

Enviroscape: Procedure

The **Enviroscape** is a model of a watershed used to explain what a watershed is, discuss the water cycle, and demonstrate how land use within a watershed can cause various types of water pollution.

I. Definition of watershed: an area of land on which all runoff from the rain that falls will drain to the same place (at the bottom of the watershed).

- Using the Rivanna Map ask students what watershed they live in, work on the James Basin too, and mention how they all go to the Chesapeake Bay
- Ask students where runoff goes when it falls on the roof of the lodge or on the hillside across the river (downhill to the Moorman River)
- Watersheds can be small or large
 1. Moorman River Watershed
 2. Rivanna River Watershed
 3. James River Watershed
 4. Chesapeake Bay Watershed
- Can discuss the importance of having clean water in the Moorman River to people in Charlottesville who get their water from the Rivanna Reservoir.

II. Students Identify Land Use on the Model

- Ask students where runoff goes when it falls on top of the hill in the model (downhill to the body of water at the bottom).
- Identify land use on the model
 - A. farm
 1. plowed field for crops (ask students for examples of crops)
 2. livestock (identify animals and food products they produce)
 - B. roads
 - C. houses
 - D. construction
 - E. forestry/lumbering (identify products derived from trees)
 - F. golf course (hint: game played on grass with sand traps)
 - G. factory (identify some products produced in factories)
 - H. waste water treatment plant (treats waste water from houses before returning it to river)

III. Students identify pollution produced by each land use (with brief discussion of effects of pollution)

- A. soil/erosion (What do you call it when rain washes the soil away?)
 1. plowed field
 2. livestock (if overcrowded)
 3. construction (if no erosion controls)
 4. forestry (if no replanting or erosion controls)
 5. stream banks (if no plants to protect banks)
- B. nutrients/fertilizer/animal waste

1. plowed field (fertilizer for crops)
2. pasture/livestock (animal waste)
3. houses (lawns and gardens/failing septic system)
4. golf course (fertilizer for grass)
5. waste water treatment plant (overflows in heavy rain)
- C. oil and gas
 1. roads
 2. parking lot
- D. other
 1. factory

IV. Watershed Review

- A. Ask students to define a watershed again.
- B. Ask students where all the runoff in the model ended up.
- C. Ask students where all the pollution ended up
 1. Point out that pollution on the roof of the lodge or on the field below ends up in the Moorman River.
 2. Ask where else the pollution goes (Rivanna, James, Chesapeake).
 3. Point out that people in the same watershed are connected; that pollution always ends up downstream, which can be as far away as the Chesapeake Bay.

V. How to prevent water pollution

- A. Farm
 1. Use as little fertilizer as needed (according to soil test)
 2. Fence cows out of creek
 3. Establish filter strips and/or buffers along waterways
- B. Roads/vehicles
 1. Keep vehicle in good repair
 2. Never pour used motor oil down drain, in woods or in driveway (recycle at garage)
- C. Houses
 1. Use as little fertilizer on lawns and gardens as needed (according to soil test; follow instructions on fertilizer bag)
 2. Inspect and pump septic tank as needed
- D. Construction
 1. Silt fences
 2. Sediment trap/basin
- E. Forestry
 1. Replant trees
 2. Use silt fences and sediment traps as needed
- F. Golf Course
 1. Use as little fertilizer as needed (according to soil test)

Soil Boxes: Procedure

Three **soil boxes** may be used to supplement the Enviroscape lesson with a soil erosion experiment which demonstrates the role that plants and mulch cover play in protecting soil from erosion, and illustrates the fact that grass and other plants keep stormwater runoff cleaner than either mulch or bare soil because roots help hold the soil in place.

I. Discuss the importance of soil

- A. Point out that almost everything we eat depends on the soil; challenge students to name anything we eat that does not depend on the soil
 - 1. fruits and vegetables
 - 2. meat (animals eat plants or other animals that eat plants)

II. Conduct the erosion experiment

- A. Ask what it is called when rain washed away the soil.
- B. Ask what is in the first box (soil)
 - 1. point out that all three boxes contain the same amount of soil
 - 2. ask what is on top of the soil in the second box (straw/hay)
 - 3. ask what is growing in the soil in the third box (grass)
- C. Tell the students that they will make it "rain" on each of the boxes using a sprinkling can and use a jar to catch the water that comes out the front.
 - 1. Ask students what it is called when a scientist makes a scientific guess (hypothesis)
 - 2. Ask what they think the water that comes out of the first box (bare soil) will look like (erosion will carry soil out with the water)
 - 3. Ask whether they think the water coming out of the second box (straw) will have more or less soil in it than the water coming out of the first box
 - 4. Ask whether they think the water coming out of the third box will contain more or less soil than water coming out of the second box
- D. Choose volunteers to use the watering can in the back of the truck and to catch the water coming out of each box.
- E. Have the volunteers hold up the jars and compare.
 - 1. Discuss whether the hypotheses were confirmed or disproved .
 - 2. Discuss how mulch and grass (and other plants) protect soil from erosion.