



# **ENVIROSCAPE**

## **NON-POINT SOURCE MODEL**

**Need a colorful lesson on water quality?  
Plan to use an EnviroScape model?  
Trying to figure out what to say and how to engage your audience?**

When I was asking these questions, I could not find a written script to get me started. Many District educators have vast experience with using an EnviroScape, but everything they said and did while using the model was “in their head”. This is a quick, basic script to help you formulate your own “storyline” and embellish it with your personal style and finesse. Your comments and suggestions are most welcome to further improve it!

A big thank you to District Education Specialists and veteran EnviroScapers for their tremendous help and inspiration:

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**Franklin Soil & Water Conservation District**

***Susan Woodard***

**Johnston Soil & Water Conservation District**

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Have fun using the EnviroScape to teach people how we all contribute to water pollution and how we can all contribute to the solution!

Respectfully submitted to 2004 District Employees Workshop Share Fair,  
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# ENVIROSCAPE

## NON-POINT SOURCE MODEL

### ~ Basic Script ~

#### **Introduction to Your Audience**

Welcome to our watershed! This colorful model is a teaching tool. Our rule today is: *Eyes on, hands off* -- until you are invited to touch it! There will be opportunities for each of you to help tell our Watershed Story today. We will all politely take turns learning about watersheds (what are they? why are they important?), water pollution (where does it come from? what harm does it do?) and how to prevent it (what can we do? how do we do it? will it make a difference?) Ready? Let's go!

*Pass out powder pollutants + spoons and the "rainmaker" spray bottle to Audience members.*

**Q: How many of you live in a watershed? Please raise your hands high.**

A: Yes, everybody lives in a watershed!

**Q: What is a watershed?**

A: A watershed is the land that water flows across or under on its way to a stream, river, lake, or the ocean.

**Q: What watershed are you in right now?**

A: The \_\_\_\_\_ is a watershed with many smaller watersheds draining into it!

**Q: Can you see on our model how 2 watersheds meet to become a larger river basin?**

A: *With your finger trace this on the EnviroScape. Example:* See how the Eno & Flat Rivers merge to become the Neuse that travels 200+ linear miles to the Atlantic Ocean, or the Deep & Haw Rivers form the Cape Fear, etc. The Neuse River is the 3<sup>rd</sup> largest river basin in North Carolina with more than a million people living within it. There are 17 river basins across NC!

*Point out the Neuse and 16 other river basins on the NC River Basin Map.*

**Q: Why are watersheds and river basins important?**

A: They provide fresh "surface water" and "groundwater" that keeps us and all living things alive. Clean, healthy water keeps us clean and healthy, grows our food, transports us and the things we buy, provides habitat for many aquatic and wetland plants & animals, and provides us all kinds of fun recreation. *As you say this, point out the different land uses illustrated on the EnviroScape: a home, a farm, a factory, and a fish in the lake.*

**Q: What is the greatest threat to our watersheds and river basins in North Carolina and across the country?**

A: Pollution from "stormwater runoff!"

As our watershed becomes covered with houses, roads, shopping centers and parking lots, rainwater is less able to soak into the ground to nourish plants and replenish groundwater. This rainwater that has nowhere to go, becomes "stormwater runoff" that flows fast & furious downhill. Stormwater picks up many pollutants and deposits them untreated into our waterways.

Please note that you won't be able to cover all this information in a festival venue with lots of people coming in short "time spurts". Let the script provide you background information and ideas to pull from as you interact with your audience—even if you only have time to cover one land use. If that's the case, you might want to start at a familiar place called "home" where a watershed ethic and all watershed protection begins!

Susan's Tip: Personalize your script and frame each scenario by introducing a family, narrating their everyday activities: "Look! There's Dad being a handy-dandy handyman in his garage fixing things with glues and paints; here's Mom and her green thumb out in the garden doing her best to win the "Yard Beautiful" award; Junior is busy souping up his "Nascar" dream car in the driveway; and little Sis insists on taking Fido for his daily walk while on the cell phone she does talk!

**Let's visit each corner of our watershed model to learn about the many different land uses in our watersheds; how they can pollute water; and how we can prevent water pollution in the first place!**

## NEIGHBORHOOD

We use land for our homes, front & back yards and driveways. Where might water pollution come from?

### 1. Ooooh, look at the gorgeous GREEN LAWN! Why is it so green?

#### → FERTILIZER (green kool-aid powder)

##### • Why is fertilizer used? What does it help grow?

Fertilizer is a mixture of 3+ plant nutrients (NPK) that promote plant growth.

##### • Why is fertilizer a water pollutant? What happens when it rains?

People use too much fertilizer--the wrong amount. Why? (Don't read directions; think "more" is better)

People use fertilizer right before it rains--at the wrong time. Why? (Think it will "soak in" better; don't know better or oblivious to weather forecasts)

## POLLUTION

Fertilizer is picked up by stormwater runoff, enters waterways, feeds algae that bloom - die - decompose - deplete O<sub>2</sub> = fish kills. By overfeeding our land plants, we are overfeeding our water plants and thus, suffocating fish and aquatic life.

FACT: Excessive nutrient-loading is a MAJOR problem in NC river basins and across the nation! Excessive nutrients hurt the health of the environment (ecology), which in turn hurts the economy (fisheries--fresh & seafood, restaurants, recreation, tourism, jobs), which in turn hurts society (people).

## SOLUTIONS

- Keep fertilizer out of our waterways in the 1<sup>st</sup> place!
- Use no fertilizer: Replace lawn with native plants that need no fertilizer, grasscycle with mulching mower; top-dress with compost (NPK + microorganisms).
- Use less fertilizer: Take soil test to determine amount of fertilizer needed; read and carefully follow fertilizer directions; check weather forecast for rain; plant native plant buffers along waterways to filter fertilizer runoff.

→ Add BMPs = buffers; Show visuals = compost; grasscycle brochure; soil test box + directions.

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## 2. Look Ma! No pesky pests in our yard! Why is it PEST-FREE?

### → CHEMICALS (red kool-aid powder)

- **Why are pesticides used? Why are herbicides used?** (To kill unwanted plants/weeds and insects & other animals)
- **What happens when it rains?** (Chemical residue can be picked up by stormwater)

### POLLUTION

Chemicals are picked up by stormwater runoff, enter and chemically contaminate waterways and/or they soak into soil and contaminate groundwater. Persistent chemicals enter food chain, are stored in animal fat, cause physical - neurological - behavioral problems and ecological havoc.

### SOLUTIONS

- Keep yard chemicals out of our waterways in the 1<sup>st</sup> place!
  - Use no chemicals and no weed-&-feed fertilizers: Plant wildlife habitat to encourage beneficial insects and insect-eating birds & bats; use VINEGAR or use boiling water to kill weeds; hand-weed or use cardboard & newspapers to snuff out weeds; use water to get rid of yellow jackets instead of gasoline!!!!; etc.
  - Use less chemicals: Use less toxic alternatives and read the directions; check the weather forecast for rain; adopt Integrated Pest Management (introduce beneficial insects, low use of specific-target chemicals, etc.); plant native plant buffers along waterways to filter chemical runoff.
- Add BMPs = buffers; Show visuals = plastic bugs; Audubon "Healthy Backyard" brochure; IPM chart; chemical-free pest control fly swatter.

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## 3. We all love our FAMILY PETS. But what do we do with dog doo?!

### → ANIMAL WASTE (add cocoa powder)

- **What goes in, must come \_\_\_\_\_. Pets eat, and pets \_\_\_\_\_.**
- **What's the big ta-doo about pet doo? How is animal waste harmful?**

### POLLUTION

People have all kinds of pets--dogs, cats, horses, goats, pot-bellied pigs, chickens, etc. Pet wastes contain nutrients and pathogens. Pet waste outdoors is picked up by stormwater runoff, nutrients and pathogens enter and contaminate waterways and/or percolate into soil and contaminate groundwater.

FACT: Pet wastes from many individual yards and mini-farms add up to a BIG water quality problem. Again, excessive nutrient-loading is a MAJOR problem in the Neuse River Basin, in NC and across the nation! Pathogens contaminate shellfish, pose a risk to swimmers, and close entire beaches.

## SOLUTIONS

- Keep pet wastes out of our waterways in the 1<sup>st</sup> place!
  - Clean up after your dog while on a walk and in your yard. Carefully wrap waste in plastic and dispose of in the garbage.
  - Plant native plant buffers along waterways to filter animal waste runoff.
- Add BMPs = buffers; Show visuals = sign that says "Please pick up after me!"  
+ dog doo + Mutt-Mitt (or reuse plastic grocery bags or plastic newspaper sleeves).
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### 4. Wow! This CLEAN HOUSE is clean as a whistle. Did we blow it?

#### → HAZARDOUS CLEANERS (add red kool-aid powder)

- Why do we use strong household cleaners? What makes them strong?
- What warnings are found on cleaners? What does the "skull & crossbones" symbol mean?

## POLLUTION

Toxic chemicals, paints & solvents can be harmful to plants, wild animals, pets & people. Problems arise with improper storage, leaks & spills; improper disposal down sink drains, stormdrains, or when chemicals are directly poured onto soil.

## SOLUTIONS

- Keep household chemicals out of our waterways in the 1<sup>st</sup> place!
- Use no toxic chemicals: Replace with environmentally friendly cleaners.
- Use less chemical cleaners: Read labels and avoid cleaners with "skull & crossbones".
- Dispose of chemicals properly at a household hazardous waste collection site.
- Never dump chemicals down a stormdrain!

→ Add BMPs = buffers; list of "green" cleaners; HHW brochure; storm drain stencil or marker.

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### 5. Gentlemen...start your GAS-POWERED ENGINES! Each race leaves a trace....

#### → CHEMICALS & EMISSIONS

add brown soy sauce (oil), red kool-aid (gasoline, brake fluid, antifreeze), green kool-aid (nitrogen oxides from vehicle emissions) and **white salt** to driveways & roads

- Do cars leak? How do you know? What happens when it rains?
- What comes out of a tailpipe? Can air pollution become water pollution? What goes up, must come \_\_\_\_\_.

## POLLUTION

Vehicles that burn fossil fuels release by-products such as NO<sub>x</sub>, CO and VOCs as emissions through the tailpipe. These polluting gases in the air "rain" back to earth and enter streams, lakes, rivers, wetlands and oceans.

FACT: Recent research indicates mobile source emissions from gas-powered vehicles may account for 1/3 of the nutrient-loading of nitrogen in our waterways.

People use toxic chemicals & solvents to clean and maintain their cars, boats, AFVs, etc. These cleaners and chemicals either leak from the vehicle onto the driveway where stormwater runoff washes it into storm drains or ditches which empty untreated into waterways; or these cleaners/chemicals are dumped directly into stormdrains or ditches; or these chemicals are poured onto soil where they contaminate groundwater.

FACT: One quart of motor oil poured down a storm drain contaminates 250,000 gallons of clean water.

## **SOLUTIONS**

- Keep vehicle emissions & air pollutants out of our waterways in the 1<sup>st</sup> place!
  - Buy an energy efficient gas-electric hybrid (rated partial zero emissions, super-ultra low emissions, or ultra low emissions) or gas-powered vehicle (rated ultra low emissions or low emissions). Drive your vehicle less by carpooling, walking, bike-riding, or taking mass transit.
  - Keep car cleaners & chemicals out of our waterways in the 1<sup>st</sup> place! Maintain the vehicle(s) you own with less toxic fluids, cleaners and solvents. Recycle used motor oil at businesses that offer this service. Properly dispose of other automotive fluids at hazardous waste collection sites.
  - Wash your vehicle on grass or vegetation instead of a paved surface. Use less toxic soaps and waxes. Visit a car wash that recycles and/or treats its wash water responsibly. Use sand or ash instead of road salt (from NC Div. Of Water Resources, SAVE curriculum).
- Add BMPs = buffers; photo of hybrid car; used oil recycling brochure; HHW brochure.

## **NEW HOMES & SHOPS UNDER CONSTRUCTION**

### **6. “Bull dozer, bull dozer....push the soil right over!” LANDCLEARING!**

#### **→ SEDIMENT (add cocoa powder)**

- **What do bulldozers do? Why? What's the problem?**
- **What happens when it rains?**

## **POLLUTION**

Large amounts of soil are disturbed when land is cleared to build new homes, schools, roads & shopping centers. Bare soil is unprotected soil. Stormwater erodes soil and transports it off the construction site, depositing it in waterways as sediment. Sediment fills up lakes and rivers and causes flooding. Sediment carries contaminants with it. Sediment smothers fish eggs and prevents their hatching. Sediment smothers aquatic insects that fish eat and alters the entire aquatic food chain. Sediment causes water to turn dark and turbid, absorbing heat energy and raising water temperature ( which depletes O<sub>2</sub>).

FACT: Sediment is NC's #1 water pollutant by volume.

## **SOLUTIONS**

- Keep sediment and air pollutants out of our waterways in the 1<sup>st</sup> place!
  - By law in NC, all sediment must be contained on a construction site of 1+ acres and kept out of state's waterways. Fine\$ are levied for non-compliance.
- Add BMPs = buffers; sediment basins; silt fences, etc.

## GOLF COURSE

### 7. GREEN FAIRWAYS → FERTILIZERS & CHEMICALS (add red kool-aid & green kool-aid powders)

- Why are golf course "greens" green? What's the problem?
- What happens when it rains?

#### **POLLUTION**

People enjoy playing golf on neat, green golf courses. Fertilizers and chemicals such as herbicides and pesticides are used for golf course maintenance. Again, when it rains...it pours and becomes stormwater all the more! And stormwater picks up and delivers chemicals and fertilizers to waterways untreated.

#### **SOLUTIONS**

- Keep fertilizers and chemicals out of our waterways in the 1<sup>st</sup> place!
- Add BMPs = buffers; less toxic alternatives (Golf pro Arnold Palmer has gone organic at his golf courses!)

## FOREST

### 8. Timber! Wood has to come from somewhere! LOGGING

- **SEDIMENT** (add cocoa powder)
- What is logging? Why do we log forests?
  - How is it done? What's the problem? What happens when it rains?

#### **POLLUTION**

Logging timber disturbs large amounts of soil from the roads that are built through forests (especially on steep slopes) and from dragging the trees to be placed on logging trucks.

#### **SOLUTIONS**

- Keep sediment out of our waterways in the 1<sup>st</sup> place!
  - Forestry BMPs are now legally required during timber-clearing operations in NC. Fine\$ are assessed for non-compliance.
- Add BMPs = buffers;

## **DRINKING WATER / WASTEWATER TREATMENT PLANT**

### **9. DRINKING WATER INTAKE → INTAKE OF POLLUTED WATER**

- **What happens when this drinking water plant takes in water from this lake?**

#### **POLLUTION**

Treatment of drinking water is an expensive process, especially if source water (raw water) is polluted. Many chemicals are not identified and treated (and don't have to be by law).

### **10. WASTEWATER PLANT CAPACITY → OVERSPILLS OF RAW SEWAGE**

**(add cocoa powder and red kool-aid powder)**

- **What happens when there's more sewage and more stormwater going into a wastewater treatment plant than it can hold and treat?**

#### **POLLUTION**

Increasing numbers of people and increasing amounts of paved surfaces in a municipality oftentimes exceed the capacity of a wastewater treatment plant. This causes overflow of raw, untreated sewage to enter our waterways. Human sewage contains nutrients, pathogens, and chemical compounds that are harmful to aquatic life and ecosystems.

#### **SOLUTIONS**

- Keep chemicals and human sewage out of our waterways in the 1<sup>st</sup> place!
  - Citizens can request a "Consumer Confidence Report" to find out what chemicals & pathogens are treated at their drinking water plant and the status of the plant's compliance record.
  - Citizens can download a "Source Water Assessment Program" report from the NC Public Water Supply Section to identify what potential contaminants threaten their source water. [www.deh.enr.state.nc.us/pws/](http://www.deh.enr.state.nc.us/pws/) Citizens can "ground-truth" or verify the accuracy of this information.
  - Citizens can protect source water by volunteering in NC Big Sweep and Adopt-A-Stream programs.
  - Citizens can get involved in their community's planning boards and land use plans to reduce the amount of impervious surfaces and to encourage buffers and low impact development.
  - Citizens can vote to pay for repairs and/or expanded wastewater treatment plant capacity.
- Add BMPs = environmental education so that citizens can reduce PS/NPS pollution and ensure clean source water and the proper sewage treatment.

## INDUSTRIAL MANUFACTURING PLANT

### 11. MANUFACTURING → EFFLUENT & EMISSIONS (add red kool-aid powder) (effluent pipe and smokestack are permitted Point Sources)

- **What do manufacturing plants manufacture? What is the process?**
- **What by-products or pollution can result?**

#### POLLUTION

People buy many products as consumers. Industries and manufacturing plants manufacture raw input (extracted natural resources) into output (finished or refined products). The manufacturing process can produce by-products such as liquid effluent that is treated/not treated and piped directly back into a waterway (permitted point source) or gaseous effluent that is treated/not treated and released to the atmosphere through smokestacks (permitted point source). Sometimes the liquid effluent can be released high in temperature which is considered thermal pollution.

As permitted point sources, industries/manufacturing plants must not exceed a set threshold for specific pollutants. Fine\$ for non-compliance are levied.

FACT: There are 400+ permitted point sources in the Neuse River Basin.

#### SOLUTIONS

- Keep liquid effluent & gaseous effluent out of our waterways in the 1<sup>st</sup> place!
  - Innovate and reuse effluent as another industrial input. Treat and clean with new technologies before release into the environment.
  - Volunteer as a concerned citizen for the Adopt-A-Permit program to ensure compliance of permitted point sources in your watershed.
- Add BMPs = patronize and support businesses and industries that model responsible environmental stewardship throughout their entire manufacturing process.

## FARM

### 12. FARMING → SEDIMENT, FERTILIZERS, CHEMICALS & ANIMAL WASTE (add cocoa powder, green & red kool-aid powders, cocoa + soy sauce)

- **What do farmers farm? What pollution can result from raising crops and livestock?**
- **What happens when it rains?**

#### POLLUTION

Farming can involve the use of fertilizers and chemicals. Farming involves the management of soil, water, plants and animal wastes.

#### SOLUTIONS

- Keep sediment, fertilizers, chemicals & animal wastes out of our waterways in the 1<sup>st</sup> place!

- Reduce erosion: Adopt conservation tillage that builds up organic matter and soil health; use other ag BMPs that reduce the impact of rainfall, increase water infiltration, and slow surface runoff (decrease % slope and shorten length of slope)--contour planting, stripcropping, terraces, diversions, grass waterways, field borders, etc.
- Maintain or plant native buffers along waterways to trap sediment.
- Use less fertilizer & chemicals: Use "Precision Farming" where GPS identifies exact amount of fertilizer needed in exact field location for specific crop & environmental conditions; adopt conservation tillage that builds up organic matter and soil health.
- Maintain or plant native buffers along waterways to filter any fertilizers and chemicals from farm runoff.
- Prevent introduction of animal wastes: Fence livestock out of streams and provide watering trough away from waterways; direct all wastes into lagoon/holding pond and treat biologically (or anaerobically to capture methane for power generation); compost manure and dead animals and collect runoff in lagoons/holding ponds. Research new animal waste management strategies that reduce odor and water pollution.
- Citizens can patronize and support local farmers that employ responsible environmental stewardship throughout their farming operations.

→ Add BMPs = buffers; fence cows out of stream, etc. (you guys know this stuff by heart!)

## **CONCLUSION**

Hopefully, you have learned many responsible actions you can take to protect your watershed. Which ones are easy enough to start doing TODAY? Which actions will you tell your friends about? What's the best way to encourage others to protect water quality? Show them by modeling "water stewardship practices" yourself!

Our waterways are a direct reflection on how much we care!

## **GLOSSARY**

**Watershed:** The land area that water flows across or under as it runs downhill to collect at the lowest point in a stream, river, or lake.

**Surface water** – Water that has collected on the surface of the land.

Ex: stream, river, lake, ocean

vs.

**Groundwater** – Water that fills the spaces between soil particles and cracks in rocks underground. Groundwater is rarely found as an underground river, lake or cavern.

**River Basin:** A river basin drains all the land around a major river. Basins can be divided into watersheds, or areas around a smaller stream, river or lake.

**Pervious Surface:** Land surfaces that allow water to infiltrate and be absorbed; land that can be penetrated by plant roots.

Ex: vegetated land covered by grass, plants, shrubs & trees

vs.

**Impervious Surface:** Land surfaces that are resistant to penetration by water or plant roots

Ex: asphalt streets, cement sidewalks, concrete patios, paved driveways, building rooftops

**Stormwater Runoff:** Rainwater that cannot soak into the ground due to saturated or compacted soil, or due to impervious surfaces that prevent infiltration. Stormwater runs downhill off the land (thus the term “stormwater runoff”) picking up pollutants on its way (thus the term “polluted runoff”).

**Point Source:** Pollution that can be traced to a single point source, such as a pipe or culvert. Ex: industrial discharge pipe, wastewater treatment plant outfall

vs.

**Non-Point Source:** Pollution that cannot be traced to a specific point or source of origin, but rather from many individual places

Ex: urban runoff from many miles of road, agricultural runoff from many field acres

###