ESS3.C Human impacts on Earth systems

##### Cross-cutting Concepts

- Systems and system models
- Influence of Science, Engineering, and Technology on Society and the Natural World

#### **Supplies**

- Tarps + objects used underneath tarps to create topography (balled up paper, buckets, etc.) or find an appropriately uneven but sloped landscaped or natural area - ideally want peaks and valleys
- Blocks (buildings)
- Toy animals, cars, and trees (optional)
- Sidewalk chalk or wet erase markers (to draw roads if desired)
- Coconut flakes (trash)
- Brown sprinkles (dog poop)
- Cocoa powder (loose soil)
- Green food coloring or sprinkles (fertilizer)
- Red food coloring (toxic substances)
- Dish soap, or baking soda (detergents)
- Cooking spray, cooking oil, soy sauce or honey (oil)
- Watering cans or spray bottles (1 per 3-5 students)

#### **Procedure**

**1. Intro.** Discuss with students what types of pollutants they have witnessed in their local natural areas or at the beach, river, or lake. Ask students where they think these pollutants originated from. Define a watershed (a region within which all water flows to the same point downstream into a stream, lake, or ocean) and discuss how land use, human activity, and topography, may influence what flows downstream. You can also discuss the difference

between point source (occurs from a single identifiable source or point) and nonpoint source (occurs due to various unidentifiable causes) pollution.

- Additional resources on point and nonpoint source pollution can be found at the [National Ocean Service Education for Students site](#).

**2. Set up.** This activity can be conducted with a tarp on a gentle slope or on a tarp that has towels, buckets or other items beneath it to create a slope and topography. If inside, also consider using towels and a basin to capture runoff.

- Using the tarps and materials, have students create their watershed landscape with peaks, valleys, and flat land. Then have students create different land uses (city, farm/agriculture, forest, etc.) as well as uses within each (dog parks, golf courses, parking lots, etc.) using blocks and toys.
- Pour or spray water to see the patterns of flow and retention, and create your watershed river systems and bodies of water.
- Have students make predictions about types of pollutants and flow patterns based on land use types and features.

**3. Add pollutants.** Add each of the pollutants that individuals may find in their watershed one at a time and let them sit there as you discuss predictions about what may happen.

- Coconut flakes = trash. Discuss with students where trash might accumulate (streets, parks, etc.). Distribute the coconut flakes throughout the watershed in areas that students predict to be associated with trash leakage or accumulations.
- Brown sprinkles = dog and other animal waste. Add sprinkles at random.
- Cocoa powder = loose dirt. Sprinkle some cocoa powder to indicate a cleared forest, a recently burned area, or a construction site exposing loose soil that can be carried with precipitation as runoff into nearby bodies of water.
- Green food coloring or sprinkles = fertilizer. Add to the areas of the watershed where there are homes with lawns, green parks, golf courses, or agriculture with fertilized crops. Tell students about the chemicals that are used on grass and other plants, discuss application of industrial fertilizer and how only a little gets taken up by plants while the rest may enter the storm drain as runoff.
- Cooking spray/ oil / honey / soy sauce = oil from cars or machinery. Discuss where oil may be found in a watershed: in areas of illegal dumping, gas stations/mechanics, or parking lots. Discuss the importance of car maintenance and the role of impervious surfaces such as roads, parking lots, and driveways in facilitating oil pollution in runoff.
- Red food coloring = toxic waste. Discuss scenarios such as a family who finds a container of household hazardous waste (e.g. paint thinner) in their garage and wants to get rid of it in a hurry so they dump it down the storm drain in front of their house. Explain to students that hazardous waste should be disposed of properly. Use only a few drops of food coloring for adequate effect.
- Dish soap, antacid tablets, or baking soda = detergents. Identify a few homes where people are washing their cars in the driveway, letting the soapy water run down the driveway into the storm drain.

- 4. Let it rain!** Simulate a rain event by pouring or spraying water into the watershed.
- Ask students to describe what they see happening to the pollutants in the watershed.
  - In particular discuss:
    - How do pollutants mix with the bodies of water in the watershed?
    - What pollutants remain on land and where, and what may happen to those?
    - What will happen to those in the water?
    - Can you tell “whose fault” the pollution is (i.e., who is responsible)? How might this change throughout the watershed or over time during the rain event? (For another fun activity on this topic, check out [this video!](#))
- 5. Discussion.** Ask students what ways the different types of pollution could have been avoided.
- Possible best management practices or watershed management techniques that could be discussed are:
    - Trash: Create less trash by avoiding single-use disposable items, make sure trash is disposed of correctly, pick up any litter, cover waste bins, etc.
    - Dog and other animal waste: Pick up pet waste and dispose of correctly, keep domesticated animals out of waterways using fences
    - Loose soil: Control erosion by planting trees, shrubs, or ground cover in areas where there is exposed soil
    - Fertilizer: Apply fertilizer according to container directions, try organic gardening or growing
    - Hazardous Waste: Contact your city or Environmental Protection Agency for household hazardous waste pick-up days or waste collection programs
    - Oil: Keep your car maintained and watch for oil spots on your garage floor
    - Detergents: Wash your car at a facility that recycles wastewater or sends it directly to a treatment facility
  - Ask students how they could have educated the people in this watershed about these pollutants and runoff affecting water quality.
  - Ask students to brainstorm ways they can reduce pollutants in their own watershed.
- 6. Assessment.**
- Turn the discussion questions into short answer reflections for written response.
  - Have students draw a diagram of the watershed, including potential pollution risks they experimented with within the model.
- 7. Extensions.**
- Have students analyze land use maps of their area to predict different kinds of pollution risk
  - Run the watershed simulation again, but have students try to create modifications that block the flow of pollutants
  - Provide students with local water quality data ([EPA How's My Waterway](#), for instance) and try and analyze the impact of rain events

### References

- Global Rivers Environmental Education Network. 2002.  
[https://www.in.gov/idem/riverwatch/files/resources\\_tarp\\_activity.pdf](https://www.in.gov/idem/riverwatch/files/resources_tarp_activity.pdf)
- *An Educator's Guide to Marine Debris*, NOAA Marine Debris Program and the North American Marine Environment Protection Association, pg. 12.



