

Storm Drain Watch

Grades: 3 – 4

Time Allotments:

Teacher preparation: 45 minutes
Lesson/activity: 30 – 45 minutes
Closure/assessment: 30 minutes

Content Objectives: After performing this activity students will be able to:

- 1) Describe what stormwater is;
- 2) Explain the purpose of a storm drain;
- 3) Define the term “nonpoint source pollution” and identify examples of it;
- 4) Suggest reasons why people create or contribute to nonpoint source pollution; and
- 5) Select strategies for reducing or preventing some forms of nonpoint source pollution.

Process Objectives: Students will:

- 1) Analyze real-life situations to determine concerns, problems and potential solutions;
- 2) Participate in group discussion and perform a task; and
- 3) Respond to questions from teacher.

Curricular Areas and Corresponding Core Curriculum Content Standards:

Consumer/Family/Life Skills **9.2** (G4) A1 & 4
Social Studies: **6.6** (G4) C1
Science: **5.10** (G4) B1
5.8 (G4) B 2 & C2
5.4 (G4) A1 & C3
5.1 (G4) A4
Language Arts: **3.4** (G3) B2 (G4) A1-3, B3 & 4
3.3 (G3) A1-3, B2, C3 (G4) A2, B4-6
3.2 (G3) D1 (G4) D1
3.1 (G3) D3, F5 & G8 (G4)

Vocabulary:

Nonpoint Source Pollution
Stormwater
Storm Drain

Materials Needed:

- An aquarium (non-leaking) with clear glass sides
- Water – should fill aquarium up halfway
- Cardboard box or box top – big enough to fit over top of aquarium
- Scissors – used to cut hole into box or box top
- Green and brown food coloring
- Two small bottles or baby food jars each filled halfway with water

- Three brown, dry twigs, each 2 – 3” in length
- A mix of soil, sand, leaves and pebbles – about 1 cup
- Vegetable oil – about ¼-cup
- Food scraps and food wrappers (about 1 cup)
- Yard waste - grass clippings, leaves, nuts and small sticks (about 1 cup)
- Paper waste – shredded newspaper, cardboard, tissues and paper (about 1 cup)
- One copy of storm drain illustration
- One copy of list of seven scenarios – these should be cut up into seven slips of paper
- A long stick or yard stick for stirring the watery mix
- Blank paper – one piece for each group of students
- Pencils – one pencil for each group of students

Anticipatory Set:

- Show the picture of the storm drain to the class and ask the following questions: “What is this called?” (Sewer or storm drain). “Where are these typically found?” (Alongside curbs or embedded in pavement, parking lots, bridges, etc.).
- Encourage stories regarding balls, toys or other items that have been accidentally dropped into storm drains or sewers by the students, their friends or family members. “Were you able to obtain these items? If not, where do you think the items went?”
- Ask: “What is the purpose of a storm drain and how does it relate to a storm?” (Flood control measure). “Where does water from snow or rain go after it enters a storm drain?” (In most cases water is carried by a pipe into a nearby waterway). Introduce the term “stormwater” to the group.
- Ask: “What other materials can enter storm drains with stormwater?” List suggestions on the board. Examples include litter, fertilizer, road salt, oil, sand, soil, leaves, twigs, animal waste and hazardous waste that has been dumped into drains or soil, etc.)
- Explain that the group will make a storm drain in the classroom in order to learn more about its purpose and the types of materials that can fall into it.

Guided and Independent Practice:

- Place the aquarium in an area where it is easy to view by all of the students.
- Fill the aquarium halfway with water. This water represents the river that the stormwater drains into after it has rained and the stormwater has traveled from a street through a storm drain and into the river.
- Cut a rectangular hole in the center of the box or box top that is large enough for someone’s hand to fit through. Place the box or box top over the top opening of the aquarium – this cover represents the storm drain opening. Leave the aquarium's sides uncovered so students can view its contents.
- The eight scenarios on the separate worksheets provide realistic examples of the types of water pollution that enter storm drains in neighborhoods and communities. These sheets should be cut up into eight slips of paper and each slip should be placed on a table next to its corresponding type of “simulated pollution.”
- Invite two student volunteers to introduce each scenario – one student should read it aloud to the class and the other student should drop the “simulated pollution” into the

storm drain (box opening on top of aquarium) when the reader is finished. After each scenario ask the class to draw conclusions regarding the concerns or problems that the scenario presents and ask them to take notes on these conclusions (as the information may be useful to them later.)

- Use the yardstick or stick to stir the contents of the aquarium when the scenarios have all been completed. Collect the slips of paper and save the scenarios for later use.

Closure:

- Ask students to examine the contents of the aquarium and describe how the quality of the water it contained changed during the activity. In a real-world setting, what do they think happens to these forms of water pollution? Review with them basic information about the water cycle and water movement, if needed, and tie these concepts into the classes' earlier discussion of stormwater.
- Discuss the definition of "nonpoint source pollution" and explain that the forms of pollution mentioned in the scenarios are all forms of nonpoint source pollution. Explain that nonpoint source pollution originates from the individual actions of residents and can occur anywhere – in small communities and neighborhoods as well as in cities and suburbs.
- Ask students: "Does this type of pollution harm the environment? If so, how?" Explain that the water quality of almost all of New Jersey's streams, rivers and lakes are effected in some way by nonpoint source pollution and it does factor into whether people can drink the water, swim in it or fish from it. It can also be harmful to the animals and plants that live in or near water.
- Ask students: "Do you think people in the scenarios wanted to damage the environment? Do you think they planned to pollute the water near them?" If so, have them explain why people might want to do these things. If not, have them guess why these people did what they did regarding their individual actions.
- Divide the class into small groups of 3 – 4 students and give each group one scenario (one slip of paper), a pencil and a piece of blank paper. Give them 5 – 10 minutes to address the problem in the scenario by answering the following questions:
 - What is the concern in this scenario?
 - Can the activity being conducted by people be reduced or prevented from happening? If so, how? OR
 - Can this form of nonpoint source pollution be reduced by amount or prevented from entering the water cycle? If so, how?

Have representatives from each group share their problems and solutions with the rest of the class.

Assessment:

- Participation in group activity and discussion; and
- Responses to questions from the teacher.

Extension:

- Have students "invent" a method or mechanism that would remove unwanted chemicals, solid materials and/or floating objects from stormwater.

Source:

- *Beneath the Shell...A Teacher's Guide to Nonpoint Source Pollution and Its Potential Impact on New Jersey Shellfish*. New Jersey Department of Environmental Protection. First Printing 1991; Revised 1993; Reprinted annually from 1997 – 2002 and 2004; adapted from "Storm Drain Watch"(pgs. 46 – 48).

Storm Drain Watch Worksheet: Eight Scenarios

Scenario #1: Mr. Fernandez has two small trees next to the house porch that he uses regularly. The trees attract wasps, mosquitoes and caterpillars. He sprayed the trees with a chemical to kill or drive away the insects. A storm occurs soon after he sprayed and most of the chemical was washed off the leaves and onto the sidewalk and driveway. From there it was washed with rainwater into the storm drain along the curb.

Simulated Pollution: *Mix 2-3 drops of green food coloring with the water in one of the bottles. Empty this green water into the opening on top of the aquarium.*

Scenario #2: A small stream winds through a popular golf course. During a heavy rain the stream is filled with fast flowing water. In certain places the sides of the stream are wearing away and tree roots are showing. During and after each rain soil, sand, leaves, pebbles and other natural debris are swept away with the heavy flow of water as the shores of the stream slowly collapse. This material is eventually carried by the stream into the river that it empties into.

Simulated Pollution: *Add the mix of soil, sand, leaves and pebbles into the opening on top of the aquarium.*

Scenario #3: Susan enjoys helping her father change the motor oil in the family automobile. She clumsily carries the huge pan of black, thick used motor oil to the storm drain in front of their apartment building, where she dumps it. It's gone! Eventually the oil will mix with the water of a nearby stream or river; and any motor oil that she spilled onto the ground will go into the soil and mix with water that is underground.

Simulated Pollution: *Empty the vegetable oil into the opening on top of the aquarium.*

Scenario #4: One snowy winter evening the Palmer family heard raccoons outside opening and turning over their garbage cans left out by the curb, but it was too dark and cold to go outside and chase them away. The next morning no one in the family had time to clean up the litter that was strewn all over the street. When the snow melted most of the trash floated with the water into the storm drain.

Simulated Pollution: *Add the paper waste through the opening on top of the aquarium.*

Scenario #5: One of Tyrone’s jobs at home is to cut the lawn each week after school. When the grass catcher is full he dumps the grass clippings into the nearby ditch or sewer, whichever one happens to be closer to the lawnmower at the time. When in the ditch or drain the clippings turn yellow and begin to rot and smell until water from the next rainstorm carries the clippings away.

Simulated Pollution: *Add grass clippings through the opening on top of the aquarium.*

Scenario #6: Theresa enjoys walking the family dog, Jasper. When Jasper needs to go to the bathroom she is careful to make Jasper go on the paved road along the curb so that Jasper doesn’t create a mess on the neighbors’ tree lawn. She doesn't worry about this though because she knows that eventually the dog’s waste will be washed with the rain into the nearby storm drain.

Simulated Pollution: *Put the three twigs through the opening on top of the aquarium.*

Scenario #7: The Martinez family enjoys stopping at a fast-food restaurant for dinner while on their way to the beach for the weekend. To save time, the family eats inside their mini-van that is parked in the restaurant parking lot. In order to keep the car clean, they leave their bags of food trash on the pavement in the parking lot for the workers to pick up, since there are no trashcans in the parking lot. This family may not realize that animals and wind will eventually open up the bags and spread this trash around. If it isn’t picked up it can be carried by rainwater during the next storm into a nearby storm drain.

Simulated Pollution: *Add food scraps and food wrappers through the opening on top of the aquarium.*

Scenario #8: A maintenance worker employed by a resident’s association for some townhouses must take on new summer duties for the landscaper while he is out sick. These duties include lawn care for each of the residences. The procedure of spreading weed killer takes about three days to complete and two days after he began an all-day rainstorm kept him indoors. The maintenance worker failed to realize that the downpour would wash away most of the weed killer that was already applied on the lawns. In fact, the chemicals would most likely be washed from plants and pavement into the nearby storm drains.

Simulated Pollution: *Mix 2-3 drops of brown food coloring with the water in one of the small bottles.. Empty this brown water into the opening on top of the aquarium.*
