Nashua River Watershed Investigations for Grades K - 8
Lesson # 7-3

Title: 7-3 Pollution Solutions: Watershed Protection and Engineering Design

Grade Level & Standard: Grade 7
7MS-LS2-5. Evaluate competing design solutions for protecting an ecosystem. Discuss benefits and limitations of each design.

Objective: Students will build a “treatment train” as they try to solve the problem of polluted runoff from a parking lot. They will compare stages of treatment to reduce runoff.

Background/Assumptions:

1. Cars and trucks drip oil when parked.
2. Parking lots get sanded in the winter.
3. Oil from the cars bind to the sand.
4. In a large rain event, the sand/oil will wash to the river.
5. This is the problem you must solve.

Vocabulary

- **Polluted runoff** - Contamination that occurs when rainwater, snowmelt, or irrigation washes off plowed fields, city streets, or suburban backyards. As this runoff moves across the land surface, it picks up soil particles and pollutants, such as nutrients and pesticides.
- **Storm drain / catch basin** - a structure that receives drainage from roadways, parking lots, and other surfaces
- **Detention pond** - a constructed area on land where storm water from a catch basin is directed via an inlet. Sand settles out in the basin. The outlet may be connected by a pipe to a river or stream
- **Treatment train** - a series of treatment steps to solve an engineering problem

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Materials:

- 1 each styrofoam bowl (“detention pond”)
- 1 styrofoam cup (“catch basin”)
- 1 styrofoam plate (“parking lot”)
- Large diameter straw (“pipe”)
- duct tape
- measuring spoons
- scissors or exacto knife
- 2 inch wide paint brush (“street sweeper”)
- two types of trash (paper pieces, candy wrapper, etc.)
- 2 cups sand
- 2 open containers to hold a few cups of water
- basting syringe (“hard rain”)
- spray bottle (“light rain”)
- coffee grounds (oil)
- room temperature water
- spoons

7-3 Pollution Solutions materials *Photo taken by Carolyn Perkins*

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Procedure

1. Set up for treatment system:
    a. Cut hole in center of “parking lot’ plate. The hole must be the size of the top of the cup.
    b. The cup is the catch basin from the parking lot. (The water flows from the lot into the cup).
    c. Cut a small slit half way up the cup and fit the end of the straw into the hole and tape it.
    d. Then tape the other end of the straw to the top of the bowl (detention pond) .
    e. Place this on a tray. (See image above)

2. Activity
    a. Put a cup of sand on the “parking lot”
    b. Sprinkle coffee on the sand.
    c. Sweep half of the material off the “parking lot”
    d. Apply light rain (spray bottle) and heavy rain (baster) on the parking lot.
    e. Continue applying until the catch basin overflows into the detention pond.
    f. Look for sand in the detention pond.
    (In a watershed, the detention pond prevents the sand and pollutants from following into a stream or river nearby.)

Data Sheet: (attached)

- Pollution Solutions data sheet

Extension:

NRWA E. Coli Monitoring Results
http://www.nashuariverwatershed.org/what-we-do/protect-water-and-land/river-water-quality-overview/wqm-data-historic.html

NRWA Current River Report Card
http://www.nashuariverwatershed.org/what-we-do/protect-water-and-land/river-water-quality-overview/wqm.html

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Pollution Solutions Data Sheet **NRWI Lesson 7-3**

Name_____

1) Draw your model below. Label the parking lot, drainage basin, and detention pond. Be sure to include the sand and where it was deposited.

2) Assume that your model is a one-acre parking lot and 20 pounds of sand was applied to melt the ice on the lot. Below are the treatment practices that an engineer could use to prevent excess sand from washing into a river. Look at the table below.

Begin with 20 pounds.

Practices	Pounds removed	Pounds remaining
Parking lot sweeping	10	10
Catch basin cleaning	5	5
Detention pond	5	0

3) Imagine the engineer left out the parking lot sweeping practice. Would more or less sand get into the catch basin? Explain why.

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