Enviroscape

(4th – 6th Grade)

1 hour

I. Intro
   a. What is a watershed?
      i. An area of land that drains into a body of water.
      ii. Use arm example (with arm bent 45 degrees show how water moves down a slope with spider fingers)
      iii. Name some local waterways in your area
      iv. We all live in a watershed, but they vary in size.
         1. Water cycles continuously through watersheds, it's recycled through evaporation, which enters our air and is then cycled back to the land as rainfall, snow or other precipitation.
   b. What is Pollution?
      i. Anything that does not belong in the air, on the land, or in the water.
   c. What is Point Source Pollution?
      i. Pollution discharged into water bodies from specific, identifiable pipes or points, such as an industrial facility or municipal sewage treatment plant.
      ii. Can you point to it? YES!!!
   d. What is Non-Point Source Pollution?
      i. Pollution that cannot be traced to a specific origin or starting point, but seems to flow from many different sources. NPS pollutants are generally carried off the land by storm water (or melting snow) runoff. The commonly used categories for non-point source pollution are agriculture, forestry, urban areas, construction sites and landfills.
      ii. May not be able to point out. Did you really see the chemicals enter the stream from your lawn? NO !!!

II. **Watershed Model**: Bad practice examples
   a. Point out sites: Construction site, clear cut forest (wood used to make paper), Ice Cream factory, rivers, streams, farm (with cows and pasture), sewage plant (where is this water coming from? Sinks toilets and is then treated.), golf course, neighborhood.
      i. High to low watershed flow
   b. Point source. Can you trace it back? Yes!
      i. Ice Cream Factory
         1. They made too much chocolate ice cream, and have no where to put it. They decide to pour it down the pipe going into the steam.
         2. **Use Sludge and observe as it goes into water**
      ii. Storm Drain located in the neighborhood
         1. Rainwater is washed over street into drain and into stream.
         2. What could be on street to make water dirty?
            a. Oil
            b. Trash
            c. Pet waste
         3. **Use Sludge and observe as it goes into water**

iii. Sewage treatment plant
    1. If built improperly could overflow with rain
    2. People could use too much water at once and cause an upset
    3. **Use Sludge and observe as it goes into water (overflow tanks)**

c. Non-point source. Can't exactly trace human activity.
    i. Construction site
        1. Tractor working with dirt causing soil erosion
        2. Loose soil + Rain = pollution when too much. Turbidity
        3. **Sprinkle with Cocoa**
    ii. Farm
        1. After harvest the land is bare with loose soil. Turbidity
            a. **Sprinkle with Cocoa**
        2. Manure from cows
        3. **Use Sludge and observe as it goes into water**
    iii. Clear Cut Forest
        1. All but two trees have been cut to make paper causing soil erosion. Turbidity.
        2. **Sprinkle with Cocoa**
    iv. Houses and Golf course
        1. What do plants need to grow? Fertilizer/Nutrients.
            a. Too much Nitrogen and Phosphorus = algae
            b. Plants on bottom of lake will not have sun and will die
            c. Bacteria break down dead plants and take oxygen out of water
            d. No oxygen for fish and so die
            e. What is a natural fertilizer? Manure!
            f. **Sprinkle houses and golf course with green Kool-Aid**
        2. Oil from cars
            a. **Sludge**

d. What will happen to the watershed when it rains?
    i. Give as many students the opportunity to make it rain with spray bottles
    ii. Do you want to go swimming in the lake? Eat fish? No!
    iii. How can you prevent this?
        1. Best Management Practices: Systems, activities and structures human beings can construct or practice to prevent non-point source pollution. (Brainstorm)
        2. **Clean Model while students work at their desks with their "Folders" and discuss BMP's (ways to prevent the pollution from getting into the water).**

30 min

III. **Watershed Model**: Best Management Practices
a. Point source.
    i. Factory
        1. Recycle and minimize waste
        2. Donate the ice cream to schools before it melts.
        3. No one is allowed to pollute waterways.
        4. Shut down

ii. Storm Drain
    1. Tell friends, relatives and neighbors where storm drains lead to
    2. Wash your car at the car wash or on the grass
    3. Recycle oil
    4. Pick up pet waste and garbage so it won't reach the storm drain
iii. Sewage treatment plant
    1. Why were tanks overflowing? Tanks too small
        a. Make the tanks bigger
        b. Place cover on tanks
        c. Conserve water at home (brainstorm ideas)
    2. **Add sludge to bigger tanks with lids**

b. Non-point source. Can't exactly trace.
    i. Construction site
        1. Straw bales in trench acting as a filter
            a. Acts as a sponge letting water through and dirt collecting on straw.
        2. Silt Fence (black fabric material)
            a. Acts as a sponge letting water through and dirt collecting.
        3. Wet down soil with water truck
        4. **Build worm wall with play dough**
        5. **Sprinkle with Coco**

    ii. Farm (Note lower land level toward lake)
        1. Berm/Diversion/Terrace
            a. Speed bump for dirt to slow water down.
            b. **Build worm wall with play dough**
        2. Plant cover crop such as winter wheat
            a. If soil is not washing off field, fertilizer stays.
            b. **Use felt to create cover crop**
            c. **Sprinkle with Coco**
        3. Use manure as natural source of fertilizer
            a. Store during winter in waste storage ponds
            b. **Place storage container**
            c. **Sludge**
        4. Cows can still get into stream
            a. Build a fence
                i. Keeps manure out, plus does not cause turbidity in stream.
                ii. **Build fence and discuss watering troughs**
        5. Growers in the Columbia Basin use BMP's everyday. For example, irrigation water management, they use water wisely, measuring the moisture in the soil, making sure the crops have the right amount of water. Growers also use fertilizer and pesticides wisely. They test their soil and put just enough on for crops to grow healthy.
    iii. Clear Cut Forest
        1. Plant trees as long term solution

2. Plant wild grasses
    a. Roots will hold soil in place as a cover crop to prevent soil erosion
    3. Use felt to create cover crop
    4. Sprinkle with Coco

iv. Houses and Golf course
1. Fertilizer
    a. Soil test
    b. Use minimum amount and read the directions
    c. Only apply when it's not raining or windy
2. We tested and are ok

c. What will happen to the watershed when it rains?
i. Give as many students the opportunity to make it rain with spray bottles
ii. Do you want to go swimming in the lake? Eat fish? Yes!
iii. Did BMPs help? Yes!
iv. Questions?
v. Storm drain flyer handout

Washington State Science Standards

The following table indicates which EALRs are met by the Enviroscape Model lesson.

Washington State Learning Standard	
4-5 INQA	Scientific *investigations* involve asking and answering *questions* and comparing the answers with *evidence* from the real world.
4-5 INQF	A scientific *model* is a simplified representation of an object, event, system, or process created to understand some aspect of the natural world. When learning from a model, it is important to realize that the model is not exactly the same as the thing being modeled.
4-5 APPC	Problems of moderate complexity can be solved using the *technological design process.* This process begins by defining and researching the problem to be solved.
4-5 APPD	Scientists and engineers often work in teams with other individuals to *generate* different *ideas* for solving a problem.
4-5 APPE	Possible *solutions* should be tested to see if they solve the problem. Building a *model* or prototype is one way to test a possible *solution*.
4-5 ES2C	*Erosion* is the movement of Earth materials by forces such as *wind*, moving water, ice forming, and *gravity*.
4-5 LS2F	People affect *ecosystems* both positively and negatively.
6-8 INQE	*Models* are used to represent objects, events, *systems*, and processes. *Models* can be used to test *hypotheses* and better understand *phenomena*, but they have limitations.
6-8 APPE	Scientists and engineers often work together to *generate* creative *solutions* to problems and decide which ones are most promising.
6-8 APPF	*Solutions* must be tested to determine whether or not they will solve the problem. Results are used to modify the *design*, and the best *solution* must be communicated persuasively.
6-8 LS2E	*Investigations* of *environmental* issues should uncover *factors* causing the problem and relevant scientific *concepts* and findings that may inform an *analysis* of different ways to address the issue.