

Directions for Enviroscape Demonstration



Set-up of Enviroscape Model

1. Put landscape on top of clear base and water-catcher Tupperware under hole.
2. Place labeled buildings in labeled locations.
3. Put monitoring wells (spray bottle top) by gas station and house with septic system.
4. Put coral reef in ocean and shellfish in estuary.
5. Put clay over holes in underground storage tank area, septic field and drainage hole in ocean.
6. Put storm pipes on either side of port facility building.
7. Put red sugar in underground storage tank and put into ground. Cover with a piece of duck tape (concrete pad).
8. Put septic tank in septic field.
9. Put approximately 5 cups of water in base (groundwater). Fill ocean water on top of model.

You should also have:

1. Spray squirt bottle with clear water.
2. Pitcher of extra water with turkey baster.
3. Small squeeze bottle with red water.
4. Two shakers of different color sugar crystals.
5. Small amounts of oatmeal, pieces of paper , & coco powder

Check your audience's awareness before demonstration

1. What is nonpoint source pollution?
2. What is point source pollution?
3. What is a watershed?
4. What is an estuary?
5. What are signs of pollution in a coastal area?

Provide audience with background information

1. Describe what a coastal zone is. Our model is specifically a coastal zone. Oceans cover 71% of Earth's surface. Coastal zones contain 90% of all marine species and is the site of most large commercial marine fisheries. Coastal zones are very productive areas because of ample sunlight and nutrients deposited from land.
2. The Enviroscape model depicts a watershed that drains to a coastal zone. A watershed is the total land area that contributes runoff to a specific body of water. You can use the analogy of a bathtub being a watershed. All rain that falls inside the tub goes to the same drain.
3. How do pollutants enter the water as it flows through this watershed?
 - a. Rain can be taken up by plants, seep into the ground and become groundwater, or flow overland (runoff) to the ocean.

Points to cover in demonstration

1. POINT SOURCE POLLUTION – comes from a specific point
 - a. **Squirt red water on top of industrial plant and treatment plant**
 - i. Water from pipe from industrial plant – a specific point – can be legal with permit.
 - ii. Treatment plant – removes pollutants from wastewater prior to releasing to environment, but sometimes plant can malfunction (an UPSET) or have a combined sewer overflow (when excess stormwater and sewage bypass treatment).
 - b. **Remove concrete pad over underground storage tank (UST). Use water from turkey baster to flood underground storage tank. Removed piece of clay below tank.**
 - i. Older tanks can have small fractures that leak to groundwater – point out red dye on side of model.
 - c. **Squirt red water or several drops of oil around pavement by gas station and make it rain.**

- i. This simulates accidental spills and overfills that can contaminate the environment.
 - ii. USTs are also used at maintenance facilities of fire stations, school districts, bus systems and marinas.
 - iii. Many leaks and spills are hidden; they occur quietly and can go unnoticed for long periods of time.
 - d. Squirt some red water on top of the residential house. Then simulate a flood with water in the turkey baster. Remove the piece of clay over the hole in the septic field and look through side of model at groundwater.
 - i. Many homes are not connected to municipal wastewater sewer systems and have septic tanks and leach fields. The tank allows solids to settle and the liquid waste flows on the leach field and is broken down by bacteria and soil microbes. Wastes are very high in nutrients. Heavy rains or unmaintained septic tanks can lead to contamination of groundwater.
 - e. Pump the water from the well by the house and squirt it into a cup to see red crystals – contamination.
 - i. Many homes with septic systems also have wells to obtain their drinking water.
- 2. NONPOINT SOURCE POLLUTION – doesn't come from a specific source
 - a. Put some oil on parking lots and roads.
 - i. Represents oil, antifreeze and salt
 - b. Put some soil (cocoa) on farm field and construction site.
 - i. No vegetation to hold onto soil.
 - c. Put pet waste (mix cocoa with drop of water) beside urban high-rise building.
 - i. High in bacteria nutrients
 - d. Place manure on farm field.
 - i. Used as fertilizer because high in nutrients
 - e. Put fertilizer (green sugar) on golf course, yards and farm field.
 - i. Too much fertilizer doesn't get absorbed.
 - f. Put pesticides (red sugar) on the farm field, golf course and yards.
 - g. Put oil and toxins by marina.
 - i. Oil from boats, paint, cleaners used on boats. Locations are directly next to water making it easier to pollute.
 - h. Make it RAIN with squirt bottle.

- i. Discuss how rain runs off streets, parking lots, and land. Picks up soil and other contaminants carrying them to smaller waterbodies and finally to the ocean. Called RUNOFF.
- ii. Nonpoint source pollutants including nutrients, toxic substances, bacteria and even soil are often invisible but still damaging. Can kill shellfish, wildlife or plants and degrade water quality we depend on for drinking, swimming and fishing in.
- iii. Too many nutrients cause sudden and excessive growth of algae, crowds waterbody and uses up oxygen when it decays.
- iv. Bacteria can be helpful to decompose organic waste, but high levels can infect shellfish and pose a threat to human health.
- v. TOXIC substances – metals and chemicals found in household cleaners and pesticides can be ingested by fish and build up as they are accumulated through the food chain – BIOACCUMULATION.

CAN REFER TO CLEAN & BE GREEN HANDOUT NOW

- vi. Put marine debris (oatmeal) on land and in ocean and trash (pieces of paper) and make it rain.
 1. Marine debris hurts marine life = ingestion, entrapment & strangulation
- vii. Point out that storm water drains directly to ocean.

Suggestions of how individuals can help

- Minimize use of chemical in house and use natural replacements
- Dispose of chemical properly
- Use less water
- Use fertilizers and pesticides sparingly
- Lawns, rock gardens, shrubs and natural areas encourage infiltration
- Don't fertilize if rain is predicted
- Let grass clippings decompose on your lawn as natural fertilizer
- Compost food waste
- Don't dispose of anything down storm drains
- Choose native plants
- Have your soil tested
- Prevent oil leakage from vehicles through regular maintenance
- If you change your own oil, use a drop cloth under your car
- Recycle old oil at service center

Watershed in a Box

DESCRIPTION:

You and your group will build a simple runoff model and use it to demonstrate how nonpoint source pollution can affect surface water. Whether you live in a city, town or rural area, nonpoint source pollution can be a problem.



OBJECTIVES

By participating in this activity, your group will:

1. Define a watershed.
2. Use powdered drink mix to represent nonpoint source pollution and demonstrate how this pollution affects surface water.
3. Design a community that will try to minimize the effects of pollution on surface water.

TIME

The runoff model is very easy to build and takes approximately 15 minutes to construct. This activity would work well at a club meeting.

AGE

This activity is appropriate for ages 8 and up.

COST

All supplies for the watershed model can be found in grocery stores, craft stores or your home.

YOU WILL NEED:

For each model:

- ♦ A box cover or other shallow box that is 12" x 12" or larger
- ♦ Foam pieces, styrofoam, or paper
- ♦ Heavy-duty aluminum foil or white plastic bag
- ♦ Permanent markers
- ♦ Spray bottle
- ♦ Cup of water
- ♦ Powdered, unsweetened drink mix - two or three different colors
- ♦ Bucket

BACKGROUND

No matter where you live, the water quality in rivers and streams is determined by what happens on the land around them. The land around a stream or river is called a watershed.

One watershed is separated from another watershed by a low rise, the crest of a hill or a mountain chain. Rain or snow that falls on opposite sides of the higher land causes water to flow into different watersheds.

Not all watersheds are the same. Some watersheds are hilly, while other watersheds are flat plains. In all cases, precipitation that falls on the watershed flows over land to reach the lowest point – a lake, river or stream.

As water flows over land, it picks up soil, chemicals and other pollutants and carries them to lakes, rivers or streams. This water transportation system is called runoff.

In rural or agricultural areas, runoff water carries a wide variety of materials, including pesticides, soil and animal wastes, directly into waterways.

In urban areas, hard surfaces such as driveways, sidewalks, rooftops and roadways prevent water from soaking into the ground. As a result, the runoff water, which can be contaminated with road salt, heavy metals, or automobile fluids, flushes quickly into storm drains that dump directly into streams and rivers.

Pollutants that do not have a single source are called nonpoint source pollution. This pollution originates from many different places.

Everyone lives in a watershed. We may not realize that what happens somewhere in the watershed will eventually have an impact on the lowest point in the watershed – a lake, a river, or a stream.

HOW TO MAKE THE MODEL

1. Get a box.

Use a box cover or a shallow box to contain the runoff model.

2. Create land forms.

Arrange pieces of foam or crumpled paper to represent hills and land forms in the bottom of the box. Encourage your group to be creative. Remember, the highest points should be near the box walls. Leave a gully or valley in the middle of the box to represent a stream or river.

3. Cover the land forms.

Cover the land forms with a large piece of aluminum foil, shiny side up. Start in the middle of the box and gently press the foil into all of the hills and valleys, working your way towards the box walls.

Push the edges of the foil up along the walls of the box and fold the foil over the edge of the box. Be careful not to tear the foil.

4. Create a community.

With a permanent marker, draw on the foil to outline the streams or rivers in your model. Next, draw houses, roads, farm fields, feed lots, stores or anything else that you want in your community.

5. Add some pollution.

Sprinkle different colors of powdered drink mix onto the model. The colors represent different kinds of pollution. For example:

- ♦ Use red powder to represent yard care chemicals and sprinkle it around the houses.
- ♦ Use green powder to represent salt on the roads or automobile waste and sprinkle it along roadways or in a parking lot.



- ◆ Use brown powder to represent exposed soil at a farm field or a construction site.
- ◆ Use blue powder to represent human or animal waste and leave little piles of powder near homes and farms.

6. Ask what will happen.

Ask the group what they think would happen if it rained.

7. Make it rain.

Using the spray bottle to represent a rain storm, spray water on the hillsides. Watch the water flow towards the rivers and streams.

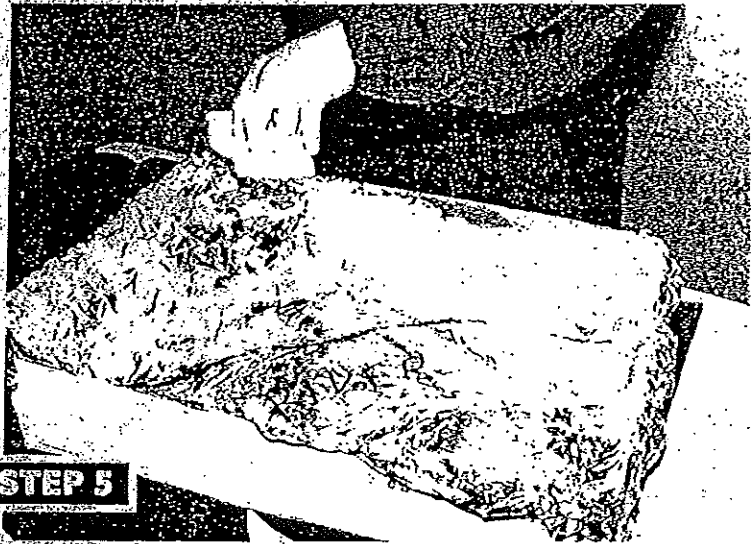
8. Follow up.

Ask the group to tell you what happened. Then ask the group how they would redesign the community to prevent water pollution.

9. Try it again.

Dump the water from the model into a bucket. Remove the foil from the model and set it aside. Place a new piece of foil on the watershed. Ask the group to redesign the community to prevent water pollution.

- ◆ Sprinkle powdered drink mix in the appropriate areas. Let it rain. Was there an improvement?



RESOURCES

Environmental Resource Guide:

*Nonpoint Source Pollution
Prevention Air and Waste
Management Association*

c/o Jane Wagner

P.O. Box 1020

Sewickley, PA 15143

1-800-275-5851

or: Roger Dodds, Chairman of

Wisconsin Chapter, AWMA

Wingra Engineering, Box 1928

Milwaukee, WI 53201

608-255-5030

www.awma.org

It All Adds Up Video Series

This video series is available
from the DNR's Madison office,
phone 608-264-6127 or
608-266-0140.

The five video titles include:

It All Adds Up (overview, 22 min.)

*Conservation in the '90s: Meeting the
Water Quality Challenge* (19 min.)

*From Barnyard to Stream: Managing
Manure for Water Quality* (17 min.)

*Streamside Protection: Finishing the
Job for Water Quality* (14 min.)

*From Curb to Stream: Cleaning Up
Our Urban Waters* (19 min.)

*Pointless Pollution: America's
Water Crisis.*

Bullfrog Films, Inc.

Oley, PA 19547

1-800-543-FROG

www.bullfrogfilms.com

This 28-minute award-winning
program focuses on how
nonpoint pollution has affected
the lives of people in four
regions of the country.

Appropriate for grades 7-12.

Water Action Volunteers is a
cooperative program between the
University of Wisconsin-Extension
and the Wisconsin Department of
Natural Resources. For more
information, contact the Water Action
Volunteers Coordinator at
608-264-8948.

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Winter, 1998.

