Homemade Watershed Model: Erosion, Pollution and Prevention

Objectives: (1) Students will be able to describe the change of precipitation to runoff. (2) Students will be able to describe a watershed. (3) Students will be able to diagram runoff and watershed patterns for a local neighborhood. (4) Students will be able to demonstrate the effects of stormwater on pollution with a handmade 3-D model. (5) Students will be able to describe ways to reduce stormwater pollution.

Materials: large aluminum pan or plastic container, aluminum foil, soil, silt, sand, gravel, paper towels, scrap felt, scrap carpet, sponge, food coloring, powdered dyes, spray bottle, water, crushed ice

Activity:

(1) Fill one third of large aluminum pan or plastic container with soil in an irregular manner to mimic the Earth's surface.

(2) Press a layer of aluminum foil over the soil.

(3) Using a spray bottle, spray small amounts of water on the foil and notice how it flows downhill in watersheds. Students record what they observe; e.g., direction of flow, pooling, etc.

(4) Cover the majority of the foil with a layer of soil, silt, sand and gravel (in any pattern you like) until the pan or container is two thirds full to simulate various soil textures. Leave areas of the model (at various elevations) with the foil still exposed to simulate paved portions of the watershed.

(5) Have students predict the effects that new soil textures will have on water flow and effects of the water on the soil.

(6) Spray water in increasing amounts onto soil. Students record observations. Does the water move certain soils more than others? Does this depend on the slope of the watershed or the quantity of water? Does more water flow from the foil (paved) area than the soil area?

(7) Place small amounts of different colors of powdered dyes around your landscape model to represent solid pollutant sources (e.g., animal waste, fertilizers, and pesticides). Place a few drops of food colorings at other places to represent liquid pollutant sources (e.g., soap from a car wash, oil from a leaky car, and sewage from a damaged septic system).

(8) Place various materials downhill from some of the pollutant sources to approximate structural water quality controls (also called Best Management Practices or BMPs). Examples of controls that could be modeled include:

◊ Grass Buffer Strip: Place a small strip of carpet below pollutants placed on pavement (i.e., directly on the foil) to model a strip of vegetation that will slow runoff and pick up pollutants such as oils and solids.

◊ Wetland: Form a small depression in the soil and place a piece of felt or sponge in it to model a small wetland. The "wetland" can be placed below an area approximating a farm field with fertilizer and pesticide or a factory with various industrial pollutants.

◊ Erosion Control Barrier: Erosion control barriers such as fiber blankets or crimped straw are placed on disturbed soil at construction sites to minimize erosion of bare soil before final vegetation or pavement

is in place. Place a strip of paper towel (i.e., an “erosion control barrier”) over an area of loose soil to minimize the erosion caused by the “rain” from the spray bottle as it hits the soil and runs downhill.

(9) Have students predict how the various pollutants will be transported through the watersheds.

(10) Spray small amounts of water on your “pollutants” and observe results. Does the water pick up the substances and transport them as stormwater pollution (colored water)? Does sandy soil filter out some pollutants, while gravel did not? Did your erosion control barriers, buffer strips or wetlands slow or stop the flow of stormwater pollution? Does more of the pollutant run off of the paved areas than the soil areas?